

PRODUCT BRIEF

Intel® Xeon® Processor E5-2600 v4 Product Family
IoT



The Foundation for IoT Transformation

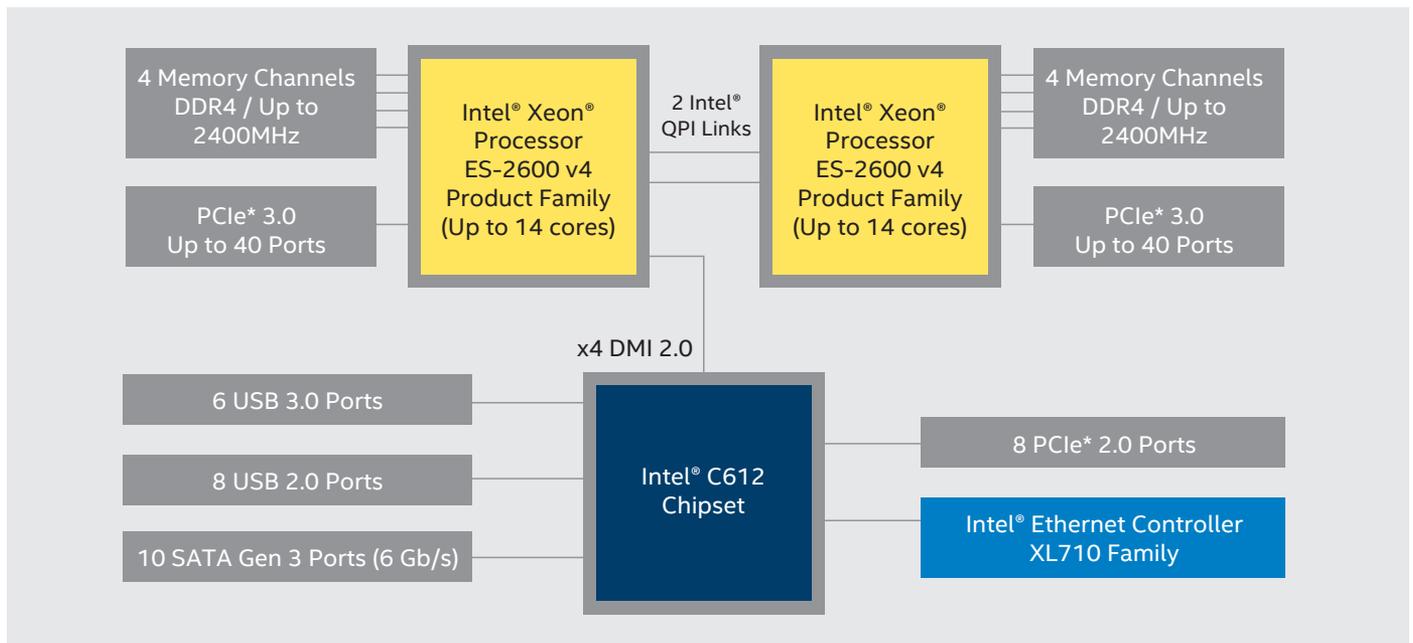
Intel® Xeon® Processor E5-2600 v4 Product Family



Product Overview

The Intel® Xeon® processor E5-2600 v4 product family, manufactured on the latest 14 nm process technology, delivers the high performance and increased memory bandwidth for the next generation of smart and intelligent IoT applications. These processors take performance and efficiency to new heights¹ across the widest range of workloads, while providing an array of new technologies for more efficient virtualization, smarter shared resource management, and enhanced protection

of systems and data. The all-new Intel Xeon processor family, offered with a 7-year extended supply life, is well suited for many IoT applications, including video analytics and high-end medical imaging applications. The latest Intel Xeon processor is also available with low-power, 10-year reliability, and robust thermal profile options to handle workloads such as industrial automation, communication and networking appliances, and military-grade equipment.



Up to 44 Percent Faster; 23 Percent Average Generational Performance Gain across Key Industry-Standard Workloads and Applications²

The two-socket Intel Xeon processor E5-2600 v4 product family provides more cores and cache than the previous generation, supports faster memory, and includes integrated technologies for accelerating a broad range of IoT and embedded workloads. These processors include Intel® QuickPath Interconnect (QPI) technology for fast, resilient system communications with up to 9.6 GT/s of QPI speed per channel. They also include key improvements in virtualization efficiency that can help to boost application performance.

- **More execution resources for higher overall performance.** With up to 14 cores per socket, up to 35 MB of last-level cache (LLC), and support for up to 12 percent faster DDR4 memory³ versus previous-generation memory, processors come in a wide variety of configurations, so core counts, frequencies, and power levels can be tailored for individual workloads to deliver optimal performance.
- **Extra boost for multithreaded workloads.** Intel® Transactional Synchronization Extensions (Intel® TSX) exposes hidden parallelism to help increase performance for multithreaded workloads that are currently slowed by memory locking.
- **Higher performance for mixed workloads.** Intel® Advanced Vector Extensions 2 (Intel® AVX2) instructions accelerate floating point and integer computations with support for 256-bit vectors. This technology can increase peak floating point operations by up to 31%,⁴ and is now optimized for mixed workload environments.
- **Faster access to critical data.** Enhanced Intel® Data Direct I/O allows direct data transfers to last-level cache (LLC) with optimized LLC-to-core communications. Main memory is bypassed completely to provide high-speed, low-latency data access that is ideal for today's increasingly data-hungry applications.

- **Enhanced virtualization.** Intel® Virtual Machine Control Structure (VMCS) shadowing extends root virtual machine monitor (VMM)-like privileges to a guest VMM to provide more flexible support for legacy code and deep security monitoring. Additional virtualization enhancements in the Intel Xeon processor E5-2600 v4 product family enable fewer and faster transitions to the VMM while reducing performance overhead.

Smarter Resource Management through Built-In Instrumentation

The Intel Xeon processor E5-2600 v4 product family includes Intel® Resource Director Technology, which provides deeper visibility and control over shared platform resources to enable smarter resource management.

- **Cache Monitoring and Allocation Technologies (CMT and CAT).** The ability to monitor and allocate LLC usage for individual applications and virtual machines can help customers provide more reliable performance guarantees for high-priority applications and make better decisions regarding workload placement.
- **Memory Bandwidth Monitoring (MBM).** With granular visibility into memory bandwidth usage, customers can balance workloads across sockets to avoid contention, improve utilization, and deliver higher service levels.
- **Code and Data Prioritization (CDP).** Code and data placement in the LLC can now be programmed to help optimize performance and code isolation for applications that have large code footprints or high sensitivity to code residency in the last-level cache.

A Better Foundation for Trust and Security

The volume and sophistication of digital threats continue to escalate. The Intel Xeon processor E5-2600 v4 product family adds additional layers of hardware-assisted security to help protect data and platforms more effectively through enhanced workload isolation, improved security policy enforcement, and faster cryptography.

- **Up to 70 percent increase in per-core performance on key encryption algorithms.**⁵ New instructions in the Intel Xeon processor E5-2600 v4 product family help to accelerate secure session initiation protocols based on RSA, ECC, and Secure Hash Algorithm (SHA). Intel® Data Protection Technology with Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) has also been improved to enable even faster bulk data encryption. With these technologies, protecting data at rest and during transmission is practically transparent for many workloads.
- **Enhanced Key Security.** The Intel Xeon processor E5-2600 v4 product family provides an integrated random number generator for creating security keys and a random bit generator for seeding software-based solutions. Both technologies help to provide high-quality keys for enhanced security.
- **Strong protection against platform attacks.** Intel® Platform Protection Technology with Intel® OS Guard (Supervisor Mode Execution Protection) has been enhanced with new Supervisor Mode Access Prevention (SMAP). These technologies work together to prevent privileged code in the operating system from executing or even accessing data from unauthorized user pages. New #VE (Virtualization Exception) provides hardware assists to reduce overhead for deep memory monitoring (below the OS), which can help organizations protect against new classes of stealthy malware and zero day attacks. Intel Platform Protection Technology with BIOS Guard adds to these safeguards by protecting BIOS during FLASH updates via protected agent authentication.
- **Measured boot for trusted infrastructure.** Intel Platform Protection Technology with Intel® Trusted Execution Technology (Intel® TXT) helps to protect platform firmware and the OS kernel from pre-boot attacks. It also supports Trusted Platform Module* 2.0 (TPM* 2.0), with its stronger cryptographic capabilities.

Intel® Xeon® Processor E5-2600 v4 Product Family Overview

High Performance for the Broadest Range of Applications and Environments

ADVANCED MULTICORE, MULTITHREADED PROCESSING

Up to 14 cores and 28 threads per socket

LARGER CACHE AND FASTER MEMORY

Up to 35 MB of last-level cache (LLC) for fast access to frequently used data

Up to 24 DIMMs per two-socket server and faster maximum memory speeds (DDR4 2400 MHz)

HIGHER PERFORMANCE FOR DIVERSE APPLICATIONS

Intel® TSX instructions take advantage of hidden parallelism to accelerate OLTP and other multithreaded workloads

Intel® AVX2 instructions accelerate floating point and integer computations with support for 256-bit vectors

Intel® Turbo Boost Technology takes advantage of power and thermal headroom to increase processor frequencies across a wide range of workloads

INDUSTRY-LEADING I/O PERFORMANCE

Intel Integrated I/O provides up to 80 PCIe* lanes per two-socket server, and supports the PCIe* 3.0 specification with atomic operations support for improved peer-to-peer (P2P) bandwidth

The Non-Volatile Memory Express* (NVMe*) specification, supported by the Intel® Solid-State Drive Data Center Family for PCIe, overcomes SAS and SATA SSD performance limitations through an optimized register interface, command set, and feature set for PCIe-based Solid-State Drives (SSDs). For more information, visit NVMeExpress.org.

Advanced storage processor features include x16 non-transparent bridging (vs. x8 NTB) for enhanced scalability, and accelerated RAID for implementing RAID 5 and RAID 6 without a custom ASIC

SMARTER RESOURCE MANAGEMENT

Intel® Resource Director Technology with:

Cache monitoring and allocation technologies to enable customers to improve application performance and determinism by providing guaranteed cache

Memory bandwidth monitoring to help customers balance workloads across sockets for optimized performance with enhanced utilization

STRONG, HIGH-SPEED ENCRYPTION FOR DATA AND COMMUNICATIONS

Intel® Data Protection Technology with:

Intel® AES-NI and new crypto acceleration for RSA, ECC, and SHA to help accelerate bulk data encryption and secure session initiation protocols, enabling encryption to be used more pervasively without slowing applications

Intel® Secure Key to provide high-quality security keys, as well as random bits (seeds) for software-based key generation solutions

AN EXCELLENT FOUNDATION FOR SECURE MULTITENANCY

Intel® Platform Protection Technology with:

Intel® Trusted Execution Technology (TXT) to enable customers to establish trusted pools of virtualized resources for stronger security and compliance in multitenant virtual and cloud environments

Intel® OS Guard (Supervisor Mode Execution Protection) and new Supervisor Mode Access Prevention (SMAP) to protect against escalation of privilege attacks that attempt to gain control of the platform, execute malware, or otherwise compromise privileged OS components

INDUSTRY-LEADING ENERGY EFFICIENCY

Intel's industry-leading 14 nm process technology supports greater functionality, higher density, and lower power consumption than the prior manufacturing process⁶

Intel® Intelligent Power technology dynamically manages CPU and memory energy states to minimize power consumption without slowing performance

Per-core P states dynamically and independently regulate power in each core for energy-efficient processing

ENABLING IOT SOLUTIONS

Extended 7-year supply life to protect system investment

10-year reliability and robust thermal specifications for ruggedized IoT and embedded designs

From modular components to market-ready systems, Intel and the 400+ global member companies of the [Intel® IoT Solutions Alliance](http://IntelIoT.com) provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics

Processor number	CPU Frequency (GHz)	Intel® Turbo Boost 2.0 Technology	Intel® HT Technology	LLC Cache (MB)	Number of cores	Power (W)	Intel® QPI Link Speed (GT/s)	DDR4 Memory	Robust Thermal Profile (High TC _{case})
Intel® Xeon® Processor E5-2680 v4	2.4	*	*	35	14	120	9.6	2400	Standard
Intel® Xeon® Processor E5-2658 v4	2.3	*	*	35	14	105	9.6	2400	91 °C ⁷
Intel® Xeon® Processor E5-2648L v4	1.8	*	*	35	14	75	9.6	2400	87 °C ⁷
Intel® Xeon® Processor E5-2640 v4	2.4	*	*	25	10	90	8.0	2133	Standard
Intel® Xeon® Processor E5-2628L v4	1.9	*	*	30	12	75	8.0	2133	87 °C ⁷
Intel® Xeon® Processor E5-2620 v4	2.1	*	*	20	8	85	8.0	2133	Standard
Intel® Xeon® Processor E5-2618L v4	2.2	*	*	25	10	75	8.0	2133	87 °C ⁷
Intel® Xeon® Processor E5-2609 v4	1.7	-	-	20	8	85	6.4	1866	Standard

* supported
 - not supported

Learn more about the Intel® Xeon® processor E5-2600 v4 product family.

Learn more at intel.com/iot.



- Intel® Xeon® processor E5-2600 v4 product family up to 50% vs. previous-generation E5 v3 average performance per watt improvement based on key industry-standard benchmark calculations submitted by OEMs as of 16 March 2016 comparing 2-socket Intel® Xeon® processor E5 v3 to v4 family. Key industry benchmarks include: SPECvirt_sc*2013_Server PPW, SPECvirt_sc*2013_PPW, SPEC power_ssj*2008 and VMmark 2.5 server power. See <http://www.intel.com/performance/datacenter> for full configuration details.
- Intel® Xeon® processor E5-2600 v4 product family up to 47% vs. previous-generation E5 v3 performance based on binomial cpu v3.0_AVX2 financial services workload results as of 16 March 2016 comparing 1-Node, 2 x Intel® Xeon® processor E5-2699 v3 on Grantley-EP (Wellsburg) with 128 GB total memory on Red Hat Enterprise Linux* 6.4 kernel 2.6.32-358, Options per second score: 106025 vs. 2 x Intel® Xeon® processor E5-2699 v4 on Grantley-EP (Wellsburg) with 128 GB total memory on Red Hat Enterprise Linux* 6.4 kernel 2.6.32-358, Options per second score: 156141 Higher is better. Data Source: Request Number: 1871
- E5 v4 up to 27% vs. previous-generation E5 v3 average performance based on key industry-standard benchmark calculations submitted by OEMs as of 16 March 2016 comparing 2-socket Intel® Xeon® processor E5 v3 to v4 family. Key industry benchmarks include: SPECint*_rate_base2006, SPECint*_base 2006 (Speed), SPECfp*_rate_base 2006, SPECfp*_base2006 (Speed), SPECmpi*_base2007, SPECm-pi*_base2007, SPECompG*_base2012, SPECvirt_sc*2013, VMmark* 2.5 performance (matched pairs), TPC-E*, SPECJEnterprise*2010, Two-tier SAP SD* Windows*/Linux*, 1-Node TPC-H* 1TB, TPCx-BB* and SPECjbb*2015 MultiJVM. See <http://www.intel.com/performance/datacenter> for full configuration details.
- The Intel® Xeon® processor E5-2600 v4 product family supports memory speeds up to 2400 MT/s versus maximum memory speeds of 2133 MT/s for the Intel® Xeon® processor E5-2600 v3 product family.
- LINPACK: 1-Node, 2 x Intel® Xeon® processor E5-2699 v3 on Grantley-EP (Wellsburg) with 64 GB total memory on CentOS* using MP_LINPACK 11.3.1 (Composer XE 2016 U1) @ 80,000 problem size. Data Source: Request Number: 1636, Benchmark: Intel® Optimized MP LINPACK, Score: 1096 vs. 1-Node, 2 x Intel® Xeon® processor E5-2699 v4 on Grantley-EP (Wellsburg) with 64 GB Total Memory on Red Hat Enterprise Linux* 7.0 kernel 3.10.0-123 using MP_LINPACK 11.3.1 (Composer XE 2016 U1). Data Source: Request Number: 1636, Benchmark: Intel® Optimized MP LINPACK, Score: 1446 Higher is better.
- 1-Node, 2 x Intel® Xeon® processor E5-2697 v3 @ 2.1GHz on Grantley-EP with 64 GB total memory on SUSE Linux Enterprise Server* 12 using haproxy* 1.6.3 and OpenSSL* 1.0.2f versus 1-Node, 2 x Intel® Xeon® processor E5-2699 v4 @ 2.1 GHz on Grantley-EP with 64 GB total memory on SUSE Linux Enterprise Server* 12 using haproxy* 1.6.3 and OpenSSL* 1.0.2f
- Compared to previous generation 22 nm processor technology. Source: Intel internal testing
- Not to exceed 360 hours per year.

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. For more information go to intel.com/performance.

Intel® processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See intel.com/performance for details. 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, visit intel.com/performance/resources/limits.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

No computer system can provide absolute security. Requires an enabled Intel® processor, enabled chipset, firmware, and/or software optimized to use the technologies. Consult your system manufacturer and/or software vendor for more information.

Intel® technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can provide absolute security.

All dates and products specified are for planning purposes only and are subject to change without notice.

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.

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