

Introducing the Intel® Xeon® Processor E5-2600 v4 Product Family

Driving the Digital Transformation in the Data Center with Improved Performance, Security and Agility

March 31, 2016 — From individual servers and workstations to clusters, data centers, IoT and the cloud, the Intel® Xeon® processor E5-2600 v4 product family takes performance and efficiency to new heights¹ across a wide range of workloads and provides an array of new technologies for more efficient virtualization, smarter resource orchestration, and enhanced protection of systems and data.

Product Family Overview

Designed specifically for two-socket servers, the Intel Xeon processor E5-2600 v4 product family provides over 20 percent more cores and cache² than the previous generation, supports faster memory, and includes integrated technologies that increase performance across a broad range of workloads³. The product family comes in a wide variety of configurations to allow core counts, frequencies and power levels to be tailored for individual workloads for optimal performance.

The Intel Xeon processor E5-2600 v4 product family can help businesses, cloud service providers and telecommunications companies achieve higher performance and value from every new server, while accelerating the transition to software-defined infrastructure (SDI).

Advanced multi-core, multi-threaded processing

- Up to 22 cores and 44 threads per socket

Larger cache and faster memory

- Up to 55 MB of last-level cache (LLC) for fast access to frequently used data
- Up to 24 DIMMs per two-socket server to support multiple data-hungry VMs
- Faster maximum memory speeds than the previous generation (DDR4 2400 MHz versus 2133 MHz)

Higher performance for diverse workloads

- Intel® Turbo Boost Technology with improvements when running mixed AVX workloads takes advantage of power and thermal headroom to increase processor frequencies across a wide range of workloads
- Improved virtualization performance, including lower latencies when entering and exiting VMs, less VM interrupts via posted interrupts, and page modification logging, which can be used for rapid VM check pointing

Higher performance for technical computing and multi-threaded applications

- Intel® TSX instructions take advantage of hidden parallelism to accelerate OLTP and other multi-threaded workloads that experience bottlenecks due to memory locks
- 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 percent⁶, and is now optimized for mixed workload environments
- The Intel Xeon processor E5-2600 v4 product family is Intel's first processor within the Intel® Scalable System Framework

Smarter Resource Orchestration

With the growth of private and hybrid clouds in the enterprise, IT organizations are deploying powerful new tools for orchestrating and automating data center resource management. 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 orchestration. This suite of technologies help IT organizations improve service levels and infrastructure utilization and accelerate their move toward fully automated SDI.

Intel Resource Director Technology includes:

- Cache monitoring and allocation technologies enable IT to make smarter scheduling and load balancing decisions, implement a new class of tiered services, and provide guaranteed cache for high priority applications
- Memory bandwidth monitoring helps IT balance workloads across sockets for optimized performance with enhanced utilization and improved service levels
- Intel® Node Manager complements Intel Resource Director Technology by monitoring and controlling server power, thermals and utilization. In combination with Intel® Data Center Manager, it enables IT to dynamically optimize energy consumption at every level, from individual servers, racks and rows to entire data centers

A Foundation for Trust and Security

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 increased per-core performance on key encryption algorithms⁵**
New instructions – such as ADCX/ADOX and PCLMULQDQ micro-architecture – 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 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.

PROCESSOR NUMBER	CPU FREQUENCY (GHz)	INTEL® TURBO BOOST 2.0 TECHNOLOGY ⁶	INTEL® HT TECHNOLOGY	LLC CACHE (MB)	NUMBER OF CORES	POWER (W)	INTEL® QPI LINK SPEED (GT/s)	DDR4 MEMORY	
FOR 2-SOCKET SERVERS									
Intel® Xeon® Processor E5-2699 v4	2.2	*	*	55	22	145	9.6	2400	\$4115
Intel® Xeon® Processor E5-2698 v4	2.2	*	*	50	20	135	9.6	2400	\$3226
Intel® Xeon® Processor E5-2697A v4	2.6	*	*	40	16	145	9.6	2400	\$2891
Intel® Xeon® Processor E5-2697 v4	2.3	*	*	45	18	145	9.6	2400	\$2702
Intel® Xeon® Processor E5-2695 v4	2.1	*	*	45	18	120	9.6	2400	\$2424

Intel® Xeon® Processor E5-2690 v4	2.6	*	*	35	14	135	9.6	2400	\$2090
Intel® Xeon® Processor E5-2683 v4	2.1	*	*	40	16	120	9.6	2400	\$1846
Intel® Xeon® Processor E5-2680 v4	2.4	*	*	35	14	120	9.6	2400	\$1745
Intel® Xeon® Processor E5-2660 v4	2.0	*	*	35	14	105	9.6	2400	\$1445
Intel® Xeon® Processor E5-2650 v4	2.2	*	*	30	12	105	9.6	2400	\$1166
Intel® Xeon® Processor E5-2640 v4	2.4	*	*	25	10	90	8.0	2133	\$939
Intel® Xeon® Processor E5-2630 v4	2.2	*	*	25	10	85	8.0	2133	\$667
Intel® Xeon® Processor E5-2623 v4	2.6	*	*	10	4	85	8.0	2133	\$444
Intel® Xeon® Processor E5-2620 v4	2.1	*	*	20	8	85	8.0	2133	\$417
Intel® Xeon® Processor E5-2609 v4	1.7	-	-	20	8	85	6.4	1866	\$306
Intel® Xeon® Processor E5-2603 v4	1.7	-	-	15	6	85	6.4	1866	\$213
FOR 2-SOCKET SERVERS – FREQUENCY OPTIMIZED									
Intel® Xeon® Processor E5-2667 v4	3.2	*	*	25	8	135	9.6	2400	\$2057
Intel® Xeon® Processor E5-2643 v4	3.4	*	*	20	6	135	9.6	2400	\$1552
Intel® Xeon® Processor E5-2637 v4	3.5	*	*	15	4	135	9.6	2400	\$996
FOR 2-SOCKET SERVERS – LOW POWER									
Intel® Xeon® Processor E5-2650L v4	1.7	*	*	35	14	65	9.6	2400	\$1329
Intel® Xeon® Processor E5-2630L v4	1.8	*	*	25	10	55	8.0	2133	\$612
FOR 2-SOCKET WORKSTATIONS									
Intel® Xeon® Processor E5-2687W v4	3.0	*	*	30	12	160	9.6	2400	\$2141
FOR STORAGE AND COMMUNICATIONS									
Intel® Xeon® Processor E5-2658 v4	2.3	*	*	35	14	105	9.6	2400	\$2040
Intel® Xeon® Processor E5-2648L v4	1.8	*	*	35	14	75	9.6	2400	\$1544
Intel® Xeon® Processor E5-2628L v4	1.9	*	*	30	12	75	8.0	2133	\$1364
Intel® Xeon® Processor E5-2618L v4	2.2	*	*	25	10	75	8.0	2133	\$779
Intel® Xeon® Processor E5-2608L v4	1.6	-	*	20	8	50	6.4	1866	\$441

The Intel Xeon processor E5-2600 v4 product family will be offered with 27 different server SKUs – including embedded and communications usage – which range in price from \$213 to \$4,115 in quantities of 1,000. Complete pricing details can be found in the <http://intc.com/priceList.cfm>. For more details on these new Intel Xeon processors, visit www.intel.com/xeone5. For more details on world records and other claims, visit <http://www.intel.com/performance/datacenter>.

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¹ E5 v4 up to 50% vs. previous-generation E5 v3 average performance per watt improvement based on key industry-standard benchmarks 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.

² Intel® Xeon® Processor E5-2600 v4 product family (22C, 55M Cache) compared to Intel® Xeon® Processor E5-2600 v3 product family (18C, 45M Cache).

³ E5 v4 up to 47% vs. previous-generation E5 v3 performance based on binomialcpu 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 benchmarks 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, SPECmpi*_base2007, SPECCompG*_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.

⁴ 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

⁵ 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

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 <http://www.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 <http://www.intel.com/performance> for details.

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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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