AMD EPYC™ SoC Consistently Sets World Records on SPEC CPU 2017 Floating Point Benchmarks

Up to 8% better floating-point performance on 2-socket servers

PERFORMANCE BRIEF
MARCH 2018

AMD EPYC

HIGHLIGHTS

- **UP TO 8% BETTER FLOATING POINT PERFORMANCE** ON THE SPECRATE®2017_FP BENCHMARK FOR 2-SOCKET SERVERS COMPARED TO THE INTEL XEON PLATINUM 8180 PROCESSOR

- **A BETTER BALANCE OF RESOURCES** TO MAKE YOUR REAL-WORLD WORKLOADS PERFORM BETTER: MORE CORES, MORE MEMORY[5], MORE MEMORY BANDWIDTH[6], AND MORE I/O CAPACITY[7]

- **EXCELLENT PROCESSOR** FOR HIGH-PERFORMANCE COMPUTING, MACHINE LEARNING, BIG DATA, AND ANALYTICS

The AMD EPYC™ 7601 system on chip (SoC) races past the best Intel Xeon Platinum 8180 processor by up to 8% in floating point performance, setting even more world records on the new SPEC CPU® 2017 benchmarks[1,4].

The new world records set by the AMD EPYC processor outperforms Intel's best CPU designed for 2-socket servers without add-on accelerators—setting new performance expectations for 2-socket multithreaded floating point performance. Multithreaded performance is a measure of how well a server can execute multiple operations at the same time. This type of performance is extremely important those who use solutions for high-performance computing, machine learning, big data, and analytics.

NEW SPEC CPU 2017 BENCHMARK

The SPEC CPU 2017 benchmark package contains SPEC's next-generation, industry-standardized, CPU-intensive suites for measuring and comparing compute intensive performance, stressing a system's processor, memory subsystem and compiler. The new SPECrate®2017 floating point benchmark suite contains 13 tests that measure how much work can get done per unit of time. We have chosen to list the SPECrate2017 floating point results because they are good indicators of how much floating point-intensive work the AMD EPYC 7601 SoC can accomplish for you. The SPEC® suite of benchmarks consist of a variety of high performance computing models, image rendering, and dynamics programs.

AMD EPYC SOC SETS 2-SOCKET FLOATING POINT WORLD RECORD		
SERVER	RESULTS	GAIN
SUPERMICRO A+ SERVER 2023US-TR4 (EPYC 7601, LRDIMM 4RX4, 2666 MHZ)	SPECRATE2017_FP_PEAK=276[1] SPECRATE2017_FP_BASE=263	7.8%
SUGON A620-G30 (EPYC 7601, LRDIMM 4RX4, 2666 MHZ)	SPECRATE2017_FP_PEAK=274[2] SPECRATE2017_FP_BASE=260[2]	7.0%
HPE PROLIANT DL385 GEN10 (EPYC 7601, LRDIMM 4RX4, 2666 MHZ)	SPECRATE2017_FP_PEAK=272[3] SPECRATE2017_FP_BASE=259[3]	6.3%
HUAWEI 2288H V5 (INTEL XEON PLATINUM 8180, 2.50 GHZ)	SPECRATE2017_FP_PEAK =256[4] SPECRATE2017_FP_BASE=251[4]	

COMPARATIVE RESULTS WERE AVAILABLE FROM WWW.SPEC.ORG AS OF MARCH 9, 2018; EACH RESULT LINKS TO ITS CORRESPONDING DISCLOSURE

AMD EPYC SOC SETS WORLD RECORDS ON SPEC CPU 2017 FLOATING POINT BENCHMARKS

AT A GLANCE
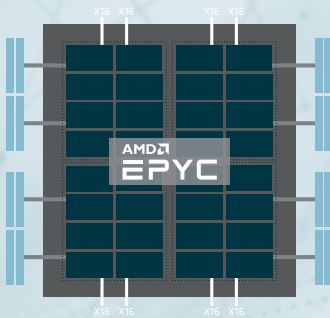
- SYSTEM-ON-CHIP (SOC) DESIGN
- UP TO 32 AMD "ZEN" CORES
- UP TO 16 DIMMS (2 TB) OF MEMORY PER SOCKET
- 8 MEMORY CHANNELS FOR HIGHER BANDWIDTH
- 128 LANES OF PCIE® BANDWIDTH
- SERVER CONTROLLER HUB
- DEDICATED, EMBEDDED SECURITY PROCESSOR WITH SECURE BOOT AND FULL MEMORY ENCRYPTION THROUGH ON-CHIP MEMORY CONTROLLERS

WHY AMD EPYC FOR HPC?

The AMD EPYC processor family helps you balance the ratio of cores, memory, and I/O bandwidth. It deploys security features embedded in silicon to achieve optimized performance for today's HPC applications.

ENHANCED CORE DENSITY

- Supports 8 to 32 cores per socket to deliver massively parallel performance
- Offers more cores in the same space as other 1RU and 2RU servers

UP TO 33% MORE MEMORY

- AMD EPYC processors support up to 2 TB of memory, versus the Intel Xeon Scalable processors which support up to a maximum of 1.5 TB (on the "M" CPU) and their standard CPUs support a maximum of 768 GB of memory[5]

UP TO 33% MORE MEMORY BANDWIDTH

- Uses 8 memory channels to speed the flow of data into and out of the CPU where the Intel Xeon Scalable 8180 processor supports 6 channels[6]
- Virtually eliminates memory bottlenecks and unlocks application performance

HIGHLY SCALABLE I/O

- Offers up to 128 lanes of PCIe® Gen 3 (both 1 socket and 2 socket) supporting a high number of NVMe drives without the need for a switch[7]
- Supports high-bandwidth network interfaces, giving HPC workloads quick access to data
- Directly attaches up to 32 NVMe or SATA devices to optimize I/O and efficiently handle storage needs.

EMBEDDED SECURITY PROCESSOR

- Full memory encryption with no changes needed to your applications
- Secure root-of-trust technology to securely boot software

INNOVATION IS BECOMING EVER MORE IMPORTANT

The reason for these outstanding results is innovation. As the automatic leaps in processor performance predicted by Moore's Law become increasingly elusive, innovation becomes even more important today. With the AMD EPYC 7601 SoC able to deliver 64 cores of CPU performance in a 2-socket server configuration, the ability to package more cores in a comprehensive system on chip becomes essential to delivering superior performance. This is part of AMD's strategy of delivering a better balance of resources for better real-world application performance. The AMD EPYC SoC delivers more—more cores, more memory capacity[5] and bandwidth[6], and massive I/O capacity[7]. Now you can use a single product line for a wide range of datacenter applications.

RECOMPILE YOUR DATACENTER

CPU performance is a prerequisite to good application performance. As you accelerate your digital business transformation, you have a flexible new system on chip that lets you deliver performance where you need it most. You help reduce business risk with cryptographically enforced data privacy and security. You can recompile your

> Our history is marked by a commitment to innovation that's truly useful—putting real customer needs first.

datacenter with silicon designed for software in a newly competitive x86 server market. With a better balance of resources you have performance, flexibility, and security to power your datacenter applications today and into the future.

LEARN MORE at amd.com/epyc.

FOOTNOTES

1. Scores based on SuperMicro internal testing of 2 x EPYC 7601 CPU in Supermicro A+ Server 2023US-TR4, SUSE Linux Enterprise Server 12 SP3 (x86_64) kernel 4.4.73-5-default; Compilers C/C++: Version 1.0.0 of AOCC and Fortran: Version 4.8.5 of GCC; 1 TB (16 x 64 GB 4Rx4 PC4-2667V-L) memory, 1 x 500 GB SATAIII, 7200 RPM

2. Scores based on Sugon internal testing of 2 x EPYC 7601 CPU in Sugon A620-G30, SUSE Linux Enterprise Server 12 SP3 (x86_64) kernel 4.4.73-5-default; Compilers C/C++: Version 1.0.0 of AOCC and Fortran: Version 4.8.5 of GCC; 1 TB (16 x 64 GB 4Rx4 PC4-2667V-L) memory, 1 x 800 GB SATA, SSD

3. Scores based on Hewlett Packard Enterprise (HPE) internal testing of 2 x EPYC 7601 CPU in ProLiant DL385 Gen10 (2.20 GHz), SUSE Linux Enterprise Server 12 SP3 (x86_64) kernel 4.4.73-5-default; Compilers C/C++: Version 1.0.0 of AOCC and Fortran: Version 4.8.5 of GCC; 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L) memory, 1 x 300 GB 15 K RPM SAS, RAID 0

4. Scores based on Huawei internal testing of 2 x Intel Xeon Platinum 8180 CPU in Huawei 2288H V5 (2.50GHz), SUSE Linux Enterprise Server 12 SP2 (x86_64) 4.4.21-69-default; Compilers C/C++: Version 18.0.0.128 of Intel C/C++ compiler for Linux and Fortran: Version 18.0.0.128 of Intel Fortran compiler for Linux; 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R) memory, 1 x 1200 GB SAS HDD, 10K RPM

5. AMD EPYC™ processors support up to 2TB of memory, versus the Intel Xeon Scalable processors which support up to a maximum of 1.5TB (on the "M" CPU), standard CPU's support a maximum of 768MB.

6. AMD EPYC™ 7601 processor supports up to 8 channels of DDR4-2667, versus the Xeon Platinum 8180 processor at 6 channels of DDR4-2667. NAP-42

7. EPYC supports up to 128 lanes of PCIe Gen 3 (both 1 socket and 2 socket) on every OPN. Skylake supports a maximum of 48 lanes of Gen 3 per CPU plus 20 lanes in the I/O chip. (max of 68 lanes on 1 socket and 96 lanes on 2 socket) on all CPU's.

8. A single AMD EPYC™ 7551P processor offers up to 128GB LRDIMM in 2 DIMM per channel config, so up to 256GB/channel x 8 channels = 2.048 TB, versus a single Xeon Gold 5118 processor at 768Gb/processor, so up to 1.54 TB for a 2-socket system. NAP-38

SPEC, SPEC CPU, and SPECrate are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. PCIe is a registered trademark of PCI-SIG Corporation.