2nd Gen AMD EPYC™ Processor Performance

From the top performance levels to the heart of the market, and across virtually all workloads, 2nd Gen AMD EPYC™ Processors set the new standard for the modern data center.

140+ NEW WORLD RECORDS SINCE LAUNCH

AMD challenged the status quo with leading performance at a fraction of competitive x86 processor pricing. This drove wide adoption of servers using the 1st Gen AMD EPYC Processors. Today’s 2nd Gen AMD EPYC Processors leave a raw performance and pricing gap so large that they define the new standard for the modern data center. The AMD EPYC 7002 Series delivers up to five times the performance of the prior generation on Java® enterprise middleware and high performance computing (HPC) applications. This historic increase in performance establishes up to a 2x average competitive advantage over the previously best published Intel Xeon Scalable Processor Family on a variety of workloads (Figure 1).

BREAKTHROUGH WORKLOAD PERFORMANCE

Based on the AMD Infinity Architecture, new 2nd Gen AMD EPYC Processors are the first x86-architecture server processors featuring a 7nm hybrid-multi-die design and PCIe®4 I/O support. The AMD EPYC Family continues to offer the most I/O and memory bandwidth in its class. AMD believes its server processor road map is designed to provide leadership for the next decade plus.
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Powered by the roadmap of the AMD ‘Zen’ microarchitecture, AMD EPYC 7002 Series Processors with the ‘Zen 2’ core achieve twice the core density\(^5\), up to 4x theoretical peak FLOPS\(^6\), improved execution pipelines, higher frequencies, and up to 4x shared L3 cache when compared to AMD EPYC 7001 Series Processors. These features translate into the industry-leading benchmark and application performance illustrated in Figure 1.

MASSIVE PERFORMANCE IMPROVEMENTS

The raw performance of the EPYC 7002 Series delivers massive performance improvements with 140+ world record scores\(^7\) since launch to deliver business results faster. Some highlights include:

- 20 OVERALL WORLD RECORD SCORES (better than any other published result) including up to 73%\(^7\) better power efficiency than Intel’s leading result as measured by the SPEC Power® 2008 benchmark
- 15 OVERALL PRICE-PERFORMANCE RECORDS including the best Microsoft SQL Server\(^{®}\) dollars-per-query on TPC Benchmark\(^{™}\) H (TPC-H), an improvement of 28%\(^8\) over the previous #1 result
- 56 SINGLE-SOCKET SERVER RECORDS including VMmark\(^{®}\) vSAN\(^{™}\) 4-host benchmark advantage over Intel’s best result by 36%\(^8\)
- 55 DUAL-SOCKET SERVER RECORDS including general-purpose application throughput benchmark SPECrate\(^{®}\)2017_int_peak results that beat Intel’s Xeon 8280L powered server by 102%\(^{10}\)

PERFORMANCE NEEDS

Regardless of your performance needs or your price point, you can expect superior performance from 2nd Gen EPYC processors.

The new AMD EPYC 7Fx2 processor is the world’s highest per-core performance x86 server CPU\(^{11}\) for heavy single-threaded compute problems like EDA jobs, or help reduce enterprise software costs per-core licensing fees.

Figure 2 illustrates how other 2nd Gen AMD EPYC processor options deliver spectacular performance benefits at competitive price points. Two AMD EPYC 7002 processors have up to 3.6x higher performance per dollar than two comparable 2nd Gen Intel\(^{®}\) Xeon\(^{®}\) Scalable processors running the SPECrate\(^{®}\)2017_int_base benchmark.\(^{12}\)

To learn more, visit amd.com/epyc.

FIGURE 2. AMD DELIVERS BETTER 2-SOCKET PERFORMANCE AT MANY PRICE POINTS

![Performance Comparison Chart]

SPECrate\(^{®}\)2017_int_base: NORMALIZED AT 100% WITH THE RELEVANT INTEL PROCESSOR IN NOTED CPU PRICEBANDS
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ENDNOTES

1. As of April 14, 2020, AMD EPYC 7002 Series Processors set 140+ world records. For a complete list of world records see http://amd.com/worldrecords; ROM-169

2. 2P AMD EPYC™ 7742 powered server has an overall world record SPECint2015-Composite Critical score of 248.786 critical-JOPS (SPECint2015-Composite Max-JOPS score 289.416), as of August 7, 2019. The previous #1 generational SPECint2015-Composite Critical score is 49.855 critical-JOPS (SPECint2015-Composite Max-JOPS score 95.016) by a 2P AMD EPYC™ 7761 server; ROM-269

3. 1P AMD EPYC™ 7742 scoring 13,522 SPECaccel®_acc_base on SPEC ACCELER® HPC benchmark published August 7, 2019, which is 5.1x the [4.6x better] performance of the best published AMD EPYC™ 2101 result of 2,559 SPECaccel_acc_base published 7/27/2019 on a 2P server; ROM-268

4. AMD EPYC 7002 series has 8 memory channels, supporting 3200 MHz DIMMs yielding 204.8 GB/s of bandwidth vs. the same class of Intel Scalable Gen 2 processors with only 6 memory channels and supporting 2933 MHz DIMMs yielding 140.8 GB/s of bandwidth. 204.8 / 140.8 = 1.454545 - 1.0 = .45 or 45% more. AMD EPYC has 45% more bandwidth. Class based on industry-standard pin-based (LGA) X86 processors; ROM-11

5. Based on June 8, 2018 AMD internal testing of same-architecture product ported from 14 to 7 nm technology with similar implementation flow/methodology, using performance from SGEEMC. EPYC-07

6. Based on standard calculation method for determining FLOPS. ROM-04

7. 1P AMD EPYC™ 7742 powered server scoring 179% overall ssj_ops/watt (2U on SUSE Linux Enterprise Server 12 S4P) has up to 1.7x the SPECpower ssj® 2008 performance of the highest previous competitive score of 11631 overall ssj_ops/watt (2U on SUSE Linux Enterprise Server 12 S4P by a 1-n, 1-socket Xeon® 8280 powered server as of 11/13/19; ROM-473

8. 1P EPYC™ 7502P powered server scores a world record result of $0.34 USD/QphH@1000GB (743.750 QphH@1000GB, avail 7/7/19). The next highest competitive score is $0.47 USD/QphH@1000GB (1,009.065 QphH@1000GB, avail 5/21/18) on a 2P Xeon® 8280L powered server as of 11/13/19; ROM-370

9. 1P EPYC™ 7702 powered server scores a VMMark® 3.1 vSAN 4-host world record result of 12.23 Score @ 13 tiles. The next highest published world record score is $0.47 USD/QphH@1000GB (1,009.065 QphH@1000GB, avail 5/21/18) on a 2P Xeon® 8280L powered server as of 11/13/19; ROM-370

10. 2P EPYC™ 7742 scored 769 SPECrate®2017_int_peak (701 SPECrate®2017_int_base) compared to 2P Xeon® 8280L score of 381 SPECrate®2017_int_peak (364 SPECrate®2017_int_base) as of 12/12/19; ROM-345

11. 17-n, 1-socket EPYC™ 7742 powered server scoring 25.47 HSpH@30TB (527,649.40 HSpH@30TB, avail 8/26/19) has up to 2.2x the TPC® Express Benchmark HS @30TB performance of the highest previous competitive score of 11.54 HSpH@30TB ($56,854.08 HSpH@30TB, avail 1/30/18) by a 17-n, 2-socket Xeon® 6122 powered server as of 11/13/19; ROM-376

12. 1P EPYC™ 7742 powered server scores a world record result of 389 SPECrate®2017_int_peak (355 SPECrate®2017_int_base). The next highest competitive score is 180 SPECrate®2017_int_peak (171 SPECrate®2017_int_base) on a 1P Xeon® 8280L powered server as of 02/12/20; ROM-545

13. 17-n, 1-socket EPYC™ 7702 powered server scoring 23.68 HSpH@10TB (255,075.91 HSpH@10TB, avail 8/26/19) has up to 2.55x the TPC® Express Benchmark HS @10TB performance of the highest previous competitive score of 11.13 HspH@10TB ($58.948.43 HspH@10TB, avail 1/30/18) by a 17-n, 2-socket Xeon® 6122 powered server as of 11/13/19; ROM-373

14. 1P EPYC™ 7742 powered server scores 297 SPECrate®2017_fp_peak (278 SPECrate®2017_fp_base). The next highest published competitive score is 141 SPECrate®2017_fp_peak (139 SPECrate®2017_fp_base) on a 1P Xeon® Platinum 8280L powered server as of 12/12/20; ROM-531

15. 1P EPYC™ 7742 powered server scores a world record result of 355 SPECrate®2017_int_base. The next highest competitive score is 181 SPECrate®2017_int_base on a 1P Xeon® 8280L powered server as of 12/12/20; ROM-544

16. 2P EPYC™ 7712L powered server scores a world record result of 68886 SD benchmark users SAP enhancement package 5 for SAP ERP 6.0 on SUSE Linux Enterprise Server 15. The next highest published competitive score is 35055 SD benchmark users SAP enhancement package 5 for SAP ERP 6.0 on SUSE Linux Enterprise Server 15 on a 2P Xeon® 8280L powered server as of 12/12/20; ROM-535

17. 8-n, 2P EPYC™ 7712L powered server scoring 4290 SPECint®2017_int_base has up to 1.96x the SPECint®2017 Integer (Base) performance of the highest previous competitive score of 2190 SPECint®2017_int_base on a 8-nodes, 2-socket Xeon® 8276 powered server as of 02/12/20; ROM-519

18. 2P EPYC™ 7742 powered server scores 319,609 SPECjbb®2015-Distributed max-JOPS (83.535 critical-JOPS) on Windows Server 2018 Standard. The next highest competitive score is 157,832 SPECjbb®2015-Distributed max-JOPS (47.771 critical-JOPS) on Windows Server 2016 Standard on a 2P Xeon® 8180L powered server as of 11/13/19; ROM-451

19. 1P EPYC™ 7742 powered server scores 154,253 SPECjbb®2015-Distributed max-JOPS (43,585 critical-JOPS) on Windows Server 2019 Standard. The next highest published competitive score is 78,002 SPECjbb®2015-Distributed max-JOPS (24,746 critical-JOPS) on Windows Server 2016 Standard on a 2P Xeon® 8180L powered server as of 11/13/19; ROM-448

20. Comparison based on best-performing systems SPECrate®2017_int_base scores published at www.spec.org and Recommended Customer Price/1Ku as of 4/1/2020 in the price bands (2x CPU pricing):

   >$100,000: 25 AMD EPYC™ 7742 (64C, $13900) score of 701, 21 Intel Xeon Platinum 8280L (28C, $26204) score of 364
   $8000-9999: 25 AMD EPYC™ 7752 (48C, $850) score of 512, 25 Intel Xeon Platinum 8260 (24C, $9404) score of 297
   $4000-7999: 25 AMD EPYC™ 7742 (32C, $4500) score of 410, 25 Intel Xeon Gold 6248R (24C, $54000) score of 312
   <$2000: 25 AMD EPYC™ 7722X (16C, $1300) score of 216, 25 Intel Xeon Silver (8C, $1588) score of 109

   ROM-567

21. Highest per core performance in the world based on EPYC 7F32 (8-cores) having the highest SPECint®2017_fp_base score divided by total core count. of all SPEC® publications as of 4/14/2020. 1x EPYC 7F32 (8-cores) scoring 12.875 base result per core (0.73 SPECint®2017_fp_base/8 total cores, www.spec.org/cpu2017/results/114707/2cpu2017-20200316-21228.pdf) compared to the next highest result 1x AMD EPYC 7F26 (8-cores) scoring 11.54 base result per core ($2.3 SPECint®2017_fp_base/8 total cores, http://spec.org/cpu2017/results/114705/1cpu2017-20191220-20435.pdf). See www.spec.org/cpu2017/results for full ranking. ROM-570