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HIGH PERFORMANCE COMPUTING

Cloud, Network, Hypercale & Supercomputing
5G & Comms Infrastructure
AI & Analytics Everywhere
Adaptable Intelligent Systems
Gaming, Simulation and Visualization
Smarter Client Devices & Edge

AT THE CENTER OF TODAY’S WORLD
OUR FOCUS
HIGH-PERFORMANCE COMPUTING SOLUTIONS

AMD EPYC™
AMD INSTINCT™
AMD RYZEN™ DESKTOP
AMD RYZEN™ MOBILE
CONSOLE GAMING
AMD RADEON™
ENTERPRISE COMPUTING LEADERSHIP
FROM DATA CENTER TO LAPTOP

ENTERPRISE PCs
HP and Lenovo laptop and desktop
enterprise portfolios powered by
AMD Ryzen™ PRO Processors

DATA CENTER PLATFORMS
AMD Instinct™ MI100
The World's Fastest
HPC GPU

DATA CENTER PLATFORMS
Full portfolio of
servers powered by
AMD EPYC™ CPUs

WORKSTATIONS
Enterprise workstations powered by
AMD Threadripper™ PRO Processors
and AMD Radeon™ PRO Graphics

See amd.com/en/claims/epyc#faq-M100-03
POWERS THE WORLD’S MOST IMPORTANT WORKLOADS

Leading the Exascale Supercomputing Era
Heart of the Largest Cloud Services
Superior TCO and Security Features for Enterprise
INSATIABLE DEMAND FOR COMPUTE

PERFORMANCE, SCALABILITY, AND SECURITY NEEDED FROM DATA CENTER TO EDGE
~19% INSTRUCTIONS-PER-CLOCK INCREASE

COMPARED TO 2ND GEN AMD EPYC™

See amd.com/en/claims/epyc#faq-MLN-003
3rd Gen AMD EPYC™

Performance Leadership Across Workloads

HPC | Cloud | Enterprise
FASTER IN HPC
ACCELERATING SCIENTIFIC BREAKTHROUGHS

INTEL® XEON® GOLD 6258R
28 CORES

2ND GEN AMD EPYC™ 7H12
64 CORES

543
2ND GEN AMD EPYC™
76%
FASTER THAN COMPETITION

2P FLOATING POINT PERFORMANCE
SPECrate®2017_fp

See amd.com/en/claims/epyc#faq-ROM-788
FASTER IN HPC
ACCELERATING SCIENTIFIC BREAKTHROUGHS

<table>
<thead>
<tr>
<th>Processor</th>
<th>Cores</th>
<th>2P Floating Point Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTEL® XEON® GOLD 6258R</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>2ND GEN AMD EPYC™ 7H12</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>3RD GEN AMD EPYC™ 7763</td>
<td>64</td>
<td>106% faster than competition</td>
</tr>
</tbody>
</table>

See amd.com/en/claims/epyc#faq-ROM-788, MLN-074K
FASTER IN CLOUD
BEST COMPUTE DENSITY FOR HYPERSCALE

**2nd Gen AMD EPYC™**

<table>
<thead>
<tr>
<th>28 Cores</th>
<th>64 Cores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® Xeon® Gold 6258R</td>
<td>7H12</td>
</tr>
</tbody>
</table>

81% FASTER THAN COMPETITION

FASTER IN CLOUD
BEST COMPUTE DENSITY FOR HYPERSCALE

INTEL® XEON® GOLD 6258R  28 CORES
2ND GEN AMD EPYC™ 7H12  64 CORES
3RD GEN AMD EPYC™ 7763  64 CORES

3RD GEN AMD EPYC™
106%
FASTER THAN COMPETITION

SPECint®2017, base core

See amd.com/en/claims/epyc#faq-ROM-787, MLN-073K
FASTER IN ENTERPRISE
BEST PERFORMANCE FOR BUSINESS APPLICATIONS

INTEL® XEON® PLATINUM 8280
28 CORES

2ND GEN AMD EPYC™ 7H12
64 CORES

2ND GEN AMD EPYC™
79%
FASTER THAN COMPETITION

2P JAVA VIRTUAL MACHINE PERFORMANCE
SPECjbb2015 MultiVM mixed-JOPS

See amd.com/en/claims/epyc#faq-ROM-693
FASTER IN ENTERPRISE
BEST PERFORMANCE FOR BUSINESS APPLICATIONS

139K
INTEL® XEON® PLATINUM 8280
28 CORES

249K
2ND GEN AMD EPYC™ 7H12
64 CORES

301K
3RD GEN AMD EPYC™ 7763
64 CORES

117%
FASTER THAN COMPETITION

3RD GEN AMD EPYC™

2P JAVA VIRTUAL MACHINE PERFORMANCE
SPECjbb2015 MultiVM offline-JOP

See amd.com/en/claims/epyc#faq-ROM-693, MLN-044A
LOGIN VSI PERFORMANCE

**INTEL XEON® 6258R**
- Number of Active VDI Sessions: 240
- Latency: Active Sessions

**AMD EPYC™ 7763**
- Number of Active VDI Sessions: 509
- Latency: Active Sessions

See amd.com/en/claims/epyc#faq-MLN-004
FASTER IN ENTERPRISE
BEST PERFORMANCE + VALUE FOR BUSINESS APPLICATIONS

INTEL® XEON® GOLD 6258R
28 CORES

3RD GEN AMD EPYC™ 7763
64 CORES

3RD GEN AMD EPYC™
112%
MORE SESSIONS (max)

See amd.com/en/claims/epyc#faq-MLN-004
DELIVERING AS PROMISED

14nm / 12nm (Shipped)
- "ZEN"
- "ZEN+

7nm (Shipping Q3 2019)
- "ZEN 2"

7nm (Shipping Q4 2020)
- "ZEN 3"

Roadmap Subject to Change
OUR “ZEN” JOURNEY

“ZEN” / “ZEN+”
- ~52% IPC
- 4-core complex
- 8MB L3 per complex
- 14nm/12nm
- Simultaneous multithread
- SEV

“ZEN 2”
- ~15% IPC
- 4-core complex
- 16MB L3 per complex
- 7nm
- Chiplet design
- FP-256
- SEV-ES

“ZEN 3”
- ~19% IPC
- New core layout
- New cache topology
- 7nm
- Doubled INT8 throughput
- New security features:
  Shadow Stack & SEV-SNP

“ZEN 3” CORE ARCHITECTURE

8 CORE COMPLEX
LOWER LATENCY
Significant Accelerator for HPC and Cloud Applications

2X
DIRECT ACCESS L3 CACHE
Better Performance for Large Virtual Machines

2X
THROUGHPUT FOR AI INFERENCE
Doubling of INT8 Pipeline and Faster Floating Point

19%
CORE COMPLEX IPC UPLIFT
Performance on SPECrates® 2017 at Same Power

See amd.com/en/claims/epyc#faq-MLN-003
INDUSTRY LEADERSHIP
“ZEN 3” ~19% IPC UPLIFT

GEOMEAN OF 28 WORKLOADS
(FIXED 3.7GHZ FREQUENCY, 8 CORES)

~19%

“ZEN 3” PERFORMANCE CONTRIBUTORS

Cache Prefetching
Execution Engine
Branch Predictor
Micro-op Cache
Front End
Load/Store

See amd.com/en/claims/epyc#faq-MLN-003
“ZEN 2”
LAYOUT

- CPU CORE
- CPU CORE
- 16MB L3 CACHE
- CPU CORE
- CPU CORE
- CPU CORE
- 16MB L3 CACHE
- CPU CORE
- CPU CORE

“ZEN 3”
LAYOUT

2X L3 Cache Directly Accessible Per Core

Accelerates Core and Cache Communication for Enterprise and Cloud Workloads

Reduction In Effective Memory Latency
“ZEN 2” LAYOUT

CPU CORE
CPU CORE
16MB L3 CACHE
CPU CORE
CPU CORE
16MB L3 CACHE
CPU CORE
CPU CORE
CPU CORE

“ZEN 3” LAYOUT

CPU CORE
CPU CORE
32MB L3 CACHE
CPU CORE
CPU CORE
CPU CORE
CPU CORE
CPU CORE

2X L3 Cache Directly Accessible Per Core
Accelerates Core and Cache Communication for Enterprise and Cloud Workloads
Reduction In Effective Memory Latency
Many throughput workloads have large amounts of data used by all cores.

With "Zen 3", all 8 cores can share the same data, increasing the effective per-core capacity.

NUMBERS ARE FOR ILLUSTRATIVE PURPOSES AND NOT INTENDED TO BE REPRESENTATIVE OF A PARTICULAR WORKLOAD.
AMD INFINITY GUARD
NEW LAYERS OF SECURITY FOR TENANTS IN THE CLOUD

SEV
SECURE ENCRYPTED VIRTUALIZATION
Encrypt Each VM with Unique Keys

SEV-ES
ENCRYPTED STATE
VM Integrity with Protected CPU Registers

SEV-SNP
SECURE NESTED PAGING
Hardware Protection Against Malicious Hypervisors
LEADERSHIP ROADMAP

2017

14nm / 12nm

“ZEN”
“ZEN+”

7nm

“ZEN 2”

7nm

“ZEN 3”

5nm
In Design

“ZEN 4”

2020

Roadmap Subject to Change
### AMD EPYC™ 7003 FAMILY

**AVAILABLE TODAY**

<table>
<thead>
<tr>
<th>CORES</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 CORES</td>
<td>7763</td>
</tr>
<tr>
<td></td>
<td>7713/P</td>
</tr>
<tr>
<td>56 CORES</td>
<td>7663</td>
</tr>
<tr>
<td>48 CORES</td>
<td>7843</td>
</tr>
<tr>
<td>32 CORES</td>
<td>75F3</td>
</tr>
<tr>
<td></td>
<td>7543/P</td>
</tr>
<tr>
<td></td>
<td>7513</td>
</tr>
<tr>
<td>28 CORES</td>
<td>7453</td>
</tr>
<tr>
<td>24 CORES</td>
<td>74F3</td>
</tr>
<tr>
<td></td>
<td>7443/P</td>
</tr>
<tr>
<td></td>
<td>7413</td>
</tr>
<tr>
<td>16 CORES</td>
<td>73F3</td>
</tr>
<tr>
<td></td>
<td>7343</td>
</tr>
<tr>
<td></td>
<td>7313/P</td>
</tr>
<tr>
<td>8 CORES</td>
<td>72F3</td>
</tr>
</tbody>
</table>

### ALL-IN FEATURE SET

- 8-Channels of DDR4-3200
- 4TB Memory Capacity
- 128 Lanes PCIe® 4
- Infinity Guard Security Features
- Socket Compatible
The best gets better
200+ World Records and counting

Databases & Analytics
- 21 Relational
- 24 Big Data

HCI/SDI/Cloud
- 12 Cloud and Virtualization
- 15 Integer Performance

Enterprise
- 6 ERP Business Apps
- 46 Java® Based Performance
- 20 Energy Efficiency

HPC
- 36 High Performance Computing Apps
- 13 Floating Point Performance
- 12 Floating Point Energy Efficiency

See amd.com/en/claims/epyc#faq-EPYC-022 or amd.com/worldrecords
THE BEST GETS BETTER
LEADERSHIP PERFORMANCE

<table>
<thead>
<tr>
<th>Processor</th>
<th>Cores</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Intel® Xeon® Gold 6258R</td>
<td>28</td>
<td>397</td>
</tr>
<tr>
<td>2nd Gen AMD EPYC™ 7532</td>
<td>32</td>
<td>444</td>
</tr>
<tr>
<td>3rd Gen AMD EPYC™ 75F3</td>
<td>32</td>
<td>557</td>
</tr>
</tbody>
</table>

3rd Gen AMD EPYC™ faster than competition by 40%

THE BEST GETS BETTER
LEADERSHIP PERFORMANCE

<table>
<thead>
<tr>
<th>Processor</th>
<th>Cores</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel Xeon Gold 6258R</td>
<td>28</td>
<td>309</td>
</tr>
<tr>
<td>2nd Gen AMD EPYC™ 7532</td>
<td>32</td>
<td>434</td>
</tr>
<tr>
<td>3rd Gen AMD EPYC™ 75F3</td>
<td>32</td>
<td>526</td>
</tr>
</tbody>
</table>

3rd Gen AMD EPYC™

70% FASTER THAN COMPETITION

2P Floating Point Performance
SPEC_sint2017_fp詹姆斯

See amd.com/en/claims/epyc#faq-ROM-789, MLN-067K
Ansys® LS-DYNA™ "3 Car Collision" Simulation

2 x Intel® Xeon® 6258R (28-Core) 48% Complete

2 x AMD EPYC™ 75F3 (32-Core) 95% Complete

See Endnote: MLN-049; See the demo at https://youtu.be/eFebGDmR4Fk
FASTER IN HPC
SHORTER DEVELOPMENT TIME, MORE COMPLEX MODELS, IMPROVED PRODUCT QUALITY

INTEL® XEON® GOLD 6258R
28 CORES

3RD GEN AMD EPYC™ 75F3
32 CORES

3RD GEN AMD EPYC™
UP TO 98%
MORE PER-CORE PERFORMANCE

See amd.com/en/claims/epyc#faq-MLN-049
DRIVING SUPERCOMPUTING TO THE EXASCALE ERA
BREAKING THE EXASCALE BARRIER
THE CLOUD HAS NEVER BEEN MORE IMPORTANT TO THE WORLD

PERFORMANCE, SCALABILITY AND SECURITY ARE MORE VITAL THAN EVER FOR THE CLOUD
THE WORLD RELIES ON AMD EPYC™ CPUs EVERY DAY

MICROSOFT 365 AND TEAMS, TENCENT MEETING, TWITTER, ZOOM AND MORE

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WORLD’S MOST IMPORTANT CLOUD SERVICES

aws  Alibaba Cloud  Google Cloud  IBM Cloud

Microsoft Azure  Oracle Cloud  Tencent Cloud

200+ INSTANCES POWERED BY 1ST AND 2ND GEN

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ANNOUNCING TODAY

New HBv3 HPC VMs Available Today
New Confidential Computing VMs Preview Today
General Purpose VMs Later This Year
Google Cloud

ANNOUNCING TODAY

Internal Properties Powered by AMD EPYC™
Next Generation C2D and N2D VMs
ANNOUNCING TODAY

New SA3 Instances Available Today
AMD EPYC™
FAST AND BROAD CLOUD RAMP

aws  Alibaba Cloud  Google Cloud  IBM Cloud
Microsoft Azure  ORACLE CLOUD  Tencent Cloud

ON TRACK TO 400+ INSTANCES IN 2021
ACCELERATING ENTERPRISE VALUE WITH 3RD GEN AMD EPYC™

HIGHEST PERFORMANCE. BEST TCO. FASTEST TIME TO VALUE.

Hyperconverged Infrastructure | Relational Databases | Data Analytics

See amd.com/en/claims/epyc#faq-MLNTCO-001, MLN-016
HYPERCONVERGED INFRASTRUCTURE SOLUTIONS

PERFORMANCE, FLEXIBILITY, SCALABILITY, SECURITY FEATURES

180% HIGHER PERFORMANCE FOR VMmark® 3.1
4 NODE VMware® vSAN™ CLUSTER WITH 2X AMD EPYC 7713 EACH VS. 4 NODE VMware® vSAN CLUSTER WITH 2X INTEL XEON PLATINUM 8268 EACH

See amd.com/en/claims/epyc#faq-MLN-064 Use of third party marks/logos/products is for informational purposes only and no endorsement of or by AMD is intended or implied. GD-83
RELATIONAL DATABASE SOLUTIONS

ACCELERATING DATABASE PERFORMANCE

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RELATIONAL DATABASE SOLUTIONS

1,883,497 QPHH AND $0.56/QPHH@10TB, FULL DISCLOSURE: WWW.TPC.ORG/3351 VS.
1,651,514 QPHH AND $0.71/QPHH@10TB, FULL DISCLOSURE: WWW.TPC.ORG/3337

See amd.com/en/claims/epyc#faq-MLN-068

2 CPUS AMD EPYCU 7763 CPU VS. 4 CPUS INTEL® XEON® PLATINUM 8280M

14% HIGHER PERFORMANCE

2 SOCKET AMD EPYC™ 7763 COMPARED TO 4 SOCKET INTEL XEON 8280M FOR TPC BENCHMARK™ H

1,883.497QPHH AND $0.56/QPHH@10TB, FULL DISCLOSURE: WWW.TPC.ORG/3351 VS.
1,651.514QPHH AND $0.71/QPHH@10TB, FULL DISCLOSURE: WWW.TPC.ORG/3337

See amd.com/en/claims/epyc#faq-MLN-068
DATA ANALYTICS SOLUTIONS

1 CPU
AMD EPYC™ 75F3 CPU
17 NODE CLUSTER

VS.

2 CPUs
INTEL® XEON® GOLD 6282V
17 NODE CLUSTER

60% HIGHER THROUGHPUT
1 SOCKET AMD EPYC™ 75F3 COMPARED TO 2 SOCKET INTEL XEON 6282V FOR TPC EXPRESS BENCHMARK™ H8

34.52HSPH AND $35,615.50/HSPH @3TB, FULL DISCLOSURE: WWW.TPC.ORG/5548 VS.
21.52HSPH AND $91,276.91/HSPH @3TB, FULL DISCLOSURE: WWW.TPC.ORG/5544

See amd.com/en/claims/epyc#faq-MLN-069K
ANNOUNCING TODAY

New Dell EMC PowerEdge Servers with 3rd Gen AMD EPYC™
ANNOUNCING TODAY

AMD EPYC™ SEV-ES Support in vSphere®
for VMs & Containers
Announcing Today

New HPE ProLiant, HPE Apollo, and HPE Cray Servers
3RD GEN AMD EPYC™

WORLD’S FASTEST SERVER PROCESSOR

POWERING MOST IMPACTFUL CLOUD SERVICES

DELIVERING OUTSTANDING BUSINESS VALUE

CONFIDENCE OF MODERN SECURITY FEATURES

See amd.com/en/claims/epyc#faq-MLN-016, MLNTOC-001
ENDNOTES

EPYC-22: For a complete list of world records see http://amd.com/worldrecords.

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GD-108: Generational IPC uplift for the “Zen” architecture vs. “Excavator” architecture is +64% as measured with Cinebench R15 1T, and also +64% with an estimated SPECint_base2006 score compiled with GCC 4.6 -O2, at a fixed 3.4GHz. System configs: AMD reference motherboard(s), AMD Radeon™ R9 290X GPU, 8GB DDR4-2667 (“Zen”)/8GB DDR3-2133 (“Excavator”)/8GB DDR3-1866 (“Piledriver”), Ubuntu Linux 16.x (SPECint_base2006 estimate) and Windows® 10 x64 RS1 (Cinebench R15).

SPECint_base2006 estimates: “Zen” vs. “Piledriver” (31.5 vs. 20.7 | +52%), “Zen” vs. “Excavator” (31.5 vs. 19.2 | +64%). Cinebench R15 1t scores: “Zen” vs. “Piledriver” (139 vs. 79 both at 3.4G | +76%), “Zen” vs. “Excavator” (160 vs. 97.5 both at 4.0G) +64%.

MI100-03: Calculations conducted by AMD Performance Labs as of Sep 18, 2020 for the AMD Instinct™ MI100 (32GB HBM2 PCIe® card) accelerator at 1,502 MHz peak boost engine clock resulted in 11.54 TFLOPS peak double precision (FP64), 46.1 TFLOPS peak single precision matrix (FP32), 23.1 TFLOPS peak single precision (FP32), 184.6 TFLOPS peak half precision (FP16) peak theoretical, floating-point performance. Published results on the Nvidia Ampere A100 (40GB) GPU accelerator resulted in 9.7 TFLOPS peak double precision (FP64), 19.5 TFLOPS peak single precision (FP32), 78 TFLOPS peak half precision (FP16) theoretical, floating-point performance. Server manufacturers may vary configuration offerings yielding different results.

MLN-003: Based on AMD internal testing as of 02/1/2021, average performance improvement at ISO-frequency on an AMD EPYC™ 72F3 (8C/8T, 3.7GHz) compared to an AMD EPYC™ 7F32 (8C/8T, 3.7GHz), per-core, single thread, using a select set of workloads including SPECrate®2017_int_base, SPECrate®2017_fp_base, and representative server workloads. SPEC® and SPECrate® are registered trademarks of Standard Performance Evaluation Corporation. Learn more at spec.org.

MLN-004: Login VSI™ Pro v4.1.40.1 comparison based on AMD internal testing as of 02/01/2021 measuring the maximum “knowledge worker” desktop sessions within VSI Baseline +1000ms response time using VMware ESXi 7.0u1 and VMware Horizon 8 on a server using 2x AMD EPYC 7763 versus a server with 2x Intel Xeon Gold 6258R for ~112% more max [~2.1x the] performance. Results may vary.

MLN-016: Results as of 01/28/2021 using SPECrate®2017_int_base. The AMD EPYC 7763 a measured estimated score of 798 is higher than the current highest 2P server with an AMD EPYC 7H12 and a score of 717, https://spec.org/cpu2017/results/res2020q2/cpu2017-20200525-22554.pdf. OEM published score(s) for 3rd Gen EPYC may vary. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

MLN-049: ANSYS® LS-DYNA® version 2021.1 comparison based on AMD internal testing as of 02/05/2021 measuring the time to run neon, 3cars, PPT-short, odb10m-short, and car2car test case simulations (converted to jobs/day - higher is better) Configurations using a server with 2x AMD EPYC 75F3 (17555 total seconds) versus a server with 2x Intel Xeon Gold 6258R. (28774 total seconds) for ~81.0% more (~1.8x the) per node or ~59% (~1.6x the) per core average performance. The 3cars test case gain individually was 126% (~2.26x the) per node or ~98% per core jobs/day performance. Results may vary.

MLN-057K: Based on SPECrate®2017_int_base on 02/20/2021, a server powered by two 8c AMD EPYC 72F3 CPU has a measured estimated score of 176 with a per core score of 11.00 which is a higher per core performance score than any currently posted in any SPEC.org publication. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.


MLN-066K: A server powered by two 32c AMD EPYC 75F3 CPUs has a score of 557 in a compliant result run on a 2P server; with Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R); OS: Red Hat Enterprise Linux 8.3 (x86_64) Kernel 4.18.0-240.10.1.el8_3.x86_64; Compiler: C/C++/Fortran: Version 3.0.0 of AOCC. 40% higher than the highest score for Intel Gold 6258R 2P server, 397 for SPECrate®2017_int_base as of 02/20/2021, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23981.pdf. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

MLN-067K: A server powered by two 32c AMD EPYC 75F3 CPUs has a score of 526 in a compliant result run on a 2P server; with Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R); OS: Red Hat Enterprise Linux 8.3 (x86_64) Kernel 4.18.0-240.10.1.el8_3.x86_64; Compiler: C/C++/Fortran: Version 3.0.0 of AOCC. 70% higher than the highest score for Intel Gold 6258R 2P server, 309 for SPECrate®2017_fp_base as of 02/20/2021, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23979.pdf. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

MLN-068: TPC Benchmark™ H QphH@10000GB non-clustered comparison based on highest system results published as of 03/12/2021. Configurations: 2x AMD EPYC 7763 (1,883,497 QphH@10000GB, $0.56/QphH@10000GB, http://www.tpc.org/3351, available 4/19/2021) versus 4x Intel Xeon Platinum 8280M (1,651,514 QphH@10000GB, $0.71/QphH@10000GB, http://www.tpc.org/3337, available 4/2/2019) for 14% higher [1.14x the] query performance at 21% better price/performance.
MLN-069K: TPC Benchmark Express™ HSph@3TB comparison based on highest system results published as of 03/12/2021. Configurations: 17-node, 1x AMD EPYC 75F3 (34.52 HSph@3TB, $35.615.50/HSph@3TB, http://www.tpc.org/5548, available 3/15/2021, Framework 1 MapReduce) versus 17-node, 2x Intel Xeon Gold 6262V (21.52 HSph@3TB, $91.276.91/HSph@3TB, http://www.tpc.org/5544, available 11/09/2020, Framework 2 Spark) for 60% higher [1.6x the] Hadoop Sort throughput performance at 61% better price/performance.

MLN-083K: Based on SPECrate®2017_int_base on 02/20/2021, a server powered by two 64c AMD EPYC 7763 CPUs has a score of 839 which is higher than any currently posted SPEC 2P server score. Per socket score would be 819/2=409.5 which is higher than any per socket score (score / sockets). This is a compliant result run on a Lenovo ThinkSystem SR645; with Memory: 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R), OS: SUSE Linux Enterprise Server 12 SP5 (x86_64) Kernel 4.12.14-120-default; Compiler: C/C++/Fortran: Version 3.0.0 of AOCC. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

MLN-073K: Based on SPECrate®2017_int_base on 02/20/2021, a server powered by two 64c AMD EPYC 7763 CPUs has a score of 819 in a compliant result run on an ThinkSystem SR645; with Memory: 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R), OS: SUSE Linux Enterprise Server 12 SP5 (x86_64) Kernel 4.12.14-120-default; Compiler: C/C++/Fortran: Version 3.0.0 of AOCC. Versus the current highest score Intel Cascade Lake Refresh server with a score of 397 using 2P Intel Gold 6258R, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23981.pdf. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.

MLN-074K: Based on SPECrate®2017_fp_base on 02/20/2021, a server powered by two 64c AMD EPYC 7763 CPUs has a score of 636 a compliant result run on an ThinkSystem SR665; with Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R); OS: Red Hat Enterprise Linux release 8.3 (Ootpa); Compiler: C/C++/Fortran: Version 3.0.0 of AOCC. Versus the current highest score Intel Cascade Lake Refresh server with a score of 309 with a 2P Intel Gold 6258R based server, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23979.pdf. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information.
MLNTCO-001: The Bare Metal TCO (total cost of ownership) Estimator solution compares the selected AMD EPYC™ and Intel® Xeon® CPU based server solutions required to deliver a TOTAL PERFORMANCE of 25000 unit of integer performance based on published the SPECrate®2017_int_base scores for Intel and AMD measured estimated scores for AMD EPYC 7003. This analysis is based on tool VERSION: 02/20/2021 v0.9982. This estimation reflects a 4 year time frame. This analysis compares a 2 CPU AMD EPYC EPYC_7763 powered server with a measured estimated SPECrate®2017_int_base score of 802; compared to a 2 CPU Intel Xeon Gold_6258R based server with a SPECrate®2017_int_base score of 397, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23981.pdf. Both AMD EPYC and Intel based servers use the same estimated cost for the following elements of the analysis: server chassis size of 2RU at a cost of $2500 per chassis; internal storage $380; physical servers managed per admin: 30; fully burdened cost per admin $110500; server rack size of 42; space allowance per rack of 27 sq feet; monthly cost of data center space $20 per sq foot; cost per kW for power $0.12; power drop per rack of 12kW; and a PUE (power usage effectiveness of 2). The EPYC powered solution estimates are: 32 2P EPYC 7763 powered total servers at a hardware only acquisition cost of $19232 per server, which includes total system memory of 768GB, which is 6GB of memory / core and a total system memory cost of $3072; internal storage cost of $380. The total AMD EPYC hardware acquisition cost for this solution is $615424. Each server draws ~611kWhr per month. For the 4 years of this EPYC powered solution analysis the: total solution power cost is ~$225240 which includes the PUE factor; the total admin cost is ~$471468, and the total real estate cost is ~$77760. The total 4 year TCO estimate for the AMD solution is $1389892. The Intel based solution estimates are: 63 2P Xeon Gold 6258R based total servers at a hardware only acquisition cost of $12316 per server, which includes total system memory of 384GB, which is 6.9GB of memory / core and a total system memory cost of $1536; internal storage cost of $380. The total Intel hardware acquisition cost for this solution is $775908. Each server draws ~476kWhr per month. For the 4 years of this Intel based solution analysis the: total solution power cost is $345460 which includes the PUE factor; the total admin cost is ~$928200, and the total real estate cost is ~$103680. The total 4 year TCO estimate for the Intel solution is $2153248. Delivering 25000 of estimated SPECrate®2017_int_base performance, produces the following estimated results: the AMD EPYC solution requires 49% fewer servers [1-(AMD server count / Intel server count)]; 25% less space [1-(AMD rack count / Intel rack count)]; 35% less power [1-(AMD power cost / Intel power cost)]; providing a 35% lower 4 year TCO [1-(AMD TCO / Intel TCO)]; AMD processor pricing based on 1KU price as of February 2021. Intel® Xeon® Scalable processor data and pricing from https://ark.intel.com as of September 2020. All pricing is in USD. Results shown here are estimates and actual results may vary. Product and company names are for informational purposes only and may be trademarks of their respective owners. SPECrate® scores as of 02/20/2021. AMD EPYC performance numbers based on AMD internal estimates and are subject to change based on actual results. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. AMD EPYC performance numbers based on AMD measured internal estimates and are subject to change based on actual results. Results generated by the AMD EPYC™ BARE METAL SERVER TCO ESTIMATION TOOL, VERSION: 02/20/2021 v0.9982.
ENDNOTES

ROM-236: Based on AMD internal testing, average per thread performance improvement at ISO-frequency on a 32-core, 64-thread, 2nd generation AMD EPYC™ platform as compared to 32-core 64-thread 1st generation AMD EPYC™ platform measured on a selected set of workloads including sub-components of SPEC CPU® 2017_int and representative server workloads. SPEC® and SPEC CPU® are registered trademarks of Standard Performance Evaluation Corporation. Learn more at www.spec.org.


The Bare Metal TCO (total cost of ownership) Estimator solution compares the selected AMD EPYC™ and Intel® Xeon® CPU based server solutions required to deliver a TOTAL PERFORMANCE of 25000 unit of integer performance based on published the SPECrate®2017_int_base scores for Intel and AMD measured estimated scores for AMD EPYC 7003. This analysis is based on tool VERSION: 02/20/2021 v0.9982. This estimation reflects a 4 year time frame. This analysis compares a 2 CPU AMD EPYC EPYC_7763 powered server with a measured estimated SPECrate®2017_int_base score of 802; compared to a 2 CPU Intel Xeon Gold_6258R based server with a SPECrate®2017_int_base score of 397, https://spec.org/cpu2017/results/res2020q3/cpu2017-20200915-23981.pdf. Both AMD EPYC and Intel based servers use the same estimated cost for the following elements of the analysis: server chassis size of 2RU at a cost of $2500 per chassis; internal storage $380; physical servers managed per admin: 30; fully burdened cost per admin $110500; server rack size of 42; space allowance per rack of 27 sq feet; monthly cost of data center space $20 per sq foot; cost per kW for power $0.12; power drop per rack of 12kW; and a PUE (power usage effectiveness of 2). The EPYC powered solution estimates are: 32 2P EPYC 7763 powered total servers at a hardware only acquisition cost of $19232 per server, which includes total system memory of 768GB, which is 6GB of memory / core and a total system memory cost of $3072; internal storage cost of $380. The total AMD EPYC hardware acquisition cost for this solution is $615424. Each server draws ~611kWhr per month. For the 4 years of this EPYC powered solution analysis the: total solution power cost is ~$225240 which includes the PUE factor; the total admin cost is ~$471468, and the total real estate cost is ~$77760. The total 4 year TCO estimate for the AMD solution is $1389892. The Intel based solution estimates are: 63 2P Xeon Gold 6258R based total servers at a hardware only acquisition cost of $12316 per server, which includes total system memory of 384GB, which is 6.9GB of memory / core and a total system memory cost of $1536; internal storage cost of $380. The total Intel hardware acquisition cost for this solution is $775908. Each server draws ~476kWhr per month. For the 4 years of this Intel based solution analysis the: total solution power cost is $345460 which includes the PUE factor; the total admin cost is ~$928200, and the total real estate cost is ~$103680. The total 4 year TCO estimate for the Intel solution is $2153248. Delivering 25000 of estimated SPECrate®2017_int_base performance, produces the following estimated results: the AMD EPYC solution requires 49% fewer servers [1-(AMD server count / Intel server count)]; 25% less space [1-(AMD rack count / Intel rack count)]; 35% less power [1-(AMD power cost / Intel power cost)]; providing a 35% lower 4 year TCO [1-(AMD TCO / Intel TCO)].

AMD processor pricing based on 1KU price as of February 2021. Intel® Xeon® Scalable processor data and pricing from https://ark.intel.com as of September 2020. All pricing is in USD. Results shown here are estimates and actual results may vary. Product and company names are for informational purposes only and may be trademarks of their respective owners. SPECrate® scores as of 02/20/2021. AMD EPYC performance numbers based on AMD internal estimates and are subject to change based on actual results. SPEC®, SPECrate® and SPEC CPU® are registered trademarks of the Standard Performance Evaluation Corporation. See www.spec.org for more information. AMD EPYC performance numbers based on AMD measured internal estimates and are subject to change based on actual results. Results generated by the AMD EPYC™ BARE METAL SERVER TCO ESTIMATION TOOL, VERSION: 02/20/2021 v0.9982.