SPEC CPU®2017 Integer Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.80 GHz, AMD EPYC 7543P)

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Apr-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>32</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>32</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>32</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>32</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>32</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>32</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>32</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>32</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>32</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>32</td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 12.6
SPECspeed®2017_int_peak = 12.6

Hardware

CPU Name: AMD EPYC 7543P
Max MHz: 3700
Nominal: 2800
Enabled: 32 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 512 KB I+D on chip per core
L3: 256 MB I+D on chip per chip, 32 MB shared / 4 cores
Other: None
Memory: 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)
Storage: 1 x 480 GB SAS SSD, RAID 0
Other: None

Software

OS: Ubuntu 20.04.1 LTS (x86_64)
Kernel 5.4.0-42-generic
Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
Parallel: Yes
Firmware: HPE BIOS Version A43 v2.42 04/15/2021 released Apr-2021
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc: jemalloc memory allocator library v5.1.0
Power Management: BIOS set to prefer performance at the cost of additional power usage
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>32</td>
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<td>6.93</td>
<td>257</td>
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<td>13.5</td>
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<td>605.mcf_s</td>
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<td>21.0</td>
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<td>620.omnetpp_s</td>
<td>32</td>
<td>190</td>
<td>8.60</td>
<td>188</td>
<td>8.66</td>
<td>189</td>
<td>8.64</td>
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<tr>
<td>623.xalancbmk_s</td>
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<tr>
<td>625.x264_s</td>
<td>32</td>
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<td>17.3</td>
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<td>631.deepsjeng_s</td>
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<td>220</td>
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<td>6.51</td>
<td>220</td>
<td>6.51</td>
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<tr>
<td>641.leela_s</td>
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<tr>
<td>648.exchange2_s</td>
<td>32</td>
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<td>124</td>
<td>23.8</td>
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<tr>
<td>657.xz_s</td>
<td>32</td>
<td>246</td>
<td>25.1</td>
<td>248</td>
<td>25.0</td>
<td>246</td>
<td>25.1</td>
</tr>
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

Submit Notes

The config file option 'submit' was used.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root to enable

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Operating System Notes (Continued)

Transparent Hugepages (THP) for this run.  
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for peak runs of 628.pop2_s and 638.imagick_s to enable THP only on request.

---

Environment Variables Notes

Environment variables set by runcpu before the start of the run:

GOMP_CPU_AFFINITY = "0-31"  
LD_LIBRARY_PATH =  
"/home/SPEC_CPU2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/amd_speed_aocc300_milan_B_lib/32:"  
MALLOCONF = "retain:true"  
OMP_DYNAMIC = "false"  
OMP_SCHEDULE = "static"  
OMP_STACKSIZE = "128M"  
OMP_THREAD_LIMIT = "32"

---

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.  
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.  
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4  
jemalloc 5.1.0 is available here:  
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

Submitted_by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>  
Submitted: Mon May 24 12:30:41 EDT 2021  
Submission: cpu2017-20210524-26393.sub

---

Platform Notes

BIOS Configuration  
Workload Profile set to General Peak Frequency Compute  
AMD SMT Option set to Disabled  
Determinism Control set to Manual  
Performance Determinism set to Power Deterministic  
Last-Level Cache (LLC) as NUMA Node set to Enabled

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Platform Notes (Continued)

NUMA memory domains per socket set to One memory domain per socket
Thermal Configuration set to Maximum Cooling
Infinity Fabric Power Management set to Disabled
Infinity Fabric Performance State set to P0
Workload Profile set to Custom
Power Regulator set to OS Control Mode

Sysinfo program /home/SPEC_CPU2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afea89d4b38e2f1c
running on ubuntu Wed Apr 1 10:44:46 2020

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
  model name : AMD EPYC 7543P 32-Core Processor
  1 "physical id"s (chips)
  32 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
  cpu cores : 32
  siblings : 32
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  Address sizes: 48 bits physical, 48 bits virtual
  CPU(s): 32
  On-line CPU(s) list: 0-31
  Thread(s) per core: 1
  Core(s) per socket: 32
  Socket(s): 1
  NUMA node(s): 8
  Vendor ID: AuthenticAMD
  CPU family: 25
  Model: 1
  Model name: AMD EPYC 7543P 32-Core Processor
  Stepping: 1
  CPU MHz: 2312.412
  BogoMIPS: 5589.81
  Virtualization: AMD-V
  L1d cache: 1 MiB
  L1i cache: 1 MiB

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**SPECspeed®2017_int_base = 12.6**  
**SPECspeed®2017_int_peak = 12.6**

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**Platform Notes (Continued)**

- **L2 cache:** 16 MiB  
- **L3 cache:** 256 MiB  
- **NUMA node0 CPU(s):** 0-3  
- **NUMA node1 CPU(s):** 4-7  
- **NUMA node2 CPU(s):** 8-11  
- **NUMA node3 CPU(s):** 12-15  
- **NUMA node4 CPU(s):** 16-19  
- **NUMA node5 CPU(s):** 20-23  
- **NUMA node6 CPU(s):** 24-27  
- **NUMA node7 CPU(s):** 28-31  

**Vulnerability Itlb multihit:** Not affected  
**Vulnerability L1tf:** Not affected  
**Vulnerability Mds:** Not affected  
**Vulnerability Meltdown:** Not affected

**Vulnerability Spec store bypass:** Mitigation; Speculative Store Bypass disabled via prctl and seccomp  
**Vulnerability Spectre v1:** Mitigation; usercopy/swapgs barriers and __user pointer sanitation  
**Vulnerability Spectre v2:** Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP disabled, RSB filling  
**Vulnerability Srbd:** Not affected  
**Vulnerability Tsx async abort:** Not affected

**Flags:**  
```
    fpu  vme de pse tsc msr pae mce cx8 apic sep mtrr
    pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
    pdpte1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
    aperfmperf pni pclmulqdq monitor sse4_1 sse4_2 movbe aes
    xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
    misalignsse 3nowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb
    b感 perfctr_llc mwaitx cmp_legacy svm extapic cr8_legacy abm sse4a
    misalignsse 3nowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb
    b感 perfctr_111 mwaitx cmp_legacy svm extapic cr8_legacy abm sse4a
```

From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a physical chip.  
```
available: 8 nodes (0-7)
node 0 cpus: 0 1 2 3
node 0 size: 128776 MB
node 0 free: 128230 MB
node 1 cpus: 4 5 6 7
node 1 size: 129022 MB
node 1 free: 128894 MB

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Node Notes (Continued)

node 2 cpus: 8 9 10 11
node 2 size: 129022 MB
node 2 free: 128807 MB
node 3 cpus: 12 13 14 15
node 3 size: 129022 MB
node 3 free: 128896 MB
node 4 cpus: 16 17 18 19
node 4 size: 129022 MB
node 4 free: 128851 MB
node 5 cpus: 20 21 22 23
node 5 size: 129022 MB
node 5 free: 128915 MB
node 6 cpus: 24 25 26 27
node 6 size: 128998 MB
node 6 free: 128846 MB
node 7 cpus: 28 29 30 31
node 7 size: 116909 MB
node 7 free: 116734 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 11 11 11 11 11 11
1: 11 10 11 11 11 11 11
2: 11 11 10 11 11 11 11
3: 11 11 11 10 11 11 11
4: 11 11 11 11 10 11 11
5: 11 11 11 11 11 10 11
6: 11 11 11 11 11 11 11
7: 11 11 11 11 11 11 11

From /proc/meminfo
MemTotal: 1044274592 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
Ubuntu 20.04.1 LTS

From /etc/*release* /etc/*version*
debian_version: bullseye/sid
os-release:
NAME="Ubuntu"
VERSION="20.04.1 LTS (Focal Fossa)"
ID=ubuntu
ID_LIKE=debian
PRETTY_NAME="Ubuntu 20.04.1 LTS"
VERSION_ID="20.04"
HOME_URL="https://www.ubuntu.com/"

(Continued on next page)
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</tbody>
</table>

Platform Notes (Continued)

SUPPORT_URL = "https://help.ubuntu.com/"

uname -a:
    Linux ubuntu 5.4.0-42-generic #46-Ubuntu SMP Fri Jul 10 00:24:02 UTC 2020 x86_64
    x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitation
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 5 Apr 1 10:23

SPEC is set to: /home/SPEC_CPU2017

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL345 Gen10 Plus
Product Family: ProLiant
Serial: J20APP0014

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:
    8x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
    8x UNKNOWN NOT AVAILABLE

BIOS:
    BIOS Vendor: HPE
    BIOS Version: A43
Hewlett Packard Enterprise  
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**Test Date:** Apr-2021  
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**Software Availability:** Mar-2021

**Platform Notes (Continued)**

```
BIOS Date:         04/15/2021
BIOS Revision:     2.42
Firmware Revision: 2.40
```

(End of data from sysinfo program)

**Compiler Version Notes**

```
C
   600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

C++
   620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
   631.deepsjeng_s(base, peak) 641.leela_s(base, peak)

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

Fortran
   648.exchange2_s(base, peak)

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
```

**Base Compiler Invocation**

```
C benchmarks:
   clang
```

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**Base Compiler Invocation (Continued)**

C++ benchmarks:  
clang++

Fortran benchmarks:  
flang

**Base Portability Flags**

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64  
602.gcc_s: -DSPEC_LP64  
605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64  
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64  
625.x264_s: -DSPEC_LP64  
631.deepsjeng_s: -DSPEC_LP64  
641.leela_s: -DSPEC_LP64  
648.exchange2_s: -DSPEC_LP64  
657.xz_s: -DSPEC_LP64

**Base Optimization Flags**

C benchmarks:  
-m64 -mnoadx -mno-sse4a -Wl,-allow-multiple-definition  
-Wl,-mllvm -Wl,--enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,--reduce-array-computations=3 -03 -march=znver3  
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5  
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000  
-fremap-arrays -mllvm -function-specialize -flv-function-specialization  
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true  
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs  
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc  
-lflang -lflangrti

C++ benchmarks:  
-m64 -std=c++98 -mnoadx -mno-sse4a  
-Wl,-mllvm -Wl,-do-block-reorder=aggressive  
-Wl,-mllvm -Wl,--region-vectorize -Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,--reduce-array-computations=3 -03 -march=znver3  
-fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
-mlir -unroll-threshold=100 -finline-aggressive
-flt -function-specialization -mlir -loop-unswitch-threshold=200000
-mlir -reroil -loop -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -reduce-array-computations=3
-mlir -global-vectorize -slp=true -mlir -convert-pow-exp-to-int=false
-z muldefs -mlir -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamlldb -ljemalloc -lfang
-llang

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -z muldefs
-mlir -unroll-aggressive -mlir -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamlldb -ljemalloc -lfang
-llang

Base Other Flags

C benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

C++ benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

(Continued on next page)
Peak Compiler Invocation (Continued)

Fortran benchmarks:
flang

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
600.perlbench_s: basepeak = yes
602.gcc_s: basepeak = yes
605.mcf_s: basepeak = yes
625.x264_s: basepeak = yes
657.xz_s: basepeak = yes

C++ benchmarks:
620.omnetpp_s: basepeak = yes
623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes
641.leela_s: basepeak = yes

Fortran benchmarks:
648.exchange2_s: basepeak = yes

Peak Other Flags

C benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.80 GHz, AMD EPYC 7543P)

SPECspeed®2017_int_base = 12.6
SPECspeed®2017_int_peak = 12.6

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Apr-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Peak Other Flags (Continued)

C++ benchmarks:
- Wno-unused-command-line-argument
- Wno-return-type

Fortran benchmarks:
- Wno-return-type

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml

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