Hewlett Packard Enterprise
ProLiant DL345 Gen10 Plus
(3.00 GHz, AMD EPYC 7313P)

SPECspeed\textsuperscript{\textregistered}2017\_int\_base = 12.4
SPECspeed\textsuperscript{\textregistered}2017\_int\_peak = 12.4

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

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline
Threads & 0 & 1.00 & 3.00 & 5.00 & 7.00 & 9.00 & 11.0 & 13.0 & 15.0 & 17.0 & 19.0 & 21.0 & 24.0 \\
\hline
600.perlbench\_s & 16 & 6.87 & & & & & & & & & & & \\
\hline
602.gcc\_s & 16 & & & & & 13.5 & & & & & & & \\
\hline
605.mcf\_s & 16 & & & & & & & 20.8 & & & & & \\
\hline
620.omnetpp\_s & 16 & & & & & 8.57 & & & & & & & \\
\hline
623.xalancbmk\_s & 16 & & & & & & & 14.5 & & & & & \\
\hline
625.x264\_s & 16 & & & & & & & & & 17.4 & & & \\
\hline
631.deepsjeng\_s & 16 & & & & & 6.47 & & & & & & & \\
\hline
641.leela\_s & 16 & & & & & 5.87 & & & & & & & \\
\hline
648.exchange2\_s & 16 & & & & & & & & & 23.7 & & & \\
\hline
657.xz\_s & 16 & & & & & & & & & 22.8 & & & \\
\hline
\end{tabular}

\textsuperscript{\textregistered}SPECspeed\textsuperscript{\textregistered}2017\_int\_base (12.4)
\textsuperscript{\textregistered}SPECspeed\textsuperscript{\textregistered}2017\_int\_peak (12.4)

\textbf{Hardware}

\begin{itemize}
\item CPU Name: AMD EPYC 7313P
\item Max MHz: 3700
\item Nominal: 3000
\item Enabled: 16 cores, 1 chip
\item Orderable: 1 chip
\item Cache L1: 32 KB I + 32 KB D on chip per core
\item L2: 512 KB I+D on chip per core
\item L3: 128 MB I+D on chip per chip, 32 MB shared / 4 cores
\item Other: None
\item Memory: 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)
\item Storage: 1 x 480 GB SAS SSD, RAID 0
\item Other: None
\end{itemize}

\textbf{Software}

\begin{itemize}
\item OS: Ubuntu 20.04.1 LTS (x86_64)
\item Kernel: 5.4.0-56-generic
\item Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
\item Parallel: Yes
\item Firmware: HPE BIOS Version A43 v2.42 04/15/2021 released Apr-2021
\item File System: ext4
\item System State: Run level 5 (multi-user)
\item Base Pointers: 64-bit
\item Peak Pointers: 64-bit
\item Other: jemalloc: jemalloc memory allocator library v5.1.0
\item Power Management: BIOS set to prefer performance at the cost of additional power usage
\end{itemize}
Hewlett Packard Enterprise  
[Test Sponsor: HPE]  
ProLiant DL345 Gen10 Plus  
(3.00 GHz, AMD EPYC 7313P)

**SPEC CPU® 2017 Integer Speed Result**

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**Test Sponsor:** HPE  
**Hardware Availability:** Jun-2021  
**Software Availability:** Mar-2021

**Results Table**

<table>
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<th>Seconds</th>
<th>Ratio</th>
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<td>22.9</td>
<td>272</td>
<td>22.8</td>
<td>270</td>
<td>22.9</td>
</tr>
</tbody>
</table>

**Results**

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/defrag' run as root to enable

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
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SPECspeed®2017_int_base = 12.4
SPECspeed®2017_int_peak = 12.4

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 = "0-15"
LD_LIBRARY_PATH = "/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "16"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-15"

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

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
NUMA memory domains per socket set to One memory domain per socket

(Continued on next page)
Platform Notes (Continued)

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/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr  1 17:44:25 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 7313P 16-Core Processor
          1  "physical id"s (chips)
       16 "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 : 16
    siblings  : 16
    physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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):              16
On-line CPU(s) list: 0-15
Thread(s) per core:  1
Core(s) per socket:  16
Socket(s):           1
NUMA node(s):        4
Vendor ID:           AuthenticAMD
CPU family:          25
Model:               1
Model name:          AMD EPYC 7313P 16-Core Processor
Stepping:            1
Frequency boost:     enabled
CPU MHz:             2115.474
CPU max MHz:         3000.000
CPU min MHz:         1500.0000
BogoMIPS:            5988.97
Virtualization:      AMD-V
L1d cache:           512 KiB
Platform Notes (Continued)

L1i cache: 512 KiB
L2 cache: 8 MiB
L3 cache: 128 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
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, IBPF conditional, IBRS_FW, STIBP disabled, RSB filling
Vulnerability Srbds: 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 pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmpref pni pclmulqdq monitor ssse3 fma cx16 pclmuid_sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalgnsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l1c mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqgbase bml1 avx2 smep bmi2 invpcid cmqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves cmqm_llc cmqm_occu polls cmqm_mbb_total cmqm_mbb_local clzero irperf xsaverptr wbnbnoivd arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgfl ump pkpu ospke vaes vpclmulqdq rdpid overflow_recov succor smca

/proc/cpuinfo cache data
  cache size: 512 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0 1 2 3
  node 0 size: 257801 MB
  node 0 free: 257409 MB
  node 1 cpus: 4 5 6 7
  node 1 size: 258046 MB
  node 1 free: 257749 MB
  node 2 cpus: 8 9 10 11
  node 2 size: 258046 MB
  node 2 free: 257778 MB

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

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SPECspeed®2017_int_base = 12.4
SPECspeed®2017_int_peak = 12.4

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

Platform Notes (Continued)

node 3 cpus: 12 13 14 15
node 3 size: 245911 MB
node 3 free: 245659 MB
node distances:
node 0 1 2 3
  0: 10 11 11 11
  1: 11 10 11 11
  2: 11 11 10 11
  3: 11 11 11 10

From /proc/meminfo
MemTotal: 1044281840 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

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

uname -a:
Linux admin 5.4.0-56-generic #62-Ubuntu SMP Mon Nov 23 19:20:19 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

(Continued on next page)
Platform Notes (Continued)

barriers and __user pointer sanitation
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 17:23

SPEC is set to: /home/SPEC_CPU2017/cpu2017

Filesystem                        Type  Size  Used Avail Use% Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv ext4  196G   83G  104G  45% /

From /sys/devices/virtual/dmi/id
Vendor:         HPE
Product:        ProLiant DL345 Gen10 Plus
Product Family: ProLiant
Serial:         J20APP000K

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
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

(Continued on next page)
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SPECspeed®2017_int_peak = 12.4

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<td>Tested by: HPE</td>
<td>Software Availability:</td>
<td>Mar-2021</td>
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</table>

Compiler Version Notes (Continued)

Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

---

C++
---

<table>
<thead>
<tr>
<th>620.omnetpp_s(base, peak)</th>
<th>623.xalancbmk_s(base, peak)</th>
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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

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

(Continued on next page)
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CPU2017 License: 3
Test Sponsor: HPE
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Test Date: Apr-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Base Portability Flags (Continued)

625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leea_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,--enable-lc-fvrt -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-lc-fvrt -mllvm -reduce-array-computations=3 -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti

C++ benchmarks:
-m64 -std=c++98 -mno-adx -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
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-z muldefs -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
-lflangrti

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-isr-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

(Continued on next page)
## Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- `Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3`
- `fveclib=AMDLIBM -ffast-math -flto -z muldefs`
- `mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP`
- `fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang`
- `lflangrti`

## 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++`

Fortran benchmarks:
- `flang`

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

(Continued on next page)
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL345 Gen10 Plus  
(3.00 GHz, AMD EPYC 7313P)  

<table>
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<th>SPECspeed®2017_int_peak = 12.4</th>
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<td><strong>Test Sponsor:</strong> HPE</td>
<td><strong>Hardware Availability:</strong> Jun-2021</td>
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<td><strong>Tested by:</strong> HPE</td>
<td><strong>Software Availability:</strong> Mar-2021</td>
</tr>
</tbody>
</table>

**Peak Optimization Flags (Continued)**

600.perlbench_s: basepeak = yes
602.gcc_s: basepeak = yes
605.mcf_s: basepeak = yes
625.x264_s: basepeak = yes
657.xz_s: -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition  
-Wl,-mlllvm -Wl,-enable-licm-vrp  
-Wl,-mlllvm -Wl,-function-specialize  
-Wl,-mlllvm -Wl,-align-all-noallthru-blocks=6  
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast  
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto  
-fstruct-layout=5 -mlllvm -unroll-threshold=50  
-fremap-arrays -flv-function-specialization  
-mlllvm -inline-threshold=1000 -mlllvm -enable-gvn-hoist  
-mlllvm -global-vectorize-slp=true  
-mlllvm -function-specialize -mlllvm -enable-licm-vrp  
-mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp  
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

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

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

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
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Hardware Availability: Jun-2021
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Peak Other Flags (Continued)

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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