



SPEC CPU®2017 Integer Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

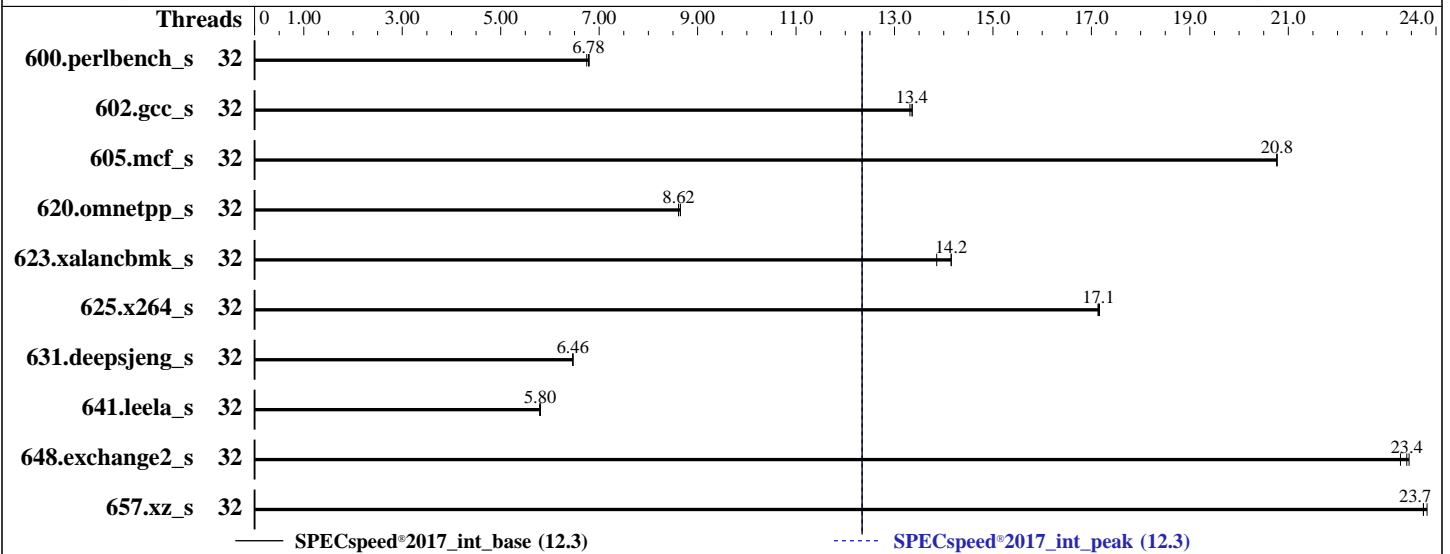
ProLiant DL345 Gen10 Plus
(2.60 GHz, AMD EPYC 7513)

SPECspeed®2017_int_base = 12.3

SPECspeed®2017_int_peak = 12.3

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

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



Hardware

CPU Name: AMD EPYC 7513
 Max MHz: 3650
 Nominal: 2600
 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: 128 MB I+D on chip per chip, 32 MB shared / 8 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 5.4.0-56-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

Benchmark	Base						Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	32	261	6.80	<u>262</u>	<u>6.78</u>	263	6.75	32	261	6.80	<u>262</u>	<u>6.78</u>	263	6.75
602.gcc_s	32	298	13.4	<u>298</u>	<u>13.4</u>	299	13.3	32	298	13.4	<u>298</u>	<u>13.4</u>	299	13.3
605.mcf_s	32	<u>227</u>	<u>20.8</u>	227	20.8	227	20.8	32	<u>227</u>	<u>20.8</u>	227	20.8	227	20.8
620.omnetpp_s	32	189	8.65	<u>189</u>	<u>8.62</u>	189	8.61	32	189	8.65	<u>189</u>	<u>8.62</u>	189	8.61
623.xalancbmk_s	32	100	14.2	<u>100</u>	<u>14.2</u>	102	13.9	32	100	14.2	<u>100</u>	<u>14.2</u>	102	13.9
625.x264_s	32	103	17.1	<u>103</u>	<u>17.1</u>	103	17.2	32	103	17.1	<u>103</u>	<u>17.1</u>	103	17.2
631.deepsjeng_s	32	<u>222</u>	<u>6.46</u>	222	6.46	222	6.47	32	<u>222</u>	<u>6.46</u>	222	6.46	222	6.47
641.leela_s	32	294	5.81	<u>294</u>	<u>5.80</u>	295	5.79	32	294	5.81	<u>294</u>	<u>5.80</u>	295	5.79
648.exchange2_s	32	125	23.5	<u>126</u>	<u>23.4</u>	126	23.3	32	125	23.5	<u>126</u>	<u>23.4</u>	126	23.3
657.xz_s	32	260	23.8	<u>260</u>	<u>23.7</u>	260	23.7	32	260	23.8	<u>260</u>	<u>23.7</u>	260	23.7

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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/cpu2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/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 12:36:50 EDT 2021
Submission: cpu2017-20210524-26414.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/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr 1 17:26:53 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 7513 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): 4
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7513 32-Core Processor
Stepping: 1
CPU MHz: 1796.065
BogoMIPS: 5190.00
Virtualization: AMD-V
L1d cache: 1 MiB
L1i cache: 1 MiB

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Platform Notes (Continued)

```

L2 cache:                16 MiB
L3 cache:                128 MiB
NUMA node0 CPU(s):      0-7
NUMA node1 CPU(s):      8-15
NUMA node2 CPU(s):      16-23
NUMA node3 CPU(s):      24-31
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 sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB 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 noopl nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr wbnoinvd arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif umip pku 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 4 5 6 7
node 0 size: 257800 MB
node 0 free: 257308 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 258046 MB
node 1 free: 257735 MB
node 2 cpus: 16 17 18 19 20 21 22 23
node 2 size: 258021 MB
node 2 free: 257729 MB
node 3 cpus: 24 25 26 27 28 29 30 31

```

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Platform Notes (Continued)

```
node 3 size: 245934 MB
node 3 free: 245657 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:          1044278380 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/"
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/swaps
barriers and __user pointer
sanitization
CVE-2017-5715 (Spectre variant 2):       Mitigation: Full AMD retpoline,
IBPB: conditional, IBRS_FW, STIBP:
```

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Platform Notes (Continued)

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: AOC3_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

(Continued on next page)



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Compiler Version Notes (Continued)

```
=====  
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

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Base Portability Flags

```
600.perlbenc_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
```

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Base Portability Flags (Continued)

657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:

```
-m64 -mno-adx -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 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-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 -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 -O3 -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,-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
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):

`-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:

`600.perlbench_s: basepeak = yes`

`602.gcc_s: basepeak = yes`

(Continued on next page)



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Peak Optimization Flags (Continued)

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

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>

<http://www.spec.org/cpu2017/flags/aocc300-flags-A1.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>

<http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml>



SPEC CPU®2017 Integer Speed Result

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(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.60 GHz, AMD EPYC 7513)

SPECspeed®2017_int_base = 12.3

SPECspeed®2017_int_peak = 12.3

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