SPEC CPU®2017 Integer Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

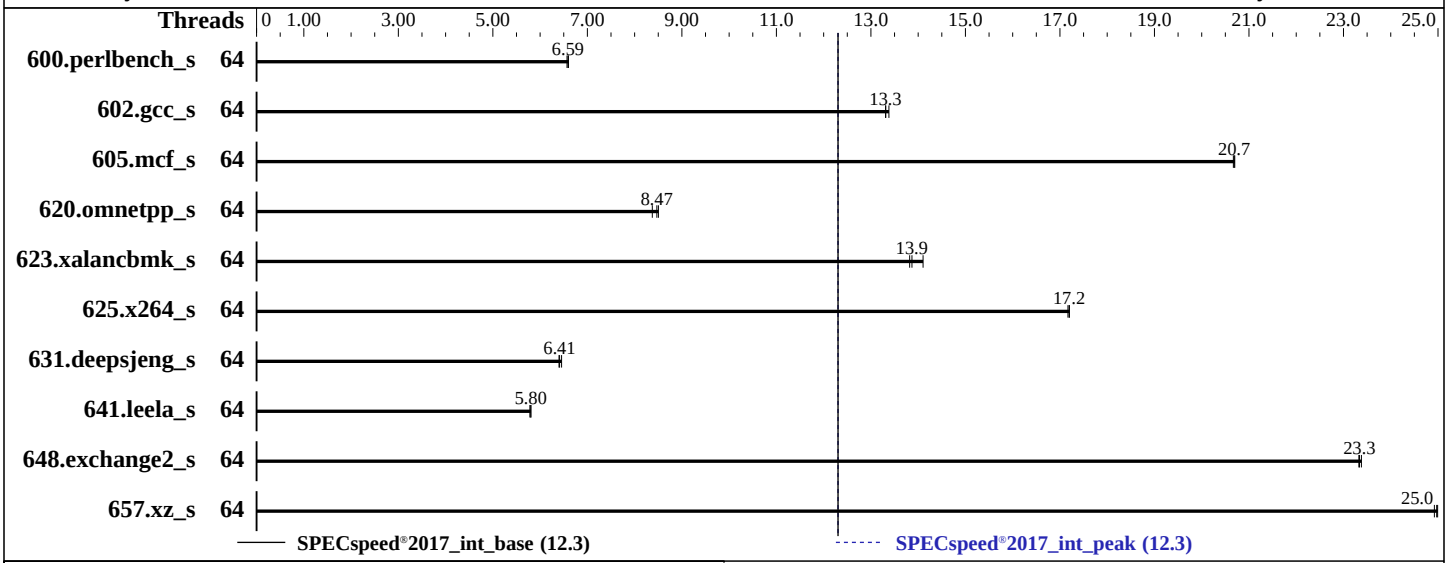
ProLiant DL385 Gen10 Plus v2
(2.60 GHz, AMD EPYC 7513)

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: Apr-2021
Software Availability: Mar-2021



Hardware

CPU Name:	AMD EPYC 7513
Max MHz:	3650
Nominal:	2600
Enabled:	64 cores, 2 chips
Orderable:	1,2 chip(s)
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:	2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
Storage:	1 x 182 GB SATA 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 A42 v2.42 04/29/2021 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	64	270	6.57	**269**	**6.59**	269	6.60	64	270	6.57	**269**	**6.59**	269	6.60
602.gcc_s	64	299	13.3	**299**	**13.3**	298	13.4	64	299	13.3	**299**	**13.3**	298	13.4
605.mcf_s	64	228	20.7	**228**	**20.7**	228	20.7	64	228	20.7	**228**	**20.7**	228	20.7
620.omnetpp_s	64	195	8.37	**193**	**8.47**	192	8.50	64	195	8.37	**193**	**8.47**	192	8.50
623.xalancbmk_s	64	100	14.1	**102**	**13.9**	103	13.8	64	100	14.1	**102**	**13.9**	103	13.8
625.x264_s	64	**103**	**17.2**	103	17.2	103	17.2	64	**103**	**17.2**	103	17.2	103	17.2
631.deepsjeng_s	64	**223**	**6.41**	224	6.40	222	6.45	64	**223**	**6.41**	224	6.40	222	6.45
641.leela_s	64	**294**	**5.80**	295	5.78	294	5.80	64	**294**	**5.80**	295	5.78	294	5.80
648.exchange2_s	64	**126**	**23.3**	126	23.4	126	23.3	64	**126**	**23.3**	126	23.4	126	23.3
657.xz_s	64	**248**	**25.0**	248	24.9	247	25.0	64	**248**	**25.0**	248	24.9	247	25.0

SPECspeed®2017_int_base = 12.3

SPECspeed®2017_int_peak = 12.3

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.
'numactl' was used to bind copies to the cores.
See the configuration file for details.
```

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.
```

(Continued on next page)

Operating System Notes (Continued)

```
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root to enable
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 = "0-63"
LD_LIBRARY_PATH =
     "/home/cpu2017_B1/amd_speed_aocc300_milan_B_lib/64;/home/cpu2017_B1/amd_
     speed_aocc300_milan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"
```

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 12:49:23 EDT 2021
Submission: cpu2017-20210524-26450.sub
```

Platform Notes

```
BIOS Configuration
 Workload Profile set to General Peak Frequency Compute
 AMD SMT Option set to Disabled
 Determinism Control set to Manual
```

(Continued on next page)

Platform Notes (Continued)

```
 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
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Infinity Fabric Power Management set to Disabled
 Infinity Fabric Performance State set to P0
Power Regulator set to OS Control Mode

Sysinfo program /home/cpu2017_B1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on dl385g10v2 Wed Apr  1 12:30:37 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
      2  "physical id"s (chips)
      64 "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
      physical 1: 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):                          64
     On-line CPU(s) list:             0-63
     Thread(s) per core:              1
     Core(s) per socket:              32
     Socket(s):                       2
     NUMA node(s):                    8
     Vendor ID:                       AuthenticAMD
     CPU family:                      25
     Model:                           1
     Model name:                      AMD EPYC 7513 32-Core Processor
     Stepping:                        1
     Frequency boost:                 enabled
```

(Continued on next page)

Platform Notes (Continued)

```
      CPU MHz:                         3143.522
      CPU max MHz:                     2600.0000
      CPU min MHz:                     1500.0000
      BogoMIPS:                        5190.12
      Virtualization:                  AMD-V
      L1d cache:                       2 MiB
      L1i cache:                       2 MiB
      L2 cache:                        32 MiB
      L3 cache:                        256 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
      NUMA node4 CPU(s):               32-39
      NUMA node5 CPU(s):               40-47
      NUMA node6 CPU(s):               48-55
      NUMA node7 CPU(s):               56-63
      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 nopl 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.
```

(Continued on next page)

Platform Notes (Continued)

```
   available: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 4 5 6 7
   node 0 size: 257799 MB
   node 0 free: 257577 MB
   node 1 cpus: 8 9 10 11 12 13 14 15
   node 1 size: 258046 MB
   node 1 free: 257833 MB
   node 2 cpus: 16 17 18 19 20 21 22 23
   node 2 size: 258046 MB
   node 2 free: 257717 MB
   node 3 cpus: 24 25 26 27 28 29 30 31
   node 3 size: 245935 MB
   node 3 free: 245695 MB
   node 4 cpus: 32 33 34 35 36 37 38 39
   node 4 size: 258021 MB
   node 4 free: 257879 MB
   node 5 cpus: 40 41 42 43 44 45 46 47
   node 5 size: 258046 MB
   node 5 free: 257821 MB
   node 6 cpus: 48 49 50 51 52 53 54 55
   node 6 size: 258046 MB
   node 6 free: 257894 MB
   node 7 cpus: 56 57 58 59 60 61 62 63
   node 7 size: 258043 MB
   node 7 free: 257898 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  11  11  32  32  32  32
     1:  11  10  11  11  32  32  32  32
     2:  11  11  10  11  32  32  32  32
     3:  11  11  11  10  32  32  32  32
     4:  32  32  32  32  10  11  11  11
     5:  32  32  32  32  11  10  11  11
     6:  32  32  32  32  11  11  10  11
     7:  32  32  32  32  11  11  11  10

 From /proc/meminfo
    MemTotal:       2101231580 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /sbin/tuned-adm active
     Current active profile: throughput-performance

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


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Platform Notes (Continued)

```
/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 dl385g10v2 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
                                                         sanitization
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 12:23

SPEC is set to: /home/cpu2017_B1
   Filesystem                         Type  Size  Used Avail Use% Mounted on
   /dev/mapper/ubuntu--vg-ubuntu--lv ext4  182G   54G  119G  32% /

From /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL385 Gen10 Plus
    Product Family: ProLiant
```

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Platform Notes (Continued)

```
     Serial:         CN79340HC3

  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:
      16x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
      16x UNKNOWN NOT AVAILABLE

  BIOS:
     BIOS Vendor:       HPE
     BIOS Version:      A42
     BIOS Date:         04/29/2021
     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)
------------------------------------------------------------------------------
```

(Continued on next page)

Compiler Version Notes (Continued)

```
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
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 -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

(Continued on next page)

Base Optimization Flags (Continued)

C benchmarks (continued):
-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 -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
-lflangrti

Base 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)

Base Other Flags (Continued)

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`

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`

(Continued on next page)

Peak Optimization Flags (Continued)

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`

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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