



SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

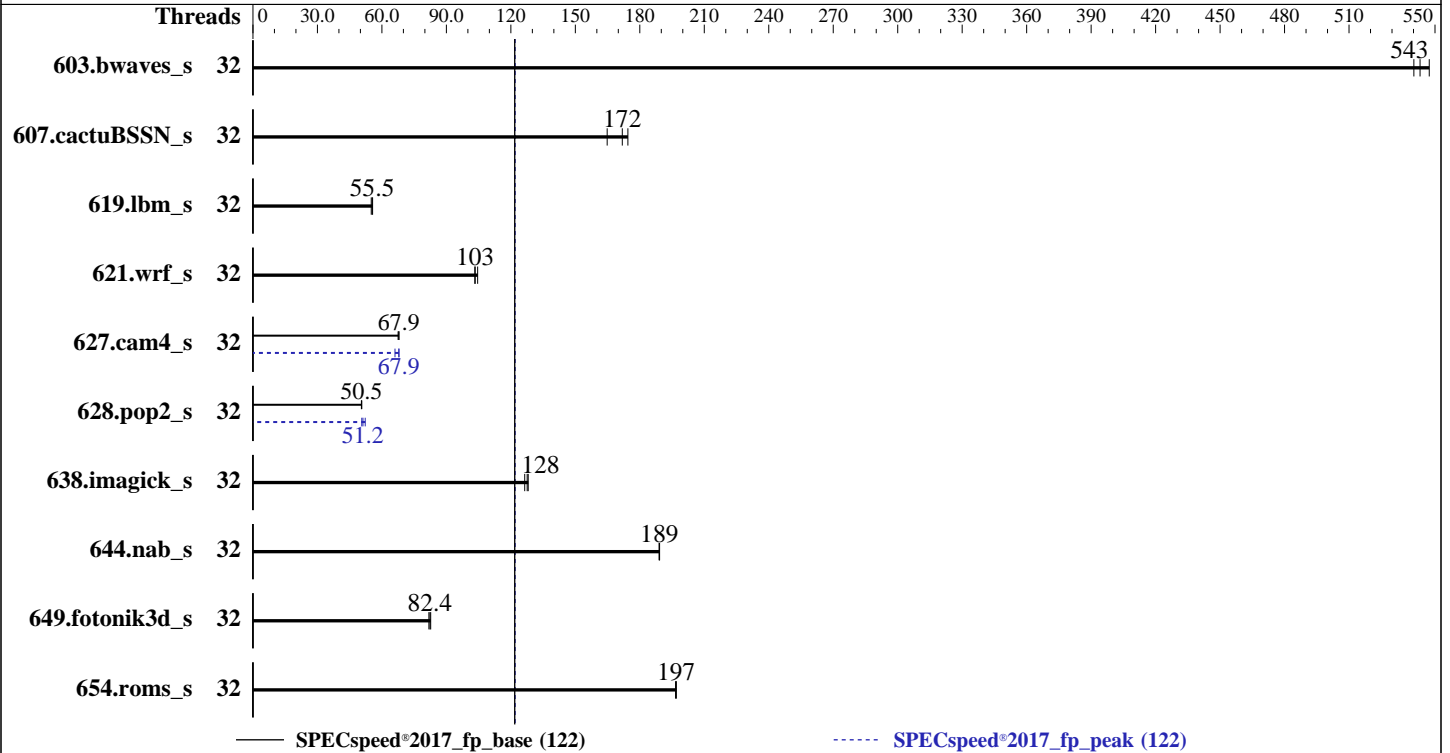
ProLiant DL385 Gen10 Plus
(3.00 GHz, AMD EPYC 7302)

SPECspeed®2017_fp_base = 122

SPECspeed®2017_fp_peak = 122

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

Test Date: Jan-2020
Hardware Availability: Dec-2019
Software Availability: Aug-2019



Hardware

CPU Name: AMD EPYC 7302
 Max MHz: 3300
 Nominal: 3000
 Enabled: 32 cores, 2 chips
 Orderable: 1, 2 chips
 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,
 16 MB shared / 2 cores
 Other: None
 Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R)
 Storage: 1 x 800 GB SAS SSD, RAID 0
 Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64) SP1
 Kernel 4.12.14-195-default
 Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
 Parallel: Yes
 Firmware: HPE BIOS Version A42 12/12/2019 released Dec-2019
 File System: btrfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: jemalloc: jemalloc memory allocator library v5.2.0
 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
603.bwaves_s	32	109	543	108	547	109	540	32	109	543	108	547	109	540
607.cactuBSSN_s	32	97.0	172	101	165	95.6	174	32	97.0	172	101	165	95.6	174
619.lbm_s	32	94.1	55.7	94.4	55.5	95.2	55.0	32	94.1	55.7	94.4	55.5	95.2	55.0
621.wrf_s	32	128	103	128	103	127	105	32	128	103	128	103	127	105
627.cam4_s	32	130	67.9	131	67.9	131	67.5	32	131	67.9	131	67.9	134	66.1
628.pop2_s	32	235	50.6	235	50.5	235	50.5	32	235	50.6	232	51.2	227	52.2
638.imagick_s	32	114	126	113	128	113	128	32	114	126	113	128	113	128
644.nab_s	32	92.4	189	92.3	189	92.5	189	32	92.4	189	92.3	189	92.5	189
649.fotonik3d_s	32	110	82.7	111	81.9	111	82.4	32	110	82.7	111	81.9	111	82.4
654.roms_s	32	80.0	197	79.9	197	80.1	197	32	80.0	197	79.9	197	80.1	197

SPECSpeed®2017_fp_base = **122**

SPECSpeed®2017_fp_peak = **122**

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>
```

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)



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Environment Variables Notes

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

GOMP_CPU_AFFINITY = "0-31"

LD_LIBRARY_PATH =

"/home/cpu2017-bbn/amd_speed_aocc200_rome_C_lib/64;/home/cpu2017-bbn/amd_speed_aocc200_rome_C_lib/32:"

MALLOC_CONF = "retain:true"

OMP_DYNAMIC = "false"

OMP_SCHEDULE = "static"

OMP_STACKSIZE = "128M"

OMP_THREAD_LIMIT = "32"

Environment variables set by runcpu during the 627.cam4_s peak run:

GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 628.pop2_s peak run:

GOMP_CPU_AFFINITY = "0-31"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:

<https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2>

Platform Notes

BIOS Configuration

Thermal Configuration set to Maximum Cooling

AMD SMT Mode set to Disabled

Determinism Control set to Manual

Performance Determinism set to Power Deterministic

Minimum Processor Idle Power core C-State set to C6 State

Memory Patrol Scrubbing set to Disabled

Workload Profile set to General Peak Frequency Compute

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

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Platform Notes (Continued)

Power Regulator Set to OS Control Mode

sysinfo program /home/cpu2017-bbn/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
running on linux-30t0 Thu Feb 14 19:55:10 2019

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 7302 16-Core Processor
  2 "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 : 16
siblings  : 16
physical 0: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29
physical 1: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29
```

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:    16
Socket(s):              2
NUMA node(s):          8
Vendor ID:             AuthenticAMD
CPU family:             23
Model:                 49
Model name:            AMD EPYC 7302 16-Core Processor
Stepping:              0
CPU MHz:               2994.332
BogoMIPS:              5988.66
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             32K
L2 cache:              512K
L3 cache:              16384K
NUMA node0 CPU(s):    0-3
NUMA node1 CPU(s):    4-7
NUMA node2 CPU(s):    8-11
```

(Continued on next page)



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Platform Notes (Continued)

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

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 xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni
pclmulqdq monitor ssse3 fma cx16 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_l2 mwaitx cpb
cat_l3 cdp_l3 hw_pstate ssbd ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2
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 arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_vmsave_vmload vgif umip 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: 8 nodes (0-7)
node 0 cpus: 0 1 2 3
node 0 size: 128711 MB
node 0 free: 128597 MB
node 1 cpus: 4 5 6 7
node 1 size: 129022 MB
node 1 free: 128943 MB
node 2 cpus: 8 9 10 11
node 2 size: 129022 MB
node 2 free: 128940 MB
node 3 cpus: 12 13 14 15
node 3 size: 128981 MB
node 3 free: 128898 MB
node 4 cpus: 16 17 18 19
node 4 size: 129022 MB
node 4 free: 128866 MB
node 5 cpus: 20 21 22 23
node 5 size: 129022 MB
node 5 free: 128789 MB
node 6 cpus: 24 25 26 27
node 6 size: 129022 MB
node 6 free: 128933 MB
node 7 cpus: 28 29 30 31
node 7 size: 129022 MB
node 7 free: 128796 MB
```

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Platform Notes (Continued)

node distances:

node	0	1	2	3	4	5	6	7
0:	10	12	12	12	32	32	32	32
1:	12	10	12	12	32	32	32	32
2:	12	12	10	12	32	32	32	32
3:	12	12	12	10	32	32	32	32
4:	32	32	32	32	10	12	12	12
5:	32	32	32	32	12	10	12	12
6:	32	32	32	32	12	12	10	12
7:	32	32	32	32	12	12	12	10

From /proc/meminfo

MemTotal: 1056591096 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*

os-release:
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:

Linux linux-30t0 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Feb 14 19:51

SPEC is set to: /home/cpu2017-bbn

Filesystem Type Size Used Avail Use% Mounted on

(Continued on next page)



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Platform Notes (Continued)

```
/dev/sdc2      btrfs  743G   25G   718G   4% /home
```

```
From /sys/devices/virtual/dmi/id
  BIOS:      HPE A42 12/12/2019
  Vendor:    HPE
  Product:   ProLiant DL385 Gen10 Plus
  Product Family: ProLiant
  Serial:    CN79310517
```

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 Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200
  16x UNKNOWN NOT AVAILABLE
```

(End of data from sysinfo program)

Compiler Version Notes

```
=====  
C          | 619.lbm_s(base, peak) 638.imagick_s(base, peak)  
          | 644.nab_s(base, peak)  
-----
```

```
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin  
-----
```

```
=====  
C++, C, Fortran | 607.cactuBSSN_s(base, peak)  
-----
```

```
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
```

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Compiler Version Notes (Continued)

AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

=====
Fortran | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
| 654.roms_s(base, peak)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

=====
Fortran, C | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
| 628.pop2_s(base, peak)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang



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Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-lflang
```

Fortran benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -funroll-loops -Mrecursive -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang
```

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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fstruct-layout=3 -mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-lamdlibm -ljemalloc -lflang
```

Base Other Flags

C benchmarks:

```
-Wno-return-type -DUSE_OPENMP
```

Fortran benchmarks:

```
-DUSE_OPENMP -Wno-return-type
```

Benchmarks using both Fortran and C:

```
-DUSE_OPENMP -Wno-return-type
```

Benchmarks using Fortran, C, and C++:

```
-Wno-return-type -DUSE_OPENMP
```

Peak Compiler Invocation

C benchmarks:

```
clang
```

Fortran benchmarks:

```
flang
```

Benchmarks using both Fortran and C:

```
flang clang
```

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(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus
(3.00 GHz, AMD EPYC 7302)

SPECspeed®2017_fp_base = 122

SPECspeed®2017_fp_peak = 122

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

Test Date: Jan-2020
Hardware Availability: Dec-2019
Software Availability: Aug-2019

Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
clang++ clang flang

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -O3 -funroll-loops
-Mrecursive -Kieee -fno-finite-math-only -DSPEC_OPENMP

(Continued on next page)



SPEC CPU®2017 Floating Point Speed Result

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Peak Optimization Flags (Continued)

627.cam4_s (continued):

-fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-lamdlibm -ljemalloc -lflang

628.pop2_s: Same as 627.cam4_s

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

Peak Other Flags

C benchmarks:

-Wno-return-type -DUSE_OPENMP

Fortran benchmarks:

-DUSE_OPENMP -Wno-return-type

Benchmarks using both Fortran and C:

-DUSE_OPENMP -Wno-return-type

Benchmarks using Fortran, C, and C++:

-Wno-return-type -DUSE_OPENMP

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/aocc200-flags-B1.html>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revH.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/aocc200-flags-B1.xml>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revH.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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