



SPEC® CPU2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL385 Gen10

(2.00 GHz, AMD EPYC 7451)

SPECspeed2017_fp_base = 111

SPECspeed2017_fp_peak = 115

CPU2017 License: 3

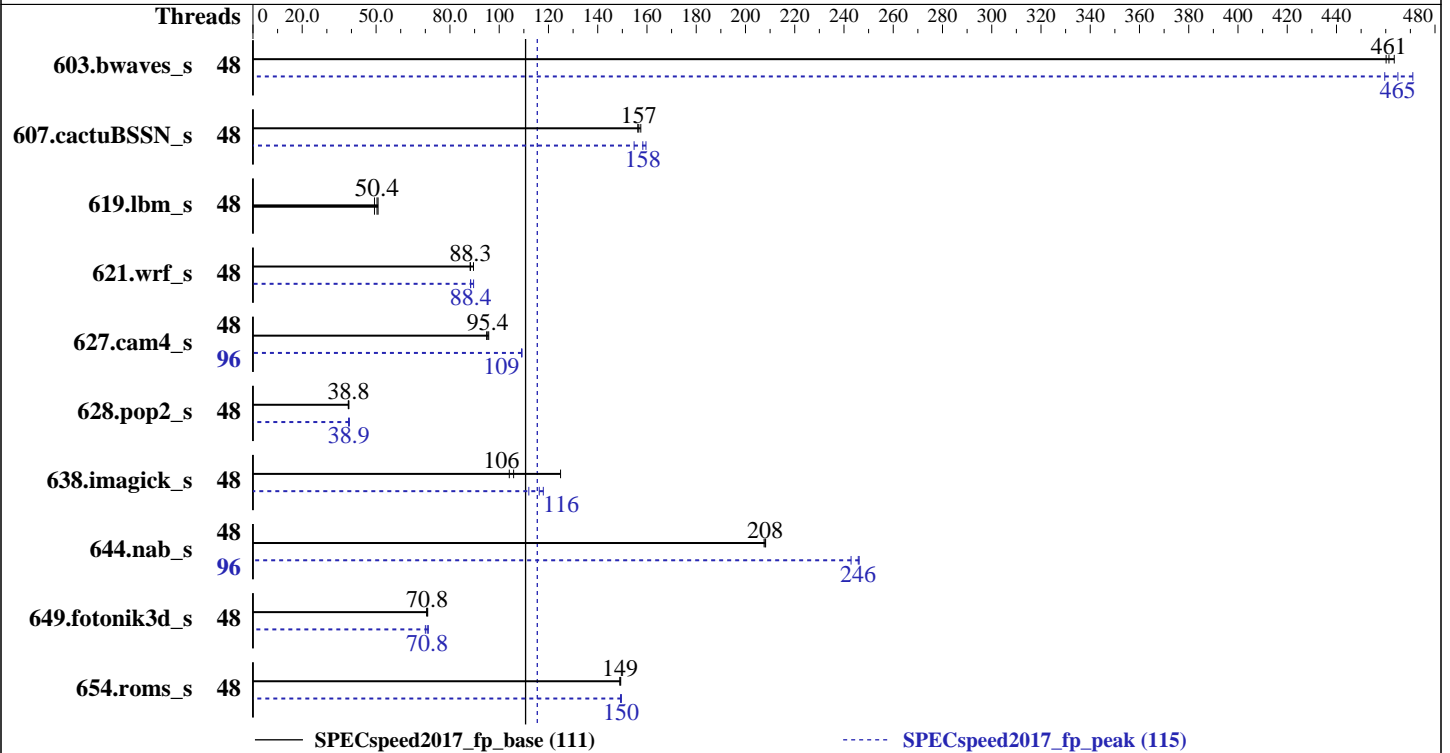
Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2019

Hardware Availability: Oct-2018

Software Availability: Nov-2018



Hardware

CPU Name: AMD EPYC 7451
 Max MHz.: 3200
 Nominal: 2300
 Enabled: 48 cores, 2 chips, 2 threads/core
 Orderable: 1, 2 chip(s)
 Cache L1: 64 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 64 MB I+D on chip per chip, 8 MB shared / 3 cores
 Other: None
 Memory: 256 GB (16 x 16 GB 1Rx4 PC4-2667V-R)
 Storage: 2 x 600 GB 10 K SAS HDD, RAID 1
 Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP3
 Kernel 4.4.162-94.72-default
 Compiler: C/C++: Version 1.2.1 of AOCC
 Fortran: Version 4.8.2 of GCC
 Parallel: Yes
 Firmware: HPE BIOS Version A40 10/02/2018 released Oct-2018
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: jemalloc memory allocator library V4.5.0



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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 | 48 | 128 | 460 | <u>128</u> | <u>461</u> | 127 | 463 | 48 | 128 | 460 | <u>127</u> | <u>465</u> | 125 | 471 |
| 607.cactuBSSN_s | 48 | 107 | 156 | <u>106</u> | <u>157</u> | 106 | 157 | 48 | <u>105</u> | <u>158</u> | 108 | 155 | 104 | 160 |
| 619.lbm_s | 48 | 103 | 50.8 | <u>104</u> | <u>50.4</u> | 106 | 49.3 | 48 | 103 | 50.8 | <u>104</u> | <u>50.4</u> | 106 | 49.3 |
| 621.wrf_s | 48 | 148 | 89.6 | 150 | 88.2 | <u>150</u> | <u>88.3</u> | 48 | <u>150</u> | <u>88.4</u> | 150 | 88.3 | 148 | 89.6 |
| 627.cam4_s | 48 | <u>92.9</u> | <u>95.4</u> | 92.6 | 95.7 | 93.4 | 94.9 | 96 | 81.2 | 109 | 81.1 | 109 | <u>81.2</u> | <u>109</u> |
| 628.pop2_s | 48 | <u>306</u> | <u>38.8</u> | 307 | 38.7 | 305 | 39.0 | 48 | 303 | 39.1 | 305 | 38.9 | <u>305</u> | <u>38.9</u> |
| 638.imagick_s | 48 | 115 | 125 | <u>136</u> | <u>106</u> | 139 | 104 | 48 | 129 | 112 | 122 | 118 | <u>124</u> | <u>116</u> |
| 644.nab_s | 48 | 83.9 | 208 | <u>84.0</u> | <u>208</u> | 84.2 | 208 | 96 | <u>71.1</u> | <u>246</u> | 71.0 | 246 | 71.9 | 243 |
| 649.fotonik3d_s | 48 | <u>129</u> | <u>70.8</u> | 129 | 70.5 | 128 | 71.0 | 48 | 130 | 70.0 | 128 | 71.2 | <u>129</u> | <u>70.8</u> |
| 654.roms_s | 48 | 105 | 149 | <u>106</u> | <u>149</u> | 106 | 149 | 48 | <u>105</u> | <u>150</u> | 105 | 150 | 105 | 149 |

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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/>

The AOCC Gold Linker plugin was installed and used for the link stage.

The AOCC Fortran Plugin version 1.2 was used to leverage AOCC optimizers with gfortran. It is available here:
<http://developer.amd.com/amd-aocc/>

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

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <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 were enabled for this run (OS default)



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General Notes

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

GOMP_CPU_AFFINITY = "0-95"

LD_LIBRARY_PATH = "/home/cpu2017/amd1806-speed-libs-revA/64:/home/cpu2017/amd1806-speed-libs-revA/32:"

OMP_PROC_BIND = "true"

OMP_STACKSIZE = "192M"

OMP_WAIT_POLICY = "active"

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4 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 v7.2 under default conditions.

jemalloc: sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

jemalloc uses environment variable MALLOC_CONF with values narenas and lg_chunk:

narenas: sets the maximum number of arenas to use for automatic multiplexing of threads and arenas.

lg_chunk: set the virtual memory chunk size (log base 2). For example,

lg_chunk:21 sets the default chunk size to 2^21 = 2MiB.

Platform Notes

BIOS Configuration:

Thermal Configuration set to Maximum Cooling

Performance Determinism set to Power Deterministic

Memory Patrol Scrubbing set to Disabled

Workload Profile set to General Throughput Compute

Processor Power and Utilization Monitoring set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on linux-ubi7 Fri Jan 18 14:00:05 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 7451 24-Core Processor

(Continued on next page)



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Platform Notes (Continued)

2 "physical id"s (chips)
96 "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 : 24
siblings  : 48
physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30
physical 1: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                96
On-line CPU(s) list:   0-95
Thread(s) per core:    2
Core(s) per socket:    24
Socket(s):              2
NUMA node(s):          8
Vendor ID:              AuthenticAMD
CPU family:             23
Model:                 1
Model name:             AMD EPYC 7451 24-Core Processor
Stepping:              2
CPU MHz:                2300.000
CPU max MHz:           2300.0000
CPU min MHz:           1200.0000
BogoMIPS:              4591.28
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             64K
L2 cache:              512K
L3 cache:              8192K
NUMA node0 CPU(s):     0-5,48-53
NUMA node1 CPU(s):     6-11,54-59
NUMA node2 CPU(s):     12-17,60-65
NUMA node3 CPU(s):     18-23,66-71
NUMA node4 CPU(s):     24-29,72-77
NUMA node5 CPU(s):     30-35,78-83
NUMA node6 CPU(s):     36-41,84-89
NUMA node7 CPU(s):     42-47,90-95
```

```
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 extd_apicid amd_dcm aperfmperf eagerfpu 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 skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx arat cpb
```

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Platform Notes (Continued)

hw_pstate ssbd ibpb npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid
decodeassists pausefilter pfthreshold vmmcall avic fsgsbase bml avx2 smep bmi2
rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero irperf amd_ibpb
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 4 5 48 49 50 51 52 53
node 0 size: 31998 MB
node 0 free: 31760 MB
node 1 cpus: 6 7 8 9 10 11 54 55 56 57 58 59
node 1 size: 32253 MB
node 1 free: 32051 MB
node 2 cpus: 12 13 14 15 16 17 60 61 62 63 64 65
node 2 size: 32253 MB
node 2 free: 32071 MB
node 3 cpus: 18 19 20 21 22 23 66 67 68 69 70 71
node 3 size: 32253 MB
node 3 free: 32097 MB
node 4 cpus: 24 25 26 27 28 29 72 73 74 75 76 77
node 4 size: 32253 MB
node 4 free: 32140 MB
node 5 cpus: 30 31 32 33 34 35 78 79 80 81 82 83
node 5 size: 32253 MB
node 5 free: 32154 MB
node 6 cpus: 36 37 38 39 40 41 84 85 86 87 88 89
node 6 size: 32253 MB
node 6 free: 32150 MB
node 7 cpus: 42 43 44 45 46 47 90 91 92 93 94 95
node 7 size: 32120 MB
node 7 free: 32022 MB
node distances:
node  0  1  2  3  4  5  6  7
 0:  10 16 16 16 32 32 32 32
 1:  16 10 16 16 32 32 32 32
 2:  16 16 10 16 32 32 32 32
 3:  16 16 16 10 32 32 32 32
 4:  32 32 32 32 10 16 16 16
 5:  32 32 32 32 16 10 16 16
 6:  32 32 32 32 16 16 10 16
 7:  32 32 32 32 16 16 16 10
```

From /proc/meminfo

(Continued on next page)



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Platform Notes (Continued)

MemTotal: 263823864 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

```
/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP3
```

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

```
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 3
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
```

```
os-release:
NAME="SLES"
VERSION="12-SP3"
VERSION_ID="12.3"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp3"
```

```
uname -a:
Linux linux-ubi7 4.4.162-94.72-default #1 SMP Mon Nov 12 18:57:45 UTC 2018 (9de753f)
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB, RSB filling

```
run-level 3 Jan 18 13:56
```

```
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 518G 5.2G 512G 1% /home
```

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.

```
BIOS HPE A40 10/02/2018
Memory:
16x HPE 840757-191 16 GB 1 rank 2666
16x UNKNOWN NOT AVAILABLE
```

(Continued on next page)



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Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

=====
CC 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin

=====
FC 607.cactuBSSN_s(base, peak)

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin
AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin
GNU Fortran (GCC) 4.8.2
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You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
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=====
FC 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base,
peak)

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Compiler Version Notes (Continued)

GNU Fortran (GCC) 4.8.2
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=====

CC 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)

GNU Fortran (GCC) 4.8.2
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AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
 b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
 18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
 AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: x86_64-unknown-linux-gnu
 Thread model: posix
 InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin

Base Compiler Invocation

C benchmarks:

clang

Fortran benchmarks:

clang gfortran

Benchmarks using both Fortran and C:

clang gfortran

Benchmarks using Fortran, C, and C++:

clang++ clang gfortran

Base Portability Flags

603.bwaves_s: -DSPEC_LP64

(Continued on next page)



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Base Portability Flags (Continued)

```

607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -fconvert=big-endian -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 -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-ffast-math -march=znver1 -fstruct-layout=3
-mllvm -unroll-threshold=50 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -function-specialize -z muldefs
-lamplibm -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ljemalloc

```

Fortran benchmarks:

```

-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-funroll-loops -ffast-math -z muldefs -lamplibm -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc -lgfortran

```

Benchmarks using both Fortran and C:

```

-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-ffast-math -march=znver1 -fstruct-layout=3
-mllvm -unroll-threshold=50 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -function-specialize -funroll-loops
-z muldefs -lamplibm -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc -lgfortran

```

Benchmarks using Fortran, C, and C++:

```

-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto -fuse-ld=lld
-Wl,-mllvm -Wl,-function-specialize -O3 -ffast-math -march=znver1
-fstruct-layout=3 -mllvm -unroll-threshold=50 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -function-specialize
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-funroll-loops -z muldefs -lamplibm -fplugin=dragonegg.so

```

(Continued on next page)



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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP  
-fopenmp -fopenmp=libomp -lomp -ljemalloc
```

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:

```
clang gfortran
```

Benchmarks using both Fortran and C:

```
clang gfortran
```

Benchmarks using Fortran, C, and C++:

```
clang++ clang gfortran
```

Peak Portability Flags

Same as Base Portability Flags



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

Test Date: Jan-2019
Hardware Availability: Oct-2018
Software Availability: Nov-2018

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

```
638.imagick_s: -flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize
-Ofast -march=znver1 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-flv-function-specialization
-mllvm -enable-vectorize-compares -z muldefs -lamdlibm
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ljemalloc
```

644.nab_s: Same as 638.imagick_s

Fortran benchmarks:

```
-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-funroll-loops -ffast-math -z muldefs -lamdlibm -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc -lgfortran
```

Benchmarks using both Fortran and C:

```
-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -Ofast
-march=znver1 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-flv-function-specialization -mllvm -enable-vectorize-compares -O3
-funroll-loops -ffast-math -z muldefs -lamdlibm -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc -lgfortran
```

Benchmarks using Fortran, C, and C++:

```
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto -fuse-ld=lld
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver1 -mno-sse4a
-fstruct-layout=5 -mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-flv-function-specialization -mllvm -enable-vectorize-compares
-mllvm -unroll-threshold=100 -O3 -funroll-loops -ffast-math
-z muldefs -lamdlibm -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc
```



SPEC CPU2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL385 Gen10

(2.00 GHz, AMD EPYC 7451)

SPECspeed2017_fp_base = 111

SPECspeed2017_fp_peak = 115

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2019

Hardware Availability: Oct-2018

Software Availability: Nov-2018

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/aocc100-flags-revC-I.2018-11-13.html>

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html>

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

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

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-11-13.xml>

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml>

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

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