



# SPEC® CPU2017 Floating Point Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL385 Gen10

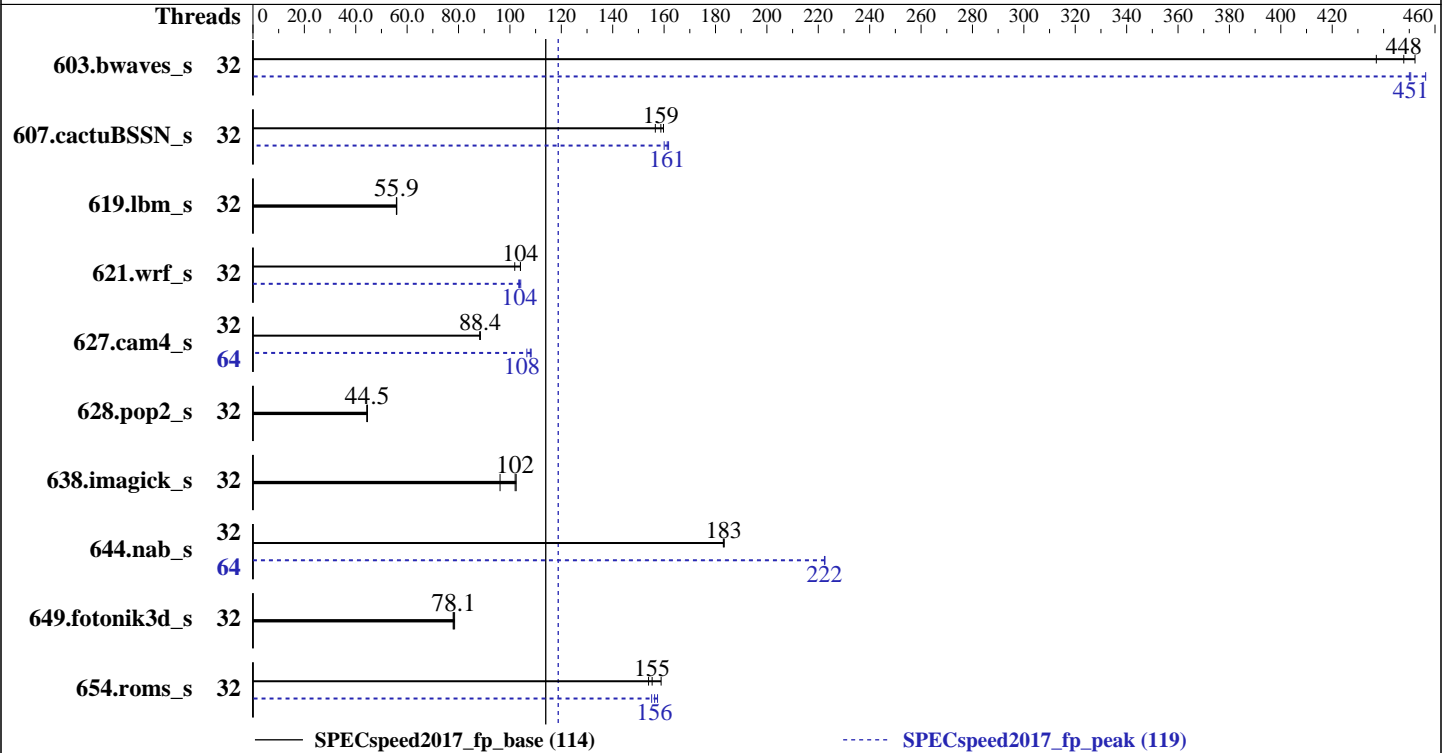
(3.10 GHz, AMD EPYC 7371)

SPECspeed2017\_fp\_base = 114

SPECspeed2017\_fp\_peak = 119

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

Test Date: Feb-2019  
Hardware Availability: Feb-2019  
Software Availability: Jul-2018



### Hardware

CPU Name: AMD EPYC 7371  
 Max MHz.: 3800  
 Nominal: 3100  
 Enabled: 32 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 / 2 cores  
 Other: None  
 Memory: 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L)  
 Storage: 1 x 400 GB SAS SSD RAID 0  
 Other: None

### Software

OS: SUSE linux Enterprise Server 12 (x86\_64) SP3  
 Kernel 4.4.132-94.33-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: btrfs  
 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	32	130	452	135	437	<b><u>132</u></b>	<b><u>448</u></b>	32	129	456	<b><u>131</u></b>	<b><u>451</u></b>	131	450
607.cactuBSSN_s	32	<b><u>105</u></b>	<b><u>159</u></b>	106	157	104	160	32	104	160	<b><u>103</u></b>	<b><u>161</u></b>	103	162
619.lbm_s	32	<b><u>93.8</u></b>	<b><u>55.9</u></b>	93.8	55.8	93.6	56.0	32	<b><u>93.8</u></b>	<b><u>55.9</u></b>	93.8	55.8	93.6	56.0
621.wrf_s	32	127	104	<b><u>127</u></b>	<b><u>104</u></b>	130	102	32	127	104	<b><u>128</u></b>	<b><u>104</u></b>	128	103
627.cam4_s	32	100	88.3	<b><u>100</u></b>	<b><u>88.4</u></b>	100	88.5	64	81.9	108	<b><u>82.1</u></b>	<b><u>108</u></b>	83.2	107
628.pop2_s	32	<b><u>267</u></b>	<b><u>44.5</u></b>	267	44.5	268	44.3	32	<b><u>267</u></b>	<b><u>44.5</u></b>	267	44.5	268	44.3
638.imagick_s	32	141	102	150	96.2	<b><u>141</u></b>	<b><u>102</u></b>	32	141	102	150	96.2	<b><u>141</u></b>	<b><u>102</u></b>
644.nab_s	32	95.5	183	<b><u>95.3</u></b>	<b><u>183</u></b>	95.3	183	64	78.5	223	<b><u>78.5</u></b>	<b><u>222</u></b>	78.6	222
649.fotonik3d_s	32	<b><u>117</u></b>	<b><u>78.1</u></b>	116	78.5	117	77.9	32	<b><u>117</u></b>	<b><u>78.1</u></b>	116	78.5	117	77.9
654.roms_s	32	99.1	159	102	154	<b><u>101</u></b>	<b><u>155</u></b>	32	100	157	<b><u>101</u></b>	<b><u>156</u></b>	101	155

SPECspeed2017\_fp\_base = **114**

SPECspeed2017\_fp\_peak = **119**

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>

BIOS Configuration

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

Thermal Configuration set to Maximum Cooling

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 = "0-63"

LD\_LIBRARY\_PATH = "/cpu2017/amd1806-speed-libs-revA/64:/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 /cpu2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on linux-lgdj Mon Jan 1 02:04:40 2001

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 7371 16-Core Processor

(Continued on next page)



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## Platform Notes (Continued)

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 : 16

siblings : 32

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
CPU(s):                 64
On-line CPU(s) list:   0-63
Thread(s) per core:     2
Core(s) per socket:    16
Socket(s):              2
NUMA node(s):          8
Vendor ID:              AuthenticAMD
CPU family:             23
Model:                  1
Model name:             AMD EPYC 7371 16-Core Processor
Stepping:               2
CPU MHz:                3100.000
CPU max MHz:            3100.0000
CPU min MHz:            2500.0000
BogoMIPS:               6188.26
Virtualization:        AMD-V
L1d cache:              32K
L1i cache:              64K
L2 cache:               512K
L3 cache:               8192K
NUMA node0 CPU(s):     0-3,32-35
NUMA node1 CPU(s):     4-7,36-39
NUMA node2 CPU(s):     8-11,40-43
NUMA node3 CPU(s):     12-15,44-47
NUMA node4 CPU(s):     16-19,48-51
NUMA node5 CPU(s):     20-23,52-55
NUMA node6 CPU(s):     24-27,56-59
NUMA node7 CPU(s):     28-31,60-63

```

```

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 retpoline retpoline\_amd npt lbrv svm\_lock nrip\_save tsc\_scale  
vmcb\_clean flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase  
bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha\_ni xsaveopt xsavec xgetbv1 clzero  
irperf 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 32 33 34 35
node 0 size: 128840 MB
node 0 free: 128633 MB
node 1 cpus: 4 5 6 7 36 37 38 39
node 1 size: 129022 MB
node 1 free: 128820 MB
node 2 cpus: 8 9 10 11 40 41 42 43
node 2 size: 129022 MB
node 2 free: 128882 MB
node 3 cpus: 12 13 14 15 44 45 46 47
node 3 size: 129022 MB
node 3 free: 128832 MB
node 4 cpus: 16 17 18 19 48 49 50 51
node 4 size: 129022 MB
node 4 free: 128927 MB
node 5 cpus: 20 21 22 23 52 53 54 55
node 5 size: 129022 MB
node 5 free: 128920 MB
node 6 cpus: 24 25 26 27 56 57 58 59
node 6 size: 129022 MB
node 6 free: 128927 MB
node 7 cpus: 28 29 30 31 60 61 62 63
node 7 size: 116925 MB
node 7 free: 116831 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: 1044375828 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-1gdj 4.4.132-94.33-default #1 SMP Tue May 29 20:09:56 UTC 2018 (76aae3b)
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
```

```
run-level 3 Dec 31 18:01
```

```
SPEC is set to: /cpu2017
```

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 btrfs 371G 13G 357G 4% /
```

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 UNKNOWN NOT AVAILABLE
16x UNKNOWN NOT AVAILABLE 64 GB 4 rank 2666
```

(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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GNU Fortran comes with NO WARRANTY, to the extent permitted by law.  
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,  
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## Compiler Version Notes (Continued)

GNU Fortran (GCC) 4.8.2  
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 under the terms of the GNU General Public License.  
 For more information about these matters, see the file named COPYING

-----

=====

CC 621.wrf\_s(base, peak) 627.cam4\_s(base, peak) 628.pop2\_s(base, peak)

-----

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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

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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
-lamdlibm -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 -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 -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 -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 -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 -lamdlibm -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



# SPEC CPU2017 Floating Point Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL385 Gen10

(3.10 GHz, AMD EPYC 7371)

SPECspeed2017\_fp\_base = 114

SPECspeed2017\_fp\_peak = 119

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Feb-2019

Hardware Availability: Feb-2019

Software Availability: Jul-2018

## Peak Optimization Flags

C benchmarks:

619.lbm\_s: basepeak = yes

638.imagick\_s: basepeak = yes

```
644.nab_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
```

Fortran benchmarks:

```
603.bwaves_s: -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
```

649.fotonik3d\_s: basepeak = yes

654.roms\_s: Same as 603.bwaves\_s

Benchmarks using both Fortran and C:

```
621.wrf_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 -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
```

627.cam4\_s: Same as 621.wrf\_s

628.pop2\_s: basepeak = yes

(Continued on next page)



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CPU2017 License: 3

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Tested by: HPE

Test Date: Feb-2019

Hardware Availability: Feb-2019

Software Availability: Jul-2018

## Peak Optimization Flags (Continued)

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
```

## 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.2017-11-20.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.2017-11-20.xml>

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

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