



# SPEC CPU®2017 Floating Point Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL385 Gen10

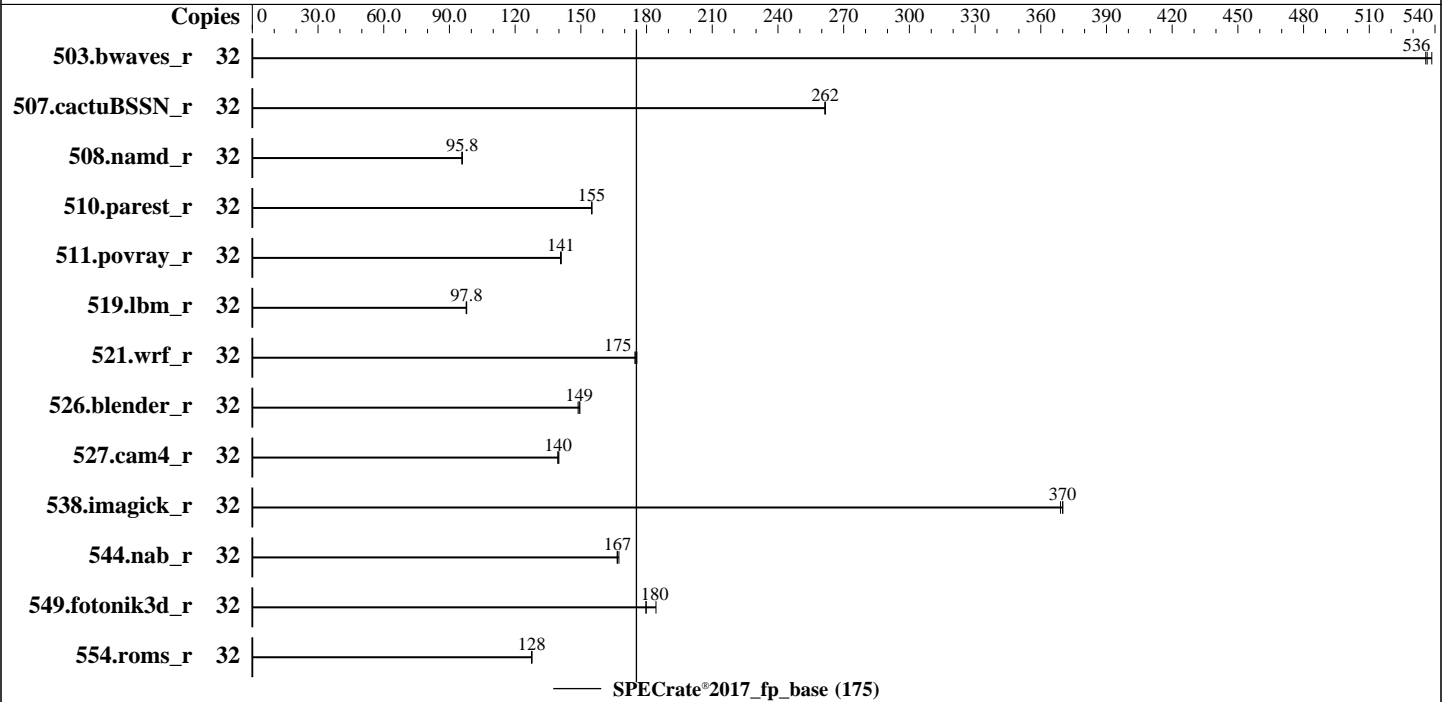
(3.20 GHz, AMD EPYC 7262)

SPECrate®2017\_fp\_base = 175

SPECrate®2017\_fp\_peak = Not Run

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

**Test Date:** Aug-2019  
**Hardware Availability:** Aug-2019  
**Software Availability:** Aug-2019



### Hardware

CPU Name: AMD EPYC 7262  
 Max MHz: 3400  
 Nominal: 3200  
 Enabled: 16 cores, 2 chips, 2 threads/core  
 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,  
 16 MB per core  
 Other: None  
 Memory: 512 GB (16 x 32 GB 2Rx4 PC4-2933Y-R)  
 Storage: 1 x 400 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: No  
 Firmware: HPE BIOS Version A40 07/20/2019 released Aug-2019  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: jemalloc: jemalloc memory allocator library V5.2.0;  
 Power Management: --



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	32	<b>598</b>	<b>536</b>	596	539	599	536							
507.cactuBSSN_r	32	155	261	155	262	<b>155</b>	<b>262</b>							
508.namd_r	32	<b>317</b>	<b>95.8</b>	317	95.9	318	95.7							
510.parest_r	32	<b>540</b>	<b>155</b>	540	155	540	155							
511.povray_r	32	531	141	<b>530</b>	<b>141</b>	530	141							
519.lbm_r	32	<b>345</b>	<b>97.8</b>	345	97.6	345	97.9							
521.wrf_r	32	408	176	<b>409</b>	<b>175</b>	410	175							
526.blender_r	32	<b>326</b>	<b>149</b>	328	149	326	150							
527.cam4_r	32	400	140	<b>401</b>	<b>140</b>	401	139							
538.imagick_r	32	216	369	215	370	<b>215</b>	<b>370</b>							
544.nab_r	32	<b>323</b>	<b>167</b>	322	167	323	167							
549.fotonik3d_r	32	677	184	<b>693</b>	<b>180</b>	694	180							
554.roms_r	32	398	128	<b>399</b>	<b>128</b>	399	128							

SPECrate®2017\_fp\_base = 175

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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.  
'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

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## Operating System Notes (Continued)

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)

## General Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/cpu2017\_A2/amd\_rate\_aocc200\_rome\_A\_lib/64;  
/home/cpu2017\_A2/amd\_rate\_aocc200\_rome\_A\_lib/32:"  
MALLOC\_CONF = "retain:true"

Binaries were compiled on a system with 2p 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 9.1.0 in Ubuntu 19.04  
with flags: -Ofast -march=znver2. 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  
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 Throughput Compute  
NUMA memory domains per socket set to Four memory domains per socket  
Sysinfo program /home/cpu2017\_A2/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
running on dl385gen10-rome-32c Wed Aug 14 09:44:58 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 7262 8-Core Processor  
2 "physical id"s (chips)

(Continued on next page)



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## Platform Notes (Continued)

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 : 8
siblings  : 16
physical 0: cores 0 4 8 12 16 20 24 28
physical 1: cores 0 4 8 12 16 20 24 28
```

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:   2
Core(s) per socket:   8
Socket(s):             2
NUMA node(s):         8
Vendor ID:             AuthenticAMD
CPU family:            23
Model:                 49
Model name:            AMD EPYC 7262 8-Core Processor
Stepping:              0
CPU MHz:               3200.000
CPU max MHz:           3200.0000
CPU min MHz:           1500.0000
BogoMIPS:              6388.11
Virtualization:       AMD-V
L1d cache:             32K
L1i cache:             32K
L2 cache:              512K
L3 cache:              16384K
NUMA node0 CPU(s):    0,1,16,17
NUMA node1 CPU(s):    2,3,18,19
NUMA node2 CPU(s):    4,5,20,21
NUMA node3 CPU(s):    6,7,22,23
NUMA node4 CPU(s):    8,9,24,25
NUMA node5 CPU(s):    10,11,26,27
NUMA node6 CPU(s):    12,13,28,29
NUMA node7 CPU(s):    14,15,30,31
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
```

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## Platform Notes (Continued)

```
cat_l3 cdp_l3 hw_pstate ssbd ibrs ibpb stibp vmcall 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_ym save_ymload 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 16 17
node 0 size: 64219 MB
node 0 free: 64098 MB
node 1 cpus: 2 3 18 19
node 1 size: 64510 MB
node 1 free: 64415 MB
node 2 cpus: 4 5 20 21
node 2 size: 64510 MB
node 2 free: 64408 MB
node 3 cpus: 6 7 22 23
node 3 size: 64498 MB
node 3 free: 64405 MB
node 4 cpus: 8 9 24 25
node 4 size: 64481 MB
node 4 free: 64374 MB
node 5 cpus: 10 11 26 27
node 5 size: 64510 MB
node 5 free: 64391 MB
node 6 cpus: 12 13 28 29
node 6 size: 64510 MB
node 6 free: 64400 MB
node 7 cpus: 14 15 30 31
node 7 size: 64302 MB
node 7 free: 64205 MB
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
```

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## Platform Notes (Continued)

From /proc/meminfo

MemTotal: 527916928 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 dl385gen10-rome-32c 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-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: conditional,  
IBRS\_FW, STIBP: conditional, RSB filling

run-level 3 Aug 12 12:02

SPEC is set to: /home/cpu2017\_A2

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda2	btrfs	371G	52G	318G	15%	/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 07/20/2019

Memory:

16x UNKNOWN NOT AVAILABLE

16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)



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## Compiler Version Notes

=====  
C | 519.lbm\_r(base) 538.imagick\_r(base) 544.nab\_r(base)  
-----

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
AOCC\_2\_0\_0-Build#179) (based on LLVM AOCC.LLVM.2.0.0.B179.2019\_06\_12)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin  
-----

=====  
C++ | 508.namd\_r(base) 510.parest\_r(base)  
-----

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
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Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin  
-----

=====  
C++, C | 511.povray\_r(base) 526.blender\_r(base)  
-----

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
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AOCC\_2\_0\_0-Build#179) (based on LLVM AOCC.LLVM.2.0.0.B179.2019\_06\_12)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin  
-----

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
-----

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
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## Compiler Version Notes (Continued)

InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin  
AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
AOCC\_2\_0\_0-Build#179) (based on LLVM AOCC.LLVM.2.0.0.B179.2019\_06\_12)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin

=====  
Fortran | 503.bwaves\_r(base) 549.fotonik3d\_r(base) 554.roms\_r(base)  
=====

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
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Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin

=====  
Fortran, C | 521.wrf\_r(base) 527.cam4\_r(base)  
=====

AOCC.LLVM.2.0.0.B179.2019\_06\_12 clang version 8.0.0 (CLANG: Jenkins  
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Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-2.0.0/bin

## Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
flang

Benchmarks using both Fortran and C:  
flang clang

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## Base Compiler Invocation (Continued)

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## Base Portability Flags

```

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -D__BOOL_DEFINED -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

```

## Base Optimization Flags

C benchmarks:

```

-flt0 -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 -lmvec -lamdlibm -ljemalloc
-lflang

```

C++ benchmarks:

```

-std=c++98 -flt0 -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

```

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

```
-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -z muldefs -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 -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
-freemap-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 -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both 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 -freemap-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 -z muldefs
-lmvec -lamdlibm -ljemalloc -lflang
```

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 -freemap-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
```

(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL385 Gen10

(3.20 GHz, AMD EPYC 7262)

SPECrate®2017\_fp\_base = 175

SPECrate®2017\_fp\_peak = Not Run

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Aug-2019

**Hardware Availability:** Aug-2019

**Software Availability:** Aug-2019

## Base Optimization Flags (Continued)

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

```
-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  
-lmvec -lamdlibm -ljemalloc -lflang
```

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

<http://www.spec.org/cpu2017/flags/aocc200-flags-C1-HPE.html>

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

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

<http://www.spec.org/cpu2017/flags/aocc200-flags-C1-HPE.xml>

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

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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