



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate2017\_fp\_base = 256

PowerEdge R7425 (AMD EPYC 7451, 2.30GHz)

SPECrate2017\_fp\_peak = 268

CPU2017 License: 55

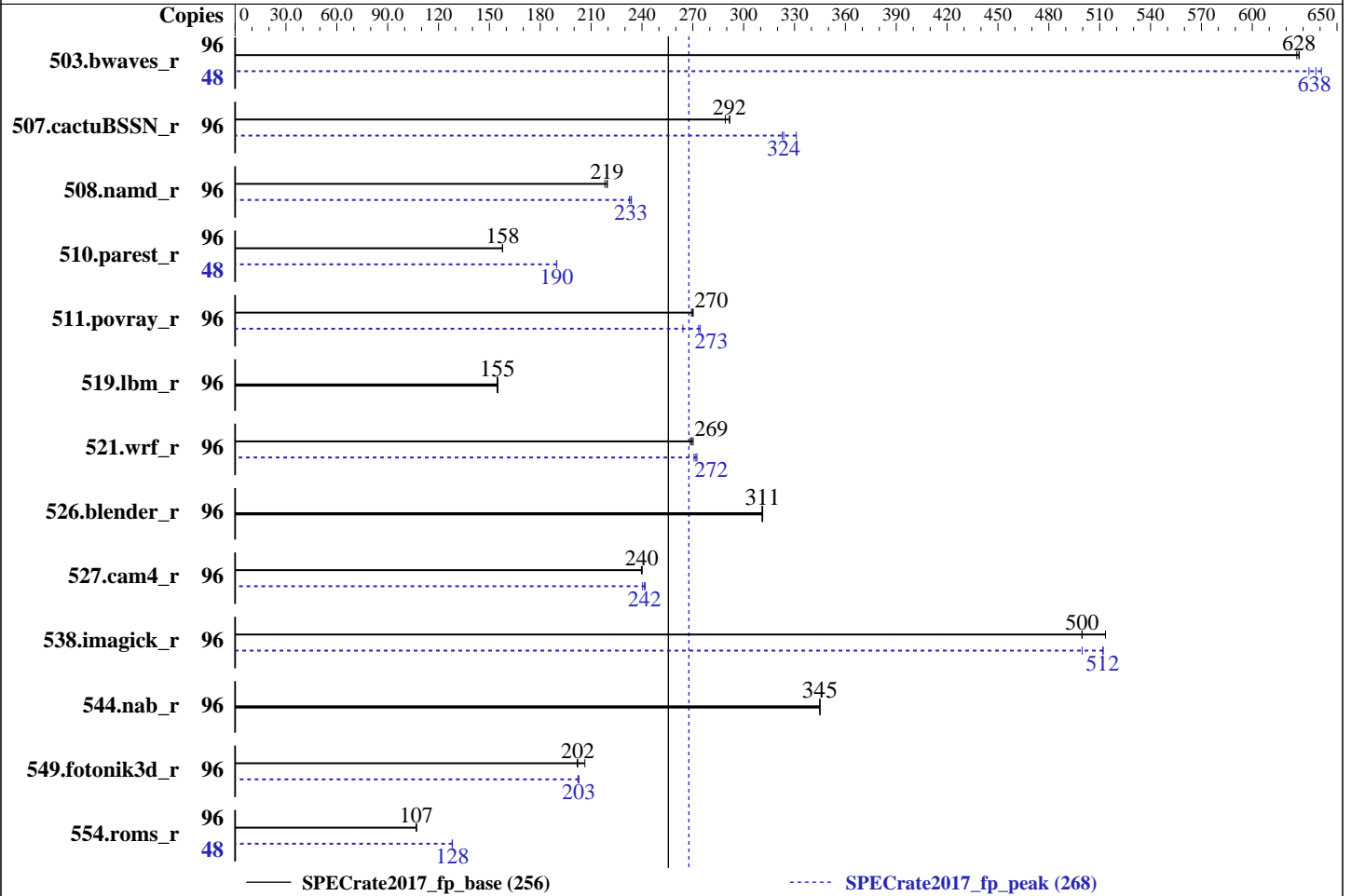
Test Date: Mar-2019

Test Sponsor: Dell Inc.

Hardware Availability: Jan-2019

Tested by: Dell Inc.

Software Availability: Feb-2019



### Hardware

CPU Name: AMD EPYC 7451  
 Max MHz.: 3200  
 Nominal: 2300  
 Enabled: 48 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 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: 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L)  
 Storage: 1 x 120 GB SATA SSD  
 Other: None

### Software

OS: Ubuntu 18.04.2 LTS  
 kernel 4.15.0-45-generic  
 Compiler: C/C++: Version 1.3.0 of AOCC  
 Fortran: Version 4.8.2 of GCC  
 Parallel: No  
 Firmware: Version 1.7.6 released Jan-2019  
 File System: ext4  
 System State: Run level 5 (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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	96	1534	628	<b><u>1534</u></b>	<b><u>628</u></b>	1537	626	48	760	633	<b><u>755</u></b>	<b><u>638</u></b>	751	641
507.cactuBSSN_r	96	420	289	416	292	<b><u>417</u></b>	<b><u>292</u></b>	96	367	331	<b><u>376</u></b>	<b><u>324</u></b>	377	323
508.namd_r	96	415	220	418	218	<b><u>416</u></b>	<b><u>219</u></b>	96	390	234	392	233	<b><u>391</u></b>	<b><u>233</u></b>
510.parest_r	96	1592	158	<b><u>1592</u></b>	<b><u>158</u></b>	1591	158	48	662	190	<b><u>662</u></b>	<b><u>190</u></b>	662	190
511.povray_r	96	<b><u>830</u></b>	<b><u>270</u></b>	830	270	833	269	96	<b><u>820</u></b>	<b><u>273</u></b>	849	264	817	274
519.lbm_r	96	655	155	<b><u>654</u></b>	<b><u>155</u></b>	653	155	96	655	155	<b><u>654</u></b>	<b><u>155</u></b>	653	155
521.wrf_r	96	796	270	<b><u>798</u></b>	<b><u>269</u></b>	801	269	96	<b><u>791</u></b>	<b><u>272</u></b>	789	272	794	271
526.blender_r	96	470	311	<b><u>470</u></b>	<b><u>311</u></b>	470	311	96	470	311	<b><u>470</u></b>	<b><u>311</u></b>	470	311
527.cam4_r	96	701	240	<b><u>700</u></b>	<b><u>240</u></b>	699	240	96	694	242	<b><u>695</u></b>	<b><u>242</u></b>	699	240
538.imagick_r	96	<b><u>478</u></b>	<b><u>500</u></b>	478	500	465	513	96	478	500	<b><u>466</u></b>	<b><u>512</u></b>	466	512
544.nab_r	96	468	345	468	345	<b><u>468</u></b>	<b><u>345</u></b>	96	468	345	468	345	<b><u>468</u></b>	<b><u>345</u></b>
549.fotonik3d_r	96	1813	206	1854	202	<b><u>1851</u></b>	<b><u>202</u></b>	96	1850	202	<b><u>1846</u></b>	<b><u>203</u></b>	1845	203
554.roms_r	96	<b><u>1426</u></b>	<b><u>107</u></b>	1428	107	1426	107	48	<b><u>595</u></b>	<b><u>128</u></b>	595	128	596	128

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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 1.3.0 was used to leverage AOCC optimizers with gfortran. It is available here: <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

runspec command invoked through numactl i.e.:  
numactl --interleave=all runspec <etc>

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## Operating System Notes (Continued)

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)

## General Notes

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

LD\_LIBRARY\_PATH = "/home/cpu2017-1.0.5/amd1812na\_rate\_revA\_lib/64:/home/cpu2017-1.0.5/amd1812na\_rate\_revA\_lib/32:"

Binaries were compiled on a system with 2 x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.6

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 v4.8.5 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 settings:

Determinism Slider set to Power Determinism

Sysinfo program /home/cpu2017-1.0.5/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on r7425 Wed Mar 20 21:46:47 2019

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## Platform Notes (Continued)

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

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 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

physical 1: cores 0 1 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: 2780.722

BogoMIPS: 4591.29

Virtualization: AMD-V

L1d cache: 32K

L1i cache: 64K

L2 cache: 512K

L3 cache: 8192K

NUMA node0 CPU(s): 0,8,16,24,32,40,48,56,64,72,80,88

NUMA node1 CPU(s): 2,10,18,26,34,42,50,58,66,74,82,90

NUMA node2 CPU(s): 4,12,20,28,36,44,52,60,68,76,84,92

NUMA node3 CPU(s): 6,14,22,30,38,46,54,62,70,78,86,94

NUMA node4 CPU(s): 1,9,17,25,33,41,49,57,65,73,81,89

NUMA node5 CPU(s): 3,11,19,27,35,43,51,59,67,75,83,91

NUMA node6 CPU(s): 5,13,21,29,37,45,53,61,69,77,85,93

NUMA node7 CPU(s): 7,15,23,31,39,47,55,63,71,79,87,95

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov

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## Platform Notes (Continued)

```

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 amd_dcm 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 skinit wdt tce topoext perfctr_core perfctr_nb bpxext perfctr_llc mwaitx cpb
hw_pstate sme ssbd ibpb vmcall fsgsbase bmi1 avx2 smep bmi2 rdseed adx smap
clflushopt sha_ni xsaveopt xsavec xgetbv1 xsaves clzero irperf xsaveerptr arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_vmsave_vmload vgif 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 8 16 24 32 40 48 56 64 72 80 88
node 0 size: 128638 MB
node 0 free: 128423 MB
node 1 cpus: 2 10 18 26 34 42 50 58 66 74 82 90
node 1 size: 129020 MB
node 1 free: 128801 MB
node 2 cpus: 4 12 20 28 36 44 52 60 68 76 84 92
node 2 size: 129020 MB
node 2 free: 128793 MB
node 3 cpus: 6 14 22 30 38 46 54 62 70 78 86 94
node 3 size: 129020 MB
node 3 free: 128789 MB
node 4 cpus: 1 9 17 25 33 41 49 57 65 73 81 89
node 4 size: 128999 MB
node 4 free: 128773 MB
node 5 cpus: 3 11 19 27 35 43 51 59 67 75 83 91
node 5 size: 129020 MB
node 5 free: 128829 MB
node 6 cpus: 5 13 21 29 37 45 53 61 69 77 85 93
node 6 size: 129020 MB
node 6 free: 128808 MB
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95
node 7 size: 124986 MB
node 7 free: 124755 MB
node distances:
node  0  1  2  3  4  5  6  7
 0:  10 16 16 16 28 28 22 28
 1:  16 10 16 16 28 28 28 22
 2:  16 16 10 16 22 28 28 28
 3:  16 16 16 10 28 22 28 28
 4:  28 28 22 28 10 16 16 16

```

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## Platform Notes (Continued)

5:	28	28	28	22	16	10	16	16
6:	22	28	28	28	16	16	10	16
7:	28	22	28	28	16	16	16	10

From /proc/meminfo

```
MemTotal:      1052392344 kB
HugePages_Total:      0
Hugepagesize:    2048 kB
```

```
/usr/bin/lsb_release -d
Ubuntu 18.04.2 LTS
```

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

```
debian_version: buster/sid
os-release:
  NAME="Ubuntu"
  VERSION="18.04.2 LTS (Bionic Beaver)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 18.04.2 LTS"
  VERSION_ID="18.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"
```

uname -a:

```
Linux r7425 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 UTC 2019 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 5 Mar 20 11:54

SPEC is set to: /home/cpu2017-1.0.5

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda2	ext4	109G	19G	85G	19%	/

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 Dell Inc. 1.7.6 01/14/2019

Memory:

16x 80CE863280CE M386A8K40BM2-CTD 64 GB 4 rank 2666

(Continued on next page)



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## Platform Notes (Continued)

16x Not Specified Not Specified

(End of data from sysinfo program)

## Compiler Version Notes

=====  
CC 519.lbm\_r(base, peak) 538.imagick\_r(base, peak) 544.nab\_r(base, peak)  
-----

AOCC.LLVM.1.3.0.B34.2018\_10\_22 clang version 7.0.0 (CLANG: Jenkins  
AOCC\_1\_3\_0\_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018\_10\_22)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/aoccl.3.0/AOCC-1.3.0-Compiler/bin  
-----

=====  
CXXC 508.namd\_r(base, peak) 510.parest\_r(base, peak)  
-----

AOCC.LLVM.1.3.0.B34.2018\_10\_22 clang version 7.0.0 (CLANG: Jenkins  
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Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/aoccl.3.0/AOCC-1.3.0-Compiler/bin  
-----

=====  
CC 511.povray\_r(base, peak) 526.blender\_r(base, peak)  
-----

AOCC.LLVM.1.3.0.B34.2018\_10\_22 clang version 7.0.0 (CLANG: Jenkins  
AOCC\_1\_3\_0\_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018\_10\_22)  
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InstalledDir: /root/work/compilers/aoccl.3.0/AOCC-1.3.0-Compiler/bin  
-----

=====  
FC 507.cactuBSSN\_r(base, peak)  
-----

AOCC.LLVM.1.3.0.B34.2018\_10\_22 clang version 7.0.0 (CLANG: Jenkins  
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 AOCC\_1\_3\_0\_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018\_10\_22)  
 Target: x86\_64-unknown-linux-gnu  
 Thread model: posix  
 InstalledDir: /root/work/compilers/aoccl.3.0/AOCC-1.3.0-Compiler/bin  
 GNU Fortran (GCC) 4.8.2  
 Copyright (C) 2013 Free Software Foundation, Inc.  
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 You may redistribute copies of GNU Fortran  
 under the terms of the GNU General Public License.  
 For more information about these matters, see the file named COPYING

=====

FC 503.bwaves\_r(base, peak) 549.fotonik3d\_r(base, peak) 554.roms\_r(base,  
 peak)

-----

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.  
 For more information about these matters, see the file named COPYING

=====

CC 521.wrf\_r(base, peak) 527.cam4\_r(base, peak)

-----

GNU Fortran (GCC) 4.8.2  
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## Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

Benchmarks using both Fortran and C:

clang gfortran

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang gfortran

## 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 -fconvert=big-endian -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:

-flto -Wl,-plugin-opt=-merge-constant  
 -Wl,-plugin-opt=-lsr-in-nested-loop  
 -Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math  
 -march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50  
 -fremap-arrays -mllvm -inline-threshold=1000

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## Base Optimization Flags (Continued)

C benchmarks (continued):

```
-flv-function-specialization -mllvm -enable-gvn-hoist  
-mllvm -function-specialize -z muldefs -lamdlibm -lpthread -ldl  
-ljemalloc
```

C++ benchmarks:

```
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant  
-Wl,-plugin-opt=-lsr-in-nested-loop  
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -march=znver1  
-mllvm -unroll-threshold=100 -finline-aggressive -fremap-arrays  
-mllvm -inline-threshold=1000 -mllvm -enable-vectorize-compares=false  
-z muldefs -lpthread -ldl -ljemalloc
```

Fortran benchmarks:

```
-flto -Wl,-plugin-opt=-merge-constant  
-Wl,-plugin-opt=-lsr-in-nested-loop  
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3(gfortran)  
-O3(clang) -mavx -madox -funroll-loops -ffast-math -z muldefs  
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant  
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false  
-lpthread -ldl -ljemalloc -lgfortran -lamdlibm
```

Benchmarks using both Fortran and C:

```
-flto -Wl,-plugin-opt=-merge-constant  
-Wl,-plugin-opt=-lsr-in-nested-loop  
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3(clang) -ffast-math  
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50  
-fremap-arrays -mllvm -inline-threshold=1000  
-flv-function-specialization -mllvm -enable-gvn-hoist  
-mllvm -function-specialize -O3(gfortran) -mavx -madox -funroll-loops  
-z muldefs -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=-merge-constant  
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false  
-lpthread -ldl -ljemalloc -lgfortran -lamdlibm
```

Benchmarks using both C and C++:

```
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant  
-Wl,-plugin-opt=-lsr-in-nested-loop  
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math  
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50  
-fremap-arrays -mllvm -inline-threshold=1000  
-flv-function-specialization -mllvm -enable-gvn-hoist  
-mllvm -function-specialize -mllvm -unroll-threshold=100  
-finline-aggressive -mllvm -enable-vectorize-compares=false -z muldefs  
-lpthread -ldl -ljemalloc
```

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# SPEC CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate2017\_fp\_base = 256

PowerEdge R7425 (AMD EPYC 7451, 2.30GHz)

SPECrate2017\_fp\_peak = 268

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Mar-2019

Hardware Availability: Jan-2019

Software Availability: Feb-2019

## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```

-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3(clang) -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-freemap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -enable-vectorize-compares=false
-O3(gfortran) -mavx -madox -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-lpthread -ldl -ljemalloc

```

## Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

Benchmarks using both Fortran and C:

clang gfortran

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang gfortran

## Peak Portability Flags

Same as Base Portability Flags



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## Peak Optimization Flags

C benchmarks:

519.lbm\_r: basepeak = yes

```
538.imagick_r: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -lpthread -ldl -ljemalloc
```

544.nab\_r: basepeak = yes

C++ benchmarks:

```
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -lpthread -ldl -ljemalloc
```

Fortran benchmarks:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -O3(gfortran) -O3(clang) -mavx2
-madx -funroll-loops -ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -lpthread
-ldl -ljemalloc -lgfortran -lamdlibm
```

Benchmarks using both Fortran and C:

```
521.wrf_r: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -O3(clang) -mavx
-ffast-math -O3(gfortran) -funroll-loops
-fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000
-lpthread -ldl -ljemalloc -lgfortran -lamdlibm
```

```
527.cam4_r: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -O3(gfortran) -O3(clang)
-mavx2 -madx -funroll-loops -ffast-math
-fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000
-lpthread -ldl -ljemalloc -lgfortran -lamdlibm
```

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Hardware Availability: Jan-2019

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## Peak Optimization Flags (Continued)

Benchmarks using both C and C++:

```
511.povray_r: -std=c++98 -flt0 -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -finline-aggressive
-lpthread -ldl -ljemalloc
```

526.blender\_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flt0 -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -finline-aggressive -O3 -mavx2 -madx
-funroll-loops -ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -lpthread
-ldl -ljemalloc
```

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

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

<http://www.spec.org/cpu2017/flags/aocc130-flags-revA2.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE2.html>

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

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

<http://www.spec.org/cpu2017/flags/aocc130-flags-revA2.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE2.xml>

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