



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate2017\_fp\_base = 180

PowerEdge R7425 (AMD EPYC 7301, 2.20 GHz)

SPECrate2017\_fp\_peak = 181

CPU2017 License: 55

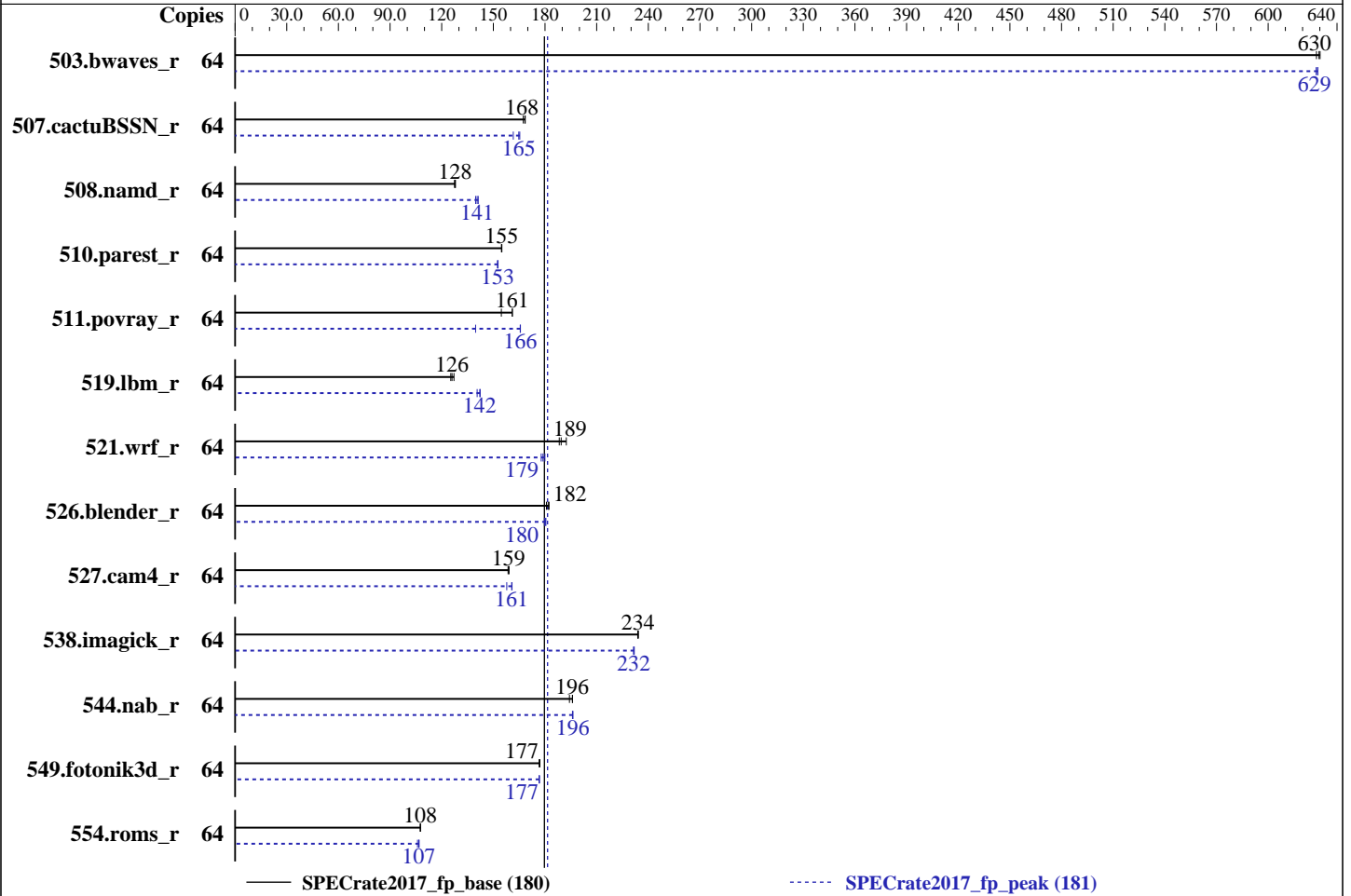
Test Date: Aug-2018

Test Sponsor: Dell Inc.

Hardware Availability: Dec-2018

Tested by: Dell Inc.

Software Availability: Jul-2018



### Hardware

CPU Name: AMD EPYC 7301  
 Max MHz.: 2700  
 Nominal: 2200  
 Enabled: 32 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 / 2 cores  
 Other: None  
 Memory: 1 TB (16 x 64 GB 4DRx4 PC4-2667V-L)

Storage: 1 x 800 GB PCIe SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP3  
 kernel 4.4.126-94.22

Compiler: C/C++: Version 1.0.0 of AOCC  
 Fortran: Version 4.8.2 of GCC

Parallel: No  
 Firmware: Version 62.5.1 released May-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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	64	1022	628	<b>1019</b>	<b>630</b>	1018	630	64	1021	629	<b>1021</b>	<b>629</b>	1022	628
507.cactuBSSN_r	64	481	169	<b>481</b>	<b>168</b>	484	167	64	<b>492</b>	<b>165</b>	502	162	490	165
508.namd_r	64	477	127	<b>475</b>	<b>128</b>	475	128	64	<b>433</b>	<b>141</b>	435	140	431	141
510.parest_r	64	<b>1081</b>	<b>155</b>	1081	155	1082	155	64	1096	153	<b>1098</b>	<b>153</b>	1098	152
511.povray_r	64	966	155	928	161	<b>928</b>	<b>161</b>	64	<b>902</b>	<b>166</b>	1070	140	902	166
519.lbm_r	64	531	127	<b>535</b>	<b>126</b>	538	125	64	<b>475</b>	<b>142</b>	474	142	480	141
521.wrf_r	64	761	188	<b>757</b>	<b>189</b>	745	192	64	806	178	797	180	<b>802</b>	<b>179</b>
526.blender_r	64	<b>536</b>	<b>182</b>	535	182	539	181	64	<b>541</b>	<b>180</b>	540	181	542	180
527.cam4_r	64	<b>705</b>	<b>159</b>	706	159	704	159	64	<b>697</b>	<b>161</b>	696	161	709	158
538.imagick_r	64	681	234	<b>680</b>	<b>234</b>	680	234	64	688	231	687	232	<b>687</b>	<b>232</b>
544.nab_r	64	550	196	<b>550</b>	<b>196</b>	555	194	64	550	196	<b>549</b>	<b>196</b>	549	196
549.fotonik3d_r	64	1409	177	1412	177	<b>1411</b>	<b>177</b>	64	1412	177	<b>1412</b>	<b>177</b>	1411	177
554.roms_r	64	<b>945</b>	<b>108</b>	945	108	945	108	64	960	106	951	107	<b>953</b>	<b>107</b>

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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 1.0 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/amd1704-rate-libs-revD/64:/home/cpu2017-1.0.5/amd1704-rate-libs-revD/32:"  
MALLOC_CONF = "lg_chunk:28"
```

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 v4.8.5  
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<sup>21</sup> =  
2MiB.

## Platform Notes

BIOS settings:  
Memory Interleaving set to Channel Interleaving  
Virtualization Technology disabled  
System Profile set to Custom  
CPU Power Management set to Maximum Performance

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## Platform Notes (Continued)

Memory Frequency set to Maximum Performance  
 Turbo Boost enabled  
 C States set to Autonomous  
 Memory Patrol Scrub disabled  
 Memory Refresh Rate set to 1x  
 PCI ASPM L1 Link Power Management disabled  
 Determinism Slider set to Power Determinism  
 Sysinfo program /home/cpu2017-1.0.5/bin/sysinfo  
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
 running on linux-yyi5 Tue Aug 14 00:26:42 2018

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 7301 16-Core Processor  
 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 8 9 12 13 16 17 20 21 24 25 28 29  
 physical 1: cores 0 1 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 7301 16-Core Processor  
 Stepping: 2  
 CPU MHz: 2195.865  
 BogoMIPS: 4391.73  
 Virtualization: AMD-V  
 L1d cache: 32K  
 L1i cache: 64K  
 L2 cache: 512K

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## Platform Notes (Continued)

```

L3 cache:                8192K
NUMA node0 CPU(s):      0,8,16,24,32,40,48,56
NUMA node1 CPU(s):      2,10,18,26,34,42,50,58
NUMA node2 CPU(s):      4,12,20,28,36,44,52,60
NUMA node3 CPU(s):      6,14,22,30,38,46,54,62
NUMA node4 CPU(s):      1,9,17,25,33,41,49,57
NUMA node5 CPU(s):      3,11,19,27,35,43,51,59
NUMA node6 CPU(s):      5,13,21,29,37,45,53,61
NUMA node7 CPU(s):      7,15,23,31,39,47,55,63

```

```

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
hw_pstate 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 8 16 24 32 40 48 56
node 0 size: 128687 MB
node 0 free: 128490 MB
node 1 cpus: 2 10 18 26 34 42 50 58
node 1 size: 129020 MB
node 1 free: 128862 MB
node 2 cpus: 4 12 20 28 36 44 52 60
node 2 size: 129020 MB
node 2 free: 128868 MB
node 3 cpus: 6 14 22 30 38 46 54 62
node 3 size: 129020 MB
node 3 free: 128863 MB
node 4 cpus: 1 9 17 25 33 41 49 57
node 4 size: 129020 MB
node 4 free: 128852 MB
node 5 cpus: 3 11 19 27 35 43 51 59
node 5 size: 129020 MB
node 5 free: 128820 MB
node 6 cpus: 5 13 21 29 37 45 53 61
node 6 size: 129020 MB
node 6 free: 128864 MB

```

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## Platform Notes (Continued)

```
node 7 cpus: 7 15 23 31 39 47 55 63
node 7 size: 129019 MB
node 7 free: 128860 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
  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:      1056597308 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-yyi5 4.4.126-94.22-default #1 SMP Wed Apr 11 07:45:03 UTC 2018 (9649989)
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
```

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## Platform Notes (Continued)

run-level 3 Aug 13 14:19

SPEC is set to: /home/cpu2017-1.0.5

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/nvme0n1p4	xfs	703G	20G	684G	3%	/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 Dell Inc. 62.5.1 [MaxPerf C\_En] 05/21/2018

Memory:

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

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.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017\_04\_26)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin  
-----

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

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017\_04\_26)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin  
-----

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

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017\_04\_26)

Target: x86\_64-unknown-linux-gnu

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## Compiler Version Notes (Continued)

```

Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

```

```

=====
FC 507.cactuBSSN_r(base, peak)
-----

```

```

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-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.
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
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

```

```

=====
CC 521.wrf_r(base, peak) 527.cam4_r(base, peak)
-----

```

```

GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.

```

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## Compiler Version Notes (Continued)

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.  
 For more information about these matters, see the file named COPYING  
 AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
 AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
 Target: x86\_64-unknown-linux-gnu  
 Thread model: posix  
 InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

-----

## 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

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## Base Portability Flags (Continued)

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=-disable-vect-cmp
-O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp -z muldefs
-ljemalloc
```

### C++ benchmarks:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp
-O3 -march=znver1 -mllvm -unroll-threshold=100 -finline-aggressive
-fremap-arrays -mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp
-z muldefs -ljemalloc
```

### Fortran benchmarks:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp
-O3 -mavx -madox -funroll-loops -ffast-math -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-disable-vect-cmp -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=-disable-vect-cmp
-O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp -mavx -madox
-funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-disable-vect-cmp -ljemalloc
-lgfortran -lamdlibm
```

### Benchmarks using both C and C++:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp
-O3 -ffast-math -march=znver1 -fstruct-layout=2
```

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# SPEC CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate2017\_fp\_base = 180

PowerEdge R7425 (AMD EPYC 7301, 2.20 GHz)

SPECrate2017\_fp\_peak = 181

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Aug-2018

Hardware Availability: Dec-2018

Software Availability: Jul-2018

## Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):

```
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp
-fininline-aggressive -z muldefs -ljemalloc
```

Benchmarks using Fortran, C, and C++:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp
-O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp
-fininline-aggressive -mavx -madox -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-disable-vect-cmp -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:

```
-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 -ljemalloc
```

C++ benchmarks:

```
-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 -ljemalloc
```

Fortran benchmarks:

```
-flto -Wl,-plugin-opt=-merge-constant  
-Wl,-plugin-opt=-lsr-in-nested-loop -O3 -mavx2 -madox -funroll-loops  
-ffast-math -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=-merge-constant  
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -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 -mavx -ffast-math  
-funroll-loops -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=-merge-constant  
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000  
-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 -mavx2 -madox  
-funroll-loops -ffast-math -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=-merge-constant  
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000  
-ljemalloc -lgfortran -lamdlibm
```

Benchmarks using both C and C++:

```
-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 -finline-aggressive -ljemalloc
```

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## Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```

-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 -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 -ljemalloc

```

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>

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>

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