



SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate2017_fp_base = 458

PowerEdge R840 (Intel Xeon Gold 6252, 2.10GHz)

SPECrate2017_fp_peak = 468

CPU2017 License: 55

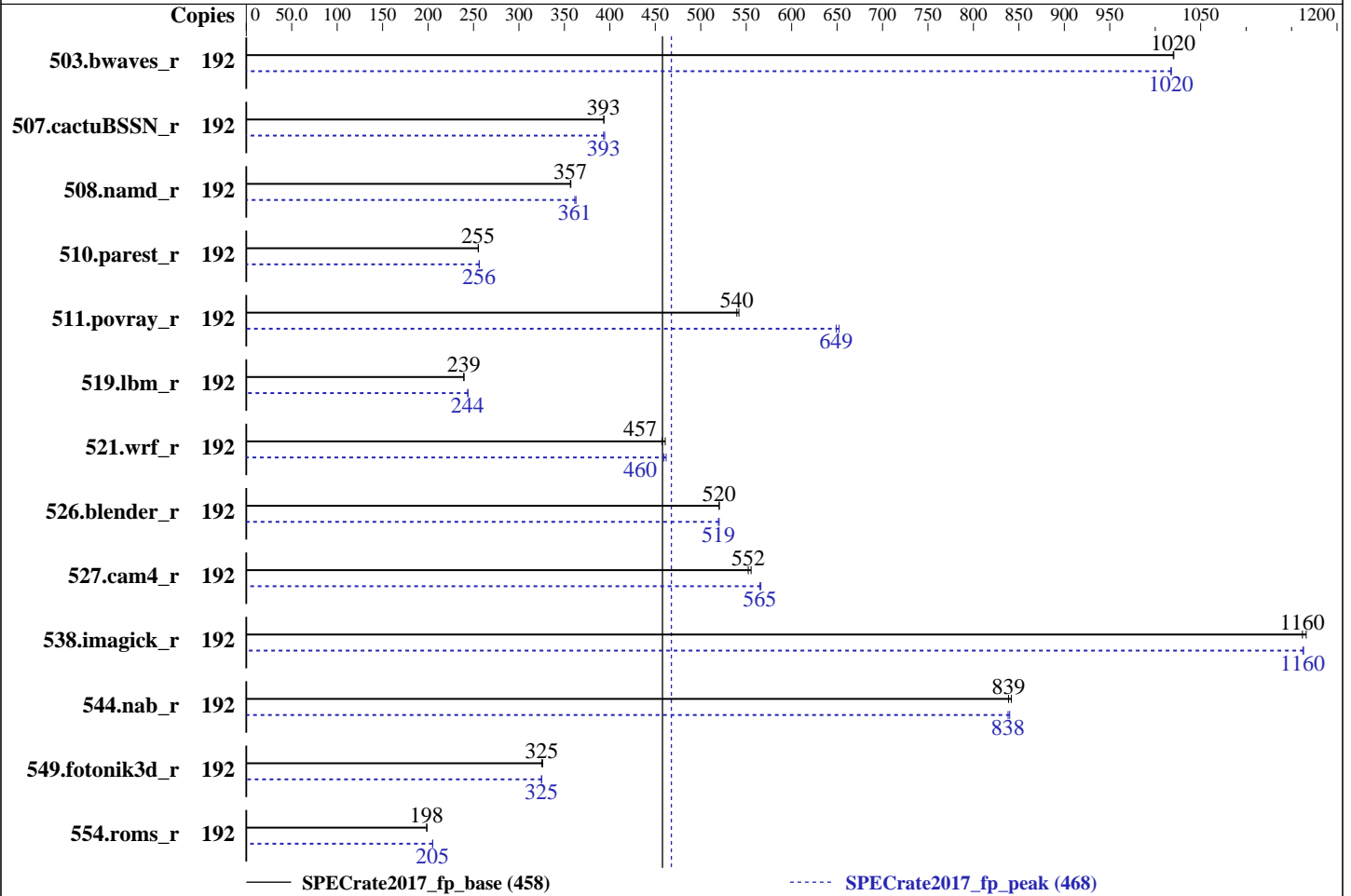
Test Date: Jul-2019

Test Sponsor: Dell Inc.

Hardware Availability: Apr-2019

Tested by: Dell Inc.

Software Availability: May-2019



Hardware

CPU Name: Intel Xeon Gold 6252
 Max MHz.: 3700
 Nominal: 2100
 Enabled: 96 cores, 4 chips, 2 threads/core
 Orderable: 2,4 chips
 Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 35.75 MB I+D on chip per chip
 Other: None
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
 Storage: 1 x 960 GB SATA SSD
 Other: None

Software

OS: Ubuntu 18.04.2 LTS
 kernel 4.15.0-45-generic
 Compiler: C/C++: Version 19.0.4.227 of Intel C/C++
 Compiler Build 20190416 for Linux;
 Fortran: Version 19.0.4.227 of Intel Fortran
 Compiler Build 20190416 for Linux
 Parallel: No
 Firmware: Version 2.2.9 released May-2019
 File System: ext4
 System State: Run level 5 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: None



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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	192	1887	1020	<u>1888</u>	<u>1020</u>			192	<u>1893</u>	<u>1020</u>	1892	1020		
507.cactuBSSN_r	192	<u>618</u>	<u>393</u>	618	394			192	616	394	<u>618</u>	<u>393</u>		
508.namd_r	192	511	357	<u>512</u>	<u>357</u>			192	503	363	<u>505</u>	<u>361</u>		
510.parest_r	192	1967	255	<u>1968</u>	<u>255</u>			192	<u>1961</u>	<u>256</u>	1959	256		
511.povray_r	192	827	542	<u>831</u>	<u>540</u>			192	687	652	<u>691</u>	<u>649</u>		
519.lbm_r	192	<u>846</u>	<u>239</u>	844	240			192	830	244	<u>831</u>	<u>244</u>		
521.wrf_r	192	<u>940</u>	<u>457</u>	933	461			192	931	462	<u>936</u>	<u>460</u>		
526.blender_r	192	562	520	<u>562</u>	<u>520</u>			192	562	520	<u>563</u>	<u>519</u>		
527.cam4_r	192	<u>608</u>	<u>552</u>	605	555			192	593	566	<u>594</u>	<u>565</u>		
538.imagick_r	192	409	1170	<u>411</u>	<u>1160</u>			192	<u>411</u>	<u>1160</u>	411	1160		
544.nab_r	192	384	842	<u>385</u>	<u>839</u>			192	385	840	<u>386</u>	<u>838</u>		
549.fotonik3d_r	192	<u>2302</u>	<u>325</u>	2295	326			192	<u>2304</u>	<u>325</u>	2302	325		
554.roms_r	192	<u>1538</u>	<u>198</u>	1534	199			192	1487	205	<u>1489</u>	<u>205</u>		

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

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.

Transparent Huge Pages enabled by default

Prior to runcpu invocation

Filesystem page cache synced and cleared with:

```
sync; echo 3> /proc/sys/vm/drop_caches
```

runcpu command invoked through numactl i.e.:

```
numactl --interleave=all runcpu <etc>
```



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Platform Notes

BIOS settings:

```

ADDDC setting disabled
Virtualization Technology disabled
DCU Streamer Prefetcher disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub disabled
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on intel-sut Thu Jul 25 09:37:08 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 : Intel(R) Xeon(R) Gold 6252 CPU @ 2.10GHz
 4 "physical id"s (chips)
 192 "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 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 2: cores 0 1 2 3 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

```

From lscpu:

```

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 192
On-line CPU(s) list: 0-191
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 4
NUMA node(s): 8
Vendor ID: GenuineIntel
CPU family: 6

```

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Platform Notes (Continued)

```

Model: 85
Model name: Intel(R) Xeon(R) Gold 6252 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 2466.305
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s):
0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120,128,136,144,152,160,168,176,184
NUMA node1 CPU(s):
1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121,129,137,145,153,161,169,177,185
NUMA node2 CPU(s):
2,10,18,22,26,34,42,50,58,66,82,90,98,106,114,118,122,130,138,146,154,162,178,186
NUMA node3 CPU(s):
3,11,19,27,35,43,51,59,67,75,83,91,99,107,115,123,131,139,147,155,163,171,179,187
NUMA node4 CPU(s):
4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124,132,140,148,156,164,172,180,188
NUMA node5 CPU(s):
5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125,133,141,149,157,165,173,181,189
NUMA node6 CPU(s):
6,14,30,38,46,54,62,70,74,78,86,94,102,110,126,134,142,150,158,166,170,174,182,190
NUMA node7 CPU(s):
7,15,23,31,39,47,55,63,71,79,87,95,103,111,119,127,135,143,151,159,167,175,183,191
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_ppin
ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid
fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pln pts pku ospke avx512_vnni flush_lld arch_capabilities

```

```
/proc/cpuinfo cache data
cache size : 36608 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 96 104 112 120 128 136 144 152 160 168
176 184
node 0 size: 95145 MB

```

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Platform Notes (Continued)

```

node 0 free: 94637 MB
node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153 161 169
177 185
node 1 size: 96763 MB
node 1 free: 96289 MB
node 2 cpus: 2 10 18 22 26 34 42 50 58 66 82 90 98 106 114 118 122 130 138 146 154 162
178 186
node 2 size: 96742 MB
node 2 free: 96203 MB
node 3 cpus: 3 11 19 27 35 43 51 59 67 75 83 91 99 107 115 123 131 139 147 155 163 171
179 187
node 3 size: 96763 MB
node 3 free: 96335 MB
node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124 132 140 148 156 164 172
180 188
node 4 size: 96763 MB
node 4 free: 96301 MB
node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125 133 141 149 157 165 173
181 189
node 5 size: 96763 MB
node 5 free: 96311 MB
node 6 cpus: 6 14 30 38 46 54 62 70 74 78 86 94 102 110 126 134 142 150 158 166 170 174
182 190
node 6 size: 96763 MB
node 6 free: 96328 MB
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127 135 143 151 159 167 175
183 191
node 7 size: 96761 MB
node 7 free: 96338 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 21 21 21 11 21 21 21
1: 21 10 21 21 21 11 21 21
2: 21 21 10 21 21 21 11 21
3: 21 21 21 10 21 21 21 11
4: 11 21 21 21 10 21 21 21
5: 21 11 21 21 21 10 21 21
6: 21 21 11 21 21 21 10 21
7: 21 21 21 11 21 21 21 10

```

```

From /proc/meminfo
MemTotal: 791006940 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

```

```

/usr/bin/lsb_release -d
Ubuntu 18.04.2 LTS

```

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Platform Notes (Continued)

```

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 intel-sut 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: Enhanced IBRS, IBPB

run-level 5 Jul 25 03:01

SPEC is set to: /home/cpu2017
  Filesystem      Type  Size  Used Avail Use% Mounted on
  /dev/sda2       ext4  439G   37G  380G   9% /

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. 2.2.9 05/08/2019
  Memory:
    24x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
    24x Not Specified Not Specified

(End of data from sysinfo program)

```

Compiler Version Notes

```

=====
CC 519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base, peak)
=====
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,

```

(Continued on next page)



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Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
CC 519.lbm_r(peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
CXXC 508.namd_r(base) 510.parest_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
CXXC 508.namd_r(peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
CC 511.povray_r(base) 526.blender_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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=====
CC 511.povray_r(peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Compiler Version Notes (Continued)

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FC 507.cactuBSSN_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

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FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

FC 554.roms_r(peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

CC 521.wrf_r(base) 527.cam4_r(base)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

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CC 521.wrf_r(peak) 527.cam4_r(peak)

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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:

icc -m64 -std=c11

C++ benchmarks:

icpc -m64

Fortran benchmarks:

ifort -m64

Benchmarks using both Fortran and C:

ifort -m64 icc -m64 -std=c11

Benchmarks using both C and C++:

icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:

icpc -m64 icc -m64 -std=c11 ifort -m64

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_LP64 -DSPEC_CASE_FLAG -convert big_endian

526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char

527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG

538.imagick_r: -DSPEC_LP64

544.nab_r: -DSPEC_LP64

549.fotonik3d_r: -DSPEC_LP64

554.roms_r: -DSPEC_LP64



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Base Optimization Flags

C benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4
```

C++ benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4
```

Fortran benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
```

Benchmarks using both Fortran and C:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
```

Benchmarks using both C and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
```

Peak Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

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Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4
```

```
538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

```
508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4
```

```
510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

Fortran benchmarks:

```
503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nostandard-realloc-lhs -align array32byte
```

549.fotonik3d_r: Same as 503.bwaves_r

```
554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
```

(Continued on next page)



SPEC CPU2017 Floating Point Rate Result

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Dell Inc.

SPECrate2017_fp_base = 458

PowerEdge R840 (Intel Xeon Gold 6252, 2.10GHz)

SPECrate2017_fp_peak = 468

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Jul-2019

Hardware Availability: Apr-2019

Software Availability: May-2019

Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both C and C++:

```
511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

```
526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.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/Intel-ic18.0-official-linux64.2019-04-02.xml>
<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE2.xml>

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