



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate2017\_fp\_base = 283

PowerEdge R940 (Intel Xeon Gold 6234, 3.30GHz)

SPECrate2017\_fp\_peak = 291

CPU2017 License: 55

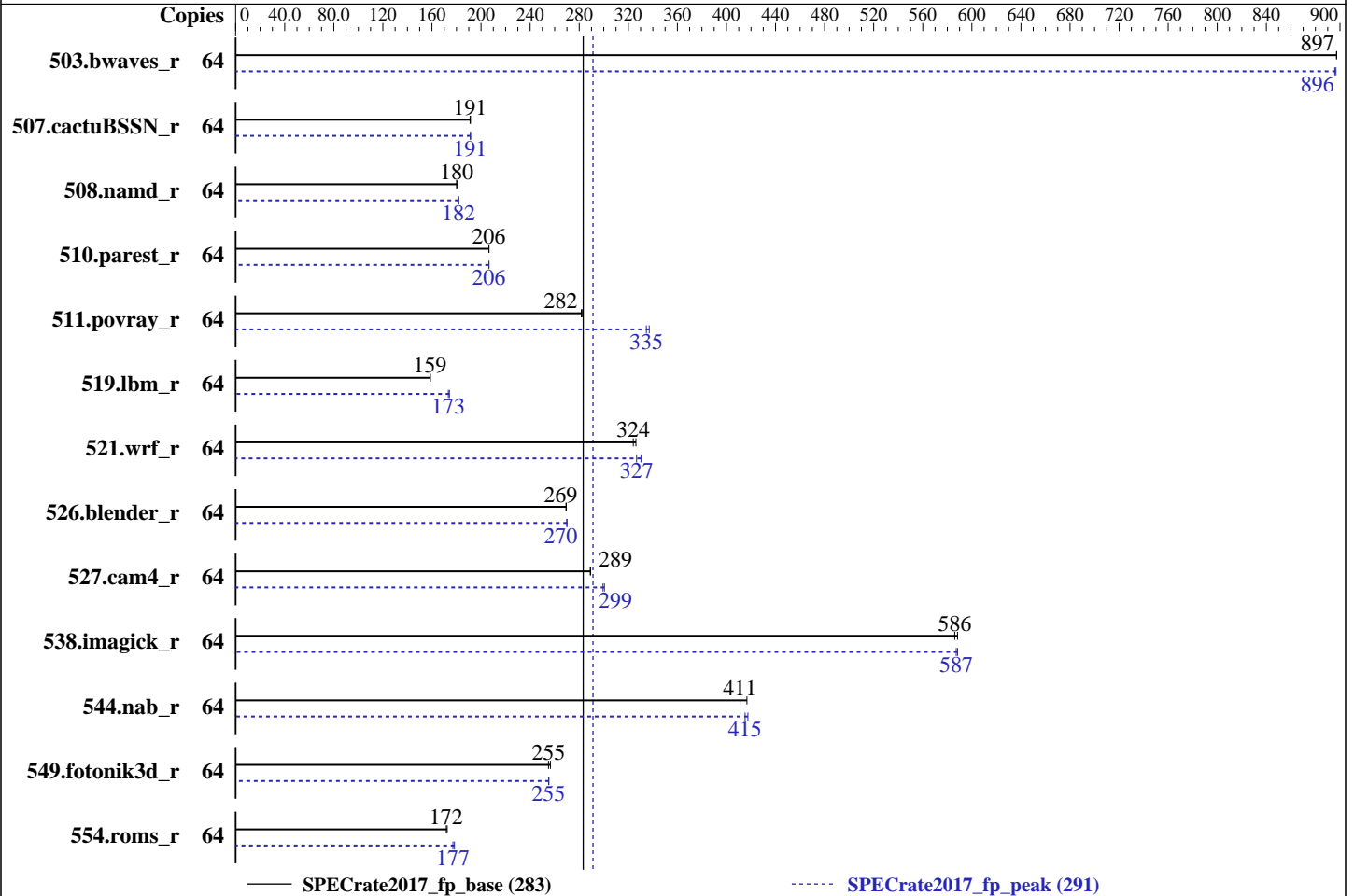
Test Date: May-2019

Test Sponsor: Dell Inc.

Hardware Availability: Apr-2019

Tested by: Dell Inc.

Software Availability: Feb-2019



### Hardware

CPU Name: Intel Xeon Gold 6234  
 Max MHz.: 4000  
 Nominal: 3300  
 Enabled: 32 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: 24.75 MB I+D on chip per chip  
 Other: None  
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)  
 Storage: 1 x 1.5 TB NVME SSD  
 Other: None

### Software

OS: Ubuntu 18.04.2 LTS  
 kernel 4.15.0-45-generic  
 Compiler: C/C++: Version 19.0.1.144 of Intel C/C++  
 Compiler Build 20181018 for Linux;  
 Fortran: Version 19.0.1.144 of Intel Fortran  
 Compiler Build 20181018 for Linux  
 Parallel: No  
 Firmware: Version 2.1.8 released Apr-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	64	715	897	<b><u>715</u></b>	<b><u>897</u></b>			64	716	897	<b><u>716</u></b>	<b><u>896</u></b>		
507.cactuBSSN_r	64	<b><u>424</u></b>	<b><u>191</u></b>	423	191			64	<b><u>424</u></b>	<b><u>191</u></b>	423	192		
508.namd_r	64	337	180	<b><u>338</u></b>	<b><u>180</u></b>			64	<b><u>335</u></b>	<b><u>182</u></b>	335	182		
510.parest_r	64	<b><u>811</u></b>	<b><u>206</u></b>	811	207			64	<b><u>811</u></b>	<b><u>206</u></b>	811	206		
511.povray_r	64	529	282	<b><u>530</u></b>	<b><u>282</u></b>			64	<b><u>446</u></b>	<b><u>335</u></b>	443	337		
519.lbm_r	64	<b><u>426</u></b>	<b><u>159</u></b>	425	159			64	<b><u>389</u></b>	<b><u>173</u></b>	387	174		
521.wrf_r	64	<b><u>442</u></b>	<b><u>324</u></b>	439	326			64	434	330	<b><u>439</u></b>	<b><u>327</u></b>		
526.blender_r	64	362	269	<b><u>362</u></b>	<b><u>269</u></b>			64	<b><u>361</u></b>	<b><u>270</u></b>	361	270		
527.cam4_r	64	<b><u>387</u></b>	<b><u>289</u></b>	387	289			64	<b><u>374</u></b>	<b><u>299</u></b>	372	301		
538.imagick_r	64	<b><u>272</u></b>	<b><u>586</u></b>	271	588			64	271	588	<b><u>271</u></b>	<b><u>587</u></b>		
544.nab_r	64	258	417	<b><u>262</u></b>	<b><u>411</u></b>			64	<b><u>259</u></b>	<b><u>415</u></b>	258	417		
549.fotonik3d_r	64	972	257	<b><u>978</u></b>	<b><u>255</u></b>			64	977	255	<b><u>978</u></b>	<b><u>255</u></b>		
554.roms_r	64	590	172	<b><u>592</u></b>	<b><u>172</u></b>			64	<b><u>574</u></b>	<b><u>177</u></b>	570	178		

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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.

## Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

## General Notes

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

LD\_LIBRARY\_PATH = "/home/cpu2017/lib/ia32:/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

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## General Notes (Continued)

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>

## Platform Notes

BIOS settings:  
ADDDC setting disabled  
Sub NUMA Cluster enabled  
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 Sat May 4 21:16:23 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 6234 CPU @ 3.30GHz  
4 "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 : 8  
siblings : 16  
physical 0: cores 1 2 3 4 9 17 20 27  
physical 1: cores 2 3 4 9 11 24 25 27  
physical 2: cores 2 3 4 8 11 17 25 27  
physical 3: cores 2 3 4 8 9 18 20 25

From lscpu:  
Architecture: x86\_64

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## Platform Notes (Continued)

```

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: 8
Socket(s):           4
NUMA node(s):        8
Vendor ID:           GenuineIntel
CPU family:           6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6234 CPU @ 3.30GHz
Stepping:            7
CPU MHz:             3730.640
BogoMIPS:            6600.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            25344K
NUMA node0 CPU(s):  0,8,16,24,32,40,48,56
NUMA node1 CPU(s):  1,17,25,29,33,49,57,61
NUMA node2 CPU(s):  2,18,22,26,34,50,54,58
NUMA node3 CPU(s):  3,15,19,31,35,47,51,63
NUMA node4 CPU(s):  4,12,20,28,36,44,52,60
NUMA node5 CPU(s):  5,9,13,21,37,41,45,53
NUMA node6 CPU(s):  6,10,14,30,38,42,46,62
NUMA node7 CPU(s):  7,11,23,27,39,43,55,59

```

```

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
aperfperf 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 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 : 25344 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

```

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## Platform Notes (Continued)

```

node 0 size: 95169 MB
node 0 free: 94873 MB
node 1 cpus: 1 17 25 29 33 49 57 61
node 1 size: 96766 MB
node 1 free: 96501 MB
node 2 cpus: 2 18 22 26 34 50 54 58
node 2 size: 96745 MB
node 2 free: 96480 MB
node 3 cpus: 3 15 19 31 35 47 51 63
node 3 size: 96766 MB
node 3 free: 96481 MB
node 4 cpus: 4 12 20 28 36 44 52 60
node 4 size: 96766 MB
node 4 free: 96484 MB
node 5 cpus: 5 9 13 21 37 41 45 53
node 5 size: 96766 MB
node 5 free: 96483 MB
node 6 cpus: 6 10 14 30 38 42 46 62
node 6 size: 96766 MB
node 6 free: 96484 MB
node 7 cpus: 7 11 23 27 39 43 55 59
node 7 size: 96765 MB
node 7 free: 96500 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:      791052680 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)"

```

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## Platform Notes (Continued)

```

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 May 4 16:46

```

SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/nvme0n1p2 ext4  439G   26G  392G   7% /

```

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. 2.1.8 04/30/2019
Memory:
12x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933
12x 00AD063200AD 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,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
=====

```

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CC 519.lbm\_r(peak)

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-----

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

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
-----

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

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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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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
-----

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

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.1.144 Build 20181018

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-----

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

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
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-----

=====  
FC 554.roms\_r(peak)

-----  
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CC 521.wrf\_r(base) 527.cam4\_r(base)

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64, Version 19.0.1.144 Build 20181018

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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-----

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## Compiler Version Notes (Continued)

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-----

## 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 = 283

PowerEdge R940 (Intel Xeon Gold 6234, 3.30GHz)

SPECrate2017\_fp\_peak = 291

CPU2017 License: 55

Test Date: May-2019

Test Sponsor: Dell Inc.

Hardware Availability: Apr-2019

Tested by: Dell Inc.

Software Availability: Feb-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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