



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017_fp_base = 336

PowerEdge MX840c (Intel Xeon Gold 6226, 2.70GHz)

SPECrate®2017_fp_peak = 344

CPU2017 License: 55

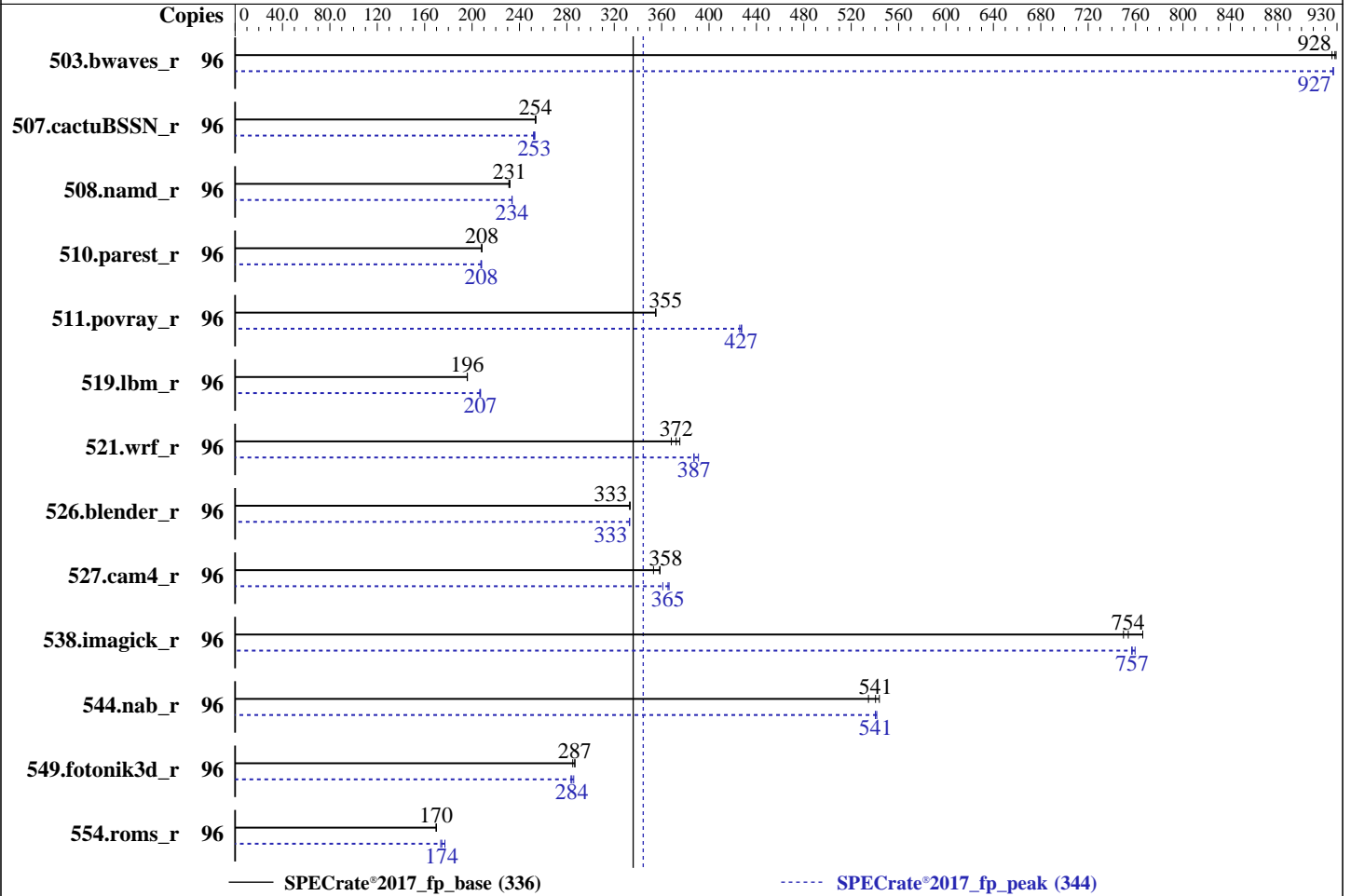
Test Date: Jun-2019

Test Sponsor: Dell Inc.

Hardware Availability: Apr-2019

Tested by: Dell Inc.

Software Availability: May-2019



Hardware

CPU Name: Intel Xeon Gold 6226
 Max MHz: 3700
 Nominal: 2700
 Enabled: 48 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: 19.25 MB I+D on chip per chip
 Other: None
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
 Storage: 1 x 480 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 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: None
 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	96	1037	928	1036	929	1040	926	96	1039	927	1039	927	1039	927
507.cactuBSSN_r	96	479	254	479	254	480	253	96	480	253	483	252	481	253
508.namd_r	96	394	231	395	231	393	232	96	390	234	390	234	390	234
510.parest_r	96	1207	208	1206	208	1206	208	96	1207	208	1209	208	1211	207
511.povray_r	96	632	355	631	355	632	355	96	525	427	526	426	524	428
519.lbm_r	96	516	196	516	196	517	196	96	489	207	489	207	490	206
521.wrf_r	96	578	372	573	375	584	368	96	555	387	555	387	550	391
526.blender_r	96	439	333	439	333	439	333	96	439	333	439	333	439	333
527.cam4_r	96	468	359	475	353	469	358	96	465	361	458	366	460	365
538.imagick_r	96	318	750	317	754	312	766	96	315	757	316	757	314	760
544.nab_r	96	299	541	302	535	297	544	96	298	542	299	541	299	540
549.fotonik3d_r	96	1313	285	1304	287	1305	287	96	1316	284	1320	283	1309	286
554.roms_r	96	899	170	899	170	898	170	96	874	174	879	174	861	177

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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:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

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 Wed Sep  4 08:44:12 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 6226 CPU @ 2.70GHz
 4 "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 : 12
siblings  : 24
physical 0: cores 0 2 3 4 5 6 8 9 10 11 12 13
physical 1: cores 0 2 3 5 6 8 9 10 11 12 13 14
physical 2: cores 1 2 3 4 5 6 8 9 10 11 12 13
physical 3: cores 0 1 2 3 4 5 6 8 10 11 12 14

```

```

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):              96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s):           4
NUMA node(s):        8
Vendor ID:           GenuineIntel
CPU family:           6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
Stepping:            7
CPU MHz:             2960.446
BogoMIPS:            5400.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            19712K
NUMA node0 CPU(s):   0,8,16,24,32,40,48,56,64,72,80,88
NUMA node1 CPU(s):   1,9,17,25,33,41,49,57,65,73,81,89
NUMA node2 CPU(s):   2,10,18,26,34,42,50,58,66,74,82,90
NUMA node3 CPU(s):   3,11,19,27,35,43,51,59,67,75,83,91
NUMA node4 CPU(s):   4,12,20,28,36,44,52,60,68,76,84,92
NUMA node5 CPU(s):   5,13,21,29,37,45,53,61,69,77,85,93
NUMA node6 CPU(s):   6,14,22,30,38,46,54,62,70,78,86,94
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
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 pdc_m 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 : 19712 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

```

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Platform Notes (Continued)

```

node 0 size: 95148 MB
node 0 free: 94821 MB
node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89
node 1 size: 96765 MB
node 1 free: 96331 MB
node 2 cpus: 2 10 18 26 34 42 50 58 66 74 82 90
node 2 size: 96765 MB
node 2 free: 96461 MB
node 3 cpus: 3 11 19 27 35 43 51 59 67 75 83 91
node 3 size: 96765 MB
node 3 free: 96470 MB
node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92
node 4 size: 96744 MB
node 4 free: 96357 MB
node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93
node 5 size: 96765 MB
node 5 free: 96250 MB
node 6 cpus: 6 14 22 30 38 46 54 62 70 78 86 94
node 6 size: 96765 MB
node 6 free: 96367 MB
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95
node 7 size: 96764 MB
node 7 free: 96464 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:      791024876 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 3 Sep 3 21:38

```

SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       ext4  439G   31G  386G   8% /

```

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:
16x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
8x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
24x Not Specified Not Specified

```

(End of data from sysinfo program)

Compiler Version Notes

```

=====
C          | 519.lbm_r(base, peak) 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
=====

```

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Compiler Version Notes (Continued)

=====
C++ | 508.namd_r(base, peak) 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.

=====
C++, C | 511.povray_r(base, peak) 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,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
C++, C, Fortran | 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
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====
Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
554.roms_r(base, 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.

=====
Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

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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Version 19.0.4.227 Build 20190416

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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
```

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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-ic19.0u1-official-linux64.2019-07-09.html>
<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml>
<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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