



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

**Dell Inc.**

PowerEdge R740xd (Intel Xeon Bronze 3206R, 1.90 GHz)

**SPECrate®2017\_fp\_base = 72.9**

**SPECrate®2017\_fp\_peak = 74.4**

CPU2017 License: 55

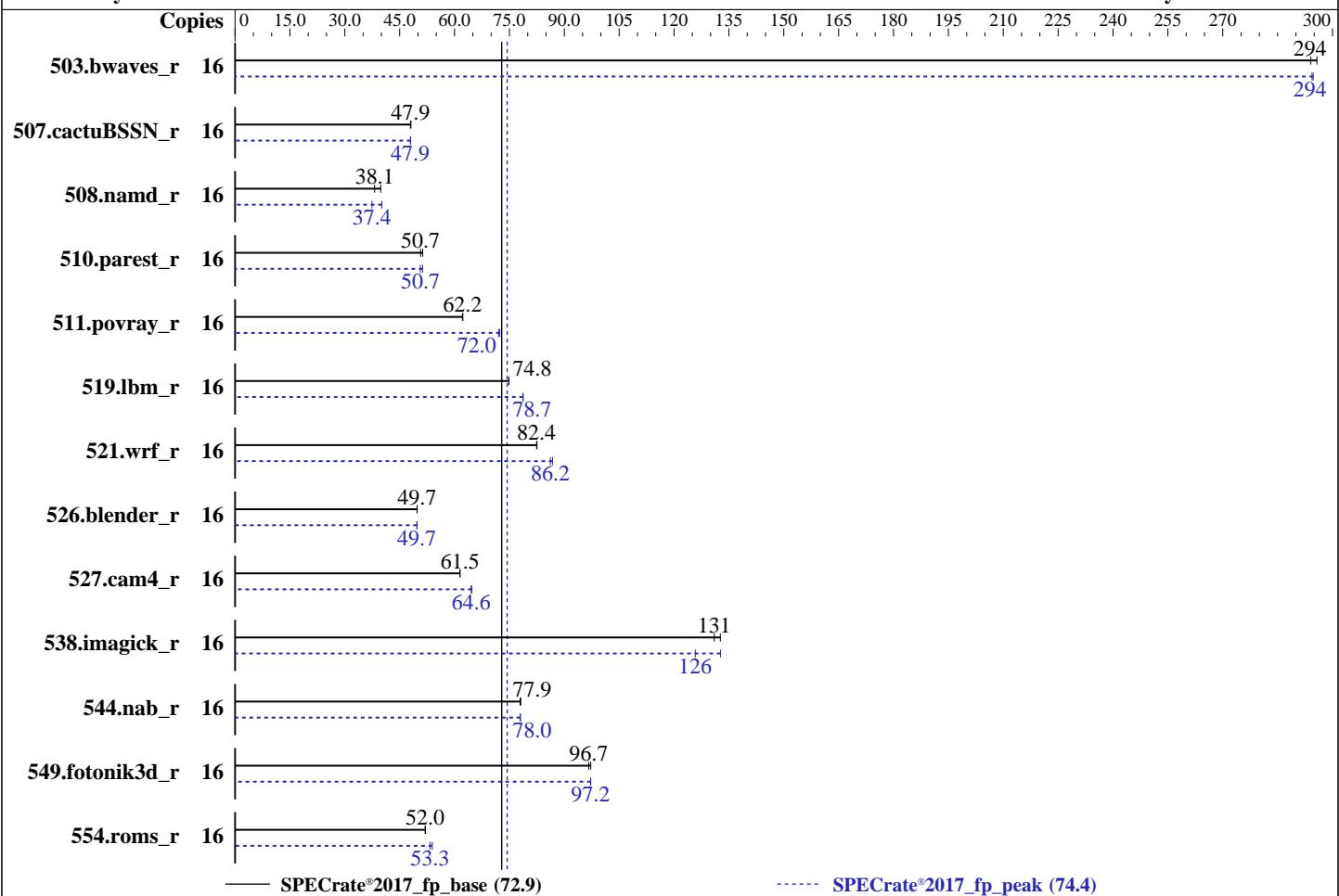
**Test Date:** Oct-2019

**Test Sponsor:** Dell Inc.

**Hardware Availability:** Feb-2020

**Tested by:** Dell Inc.

**Software Availability:** Oct-2019



<b>Hardware</b>		<b>Software</b>	
CPU Name:	Intel Xeon Bronze 3206R	OS:	Ubuntu 18.04.2 LTS
Max MHz:	1900	Compiler:	kernel 4.15.0-65-generic
Nominal:	1900		C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
Enabled:	16 cores, 2 chips		Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
Orderable:	1,2 chips	Parallel:	No
Cache L1:	32 KB I + 32 KB D on chip per core	Firmware:	Version 2.4.5 released Sep-2019
L2:	1 MB I+D on chip per core	File System:	ext4
L3:	11 MB I+D on chip per chip	System State:	Run level 5 (multi-user)
Other:	None	Base Pointers:	64-bit
Memory:	384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2133)	Peak Pointers:	64-bit
Storage:	1 x 960 GB SATA SSD	Other:	None
Other:	None	Power Management:	BIOS set to prefer performance at the cost of additional power usage.



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## Results Table

Benchmark	Base								Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	16	543	296	<b>546</b>	<b>294</b>			16	<b>545</b>	<b>294</b>	544	295				
507.cactuBSSN_r	16	421	48.1	<b>422</b>	<b>47.9</b>			16	<b>423</b>	<b>47.9</b>	422	48.0				
508.namd_r	16	<b>399</b>	<b>38.1</b>	382	39.8			16	<b>406</b>	<b>37.4</b>	379	40.1				
510.parest_r	16	816	51.3	<b>825</b>	<b>50.7</b>			16	<b>826</b>	<b>50.7</b>	816	51.3				
511.povray_r	16	600	62.3	<b>601</b>	<b>62.2</b>			16	516	72.4	<b>519</b>	<b>72.0</b>				
519.lbm_r	16	225	74.9	<b>225</b>	<b>74.8</b>			16	214	78.7	<b>214</b>	<b>78.7</b>				
521.wrf_r	16	434	82.5	<b>435</b>	<b>82.4</b>			16	413	86.8	<b>416</b>	<b>86.2</b>				
526.blender_r	16	<b>490</b>	<b>49.7</b>	489	49.8			16	490	49.7	<b>490</b>	<b>49.7</b>				
527.cam4_r	16	455	61.5	<b>455</b>	<b>61.5</b>			16	432	64.7	<b>433</b>	<b>64.6</b>				
538.imagick_r	16	300	133	<b>304</b>	<b>131</b>			16	<b>316</b>	<b>126</b>	300	133				
544.nab_r	16	<b>345</b>	<b>77.9</b>	345	78.1			16	345	78.0	<b>345</b>	<b>78.0</b>				
549.fotonik3d_r	16	<b>645</b>	<b>96.7</b>	641	97.2			16	<b>642</b>	<b>97.2</b>	641	97.2				
554.roms_r	16	488	52.0	<b>489</b>	<b>52.0</b>			16	472	53.9	<b>477</b>	<b>53.3</b>				

SPECrate®2017\_fp\_base = 72.9

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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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/cpu2017/lib/intel64"

## General Notes

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.

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## General Notes (Continued)

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>
```

## Platform Notes

BIOS settings:

Virtualization Technology 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

CPU Interconnect Bus Link Power Management enabled

PCI ASPM L1 Link Power Management enabled

```
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
running on intel-sut Tue Oct 22 17:09:20 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) Bronze 3206R CPU @ 1.90GHz
  2 "physical id"s (chips)
  16 "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   : 8
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
```

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## Platform Notes (Continued)

CPU(s): 16  
On-line CPU(s) list: 0-15  
Thread(s) per core: 1  
Core(s) per socket: 8  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Bronze 3206R CPU @ 1.90GHz  
Stepping: 7  
CPU MHz: 1896.443  
BogoMIPS: 3800.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 11264K  
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14  
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15  
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 xtTopology nonstop\_tsc cpuid aperf fm perf 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 tsc\_deadline\_timer aes xsave avx f16c rdrand lahf\_lm abm 3dnowprefetch cpuid\_fault epb cat\_13 cdp\_13 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 mpq 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 arat pln pts pku ospke avx512\_vnni md\_clear flush\_l1d arch\_capabilities

/proc/cpuinfo cache data  
cache size : 11264 KB

From numactl --hardware    WARNING: a numactl 'node' might or might not correspond to a physical chip.

available: 2 nodes (0-1)  
node 0 cpus: 0 2 4 6 8 10 12 14  
node 0 size: 191917 MB  
node 0 free: 190997 MB  
node 1 cpus: 1 3 5 7 9 11 13 15  
node 1 size: 193512 MB  
node 1 free: 192648 MB  
node distances:  
node 0 1

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## Platform Notes (Continued)

```
0: 10 21  
1: 21 10
```

```
From /proc/meminfo  
MemTotal:      394680180 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 intel-sut 4.15.0-65-generic #74-Ubuntu SMP Tue Sep 17 17:06:04 UTC 2019 x86_64  
x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault):	Not affected
Microarchitectural Data Sampling:	Not affected
CVE-2017-5754 (Meltdown):	Not affected
CVE-2018-3639 (Speculative Store Bypass):	Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):	Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

```
run-level 5 Oct 22 11:29
```

```
SPEC is set to: /home/cpu2017  
Filesystem      Type  Size  Used Avail Use% Mounted on  
/dev/sda2        ext4  439G   36G  381G   9%  /
```

```
From /sys/devices/virtual/dmi/id  
BIOS:    Dell Inc. 2.4.5 09/22/2019
```

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## Platform Notes (Continued)

Vendor: Dell Inc.  
Product: PowerEdge R740xd  
Product Family: PowerEdge  
Serial: F5BMCS2

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.

Memory:

12x 002C069D002C 18ASF2G72PDZ-2G9E1 16 GB 2 rank 2933, configured at 2133  
7x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933, configured at 2133  
5x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933, configured at 2133

(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.

-----

=====

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.  
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## Compiler Version Notes (Continued)

=====  
C++, C, Fortran | 507.cactusBSSN\_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

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

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## Base Compiler Invocation (Continued)

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
```

## 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
```

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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-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
```

Benchmarks using Fortran, C, and C++:

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

## Peak Portability Flags

Same as Base Portability Flags



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## 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
```

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
```

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## Peak Optimization Flags (Continued)

```
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-ic19.0ul-official-linux64.2019-07-09.html>  
<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic19.0ul-official-linux64.2019-07-09.xml>  
<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.xml>

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Tested with SPEC CPU®2017 v1.1.0 on 2019-10-22 13:09:19-0400.

Report generated on 2020-03-02 11:49:20 by CPU2017 PDF formatter v6255.

Originally published on 2020-02-29.