## Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

### SPECrate2017_fp_base = 89.6

### SPECrate2017_fp_peak = 91.7

| Test Sponsor | Dell Inc. | Hardware Availability | Apr-2019 |
| Test Date:   | Mar-2019  | Software Availability | Feb-2019 |

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Silver 4215</td>
<td>OS: Ubuntu 18.04.2 LTS</td>
</tr>
<tr>
<td>Max MHz.: 3500</td>
<td>kernel 4.15.0-45-generic</td>
</tr>
<tr>
<td>Nominal: 2500</td>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td>Enabled: 16 cores, 2 chips, 2 threads/core</td>
<td>Compiler Build 20181018 for Linux;</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
<td>Fortran: Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>Compiler Build 20181018 for Linux</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td>Parallel: No</td>
</tr>
<tr>
<td>L3: 11 MB I+D on chip per chip</td>
<td>Firmware: Version 2.1.6 released Mar-2019</td>
</tr>
<tr>
<td>Other: None</td>
<td>File System: ext4</td>
</tr>
<tr>
<td>Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)</td>
<td>System State: Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Storage: 1 x 480 GB SATA SSD</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Peak Pointers: 64-bit</td>
</tr>
</tbody>
</table>

### Software

#### SPECrate2017_fp_base = 89.6

#### SPECrate2017_fp_peak = 91.7

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate2017_fp_base (89.6)</th>
<th>SPECrate2017_fp_peak (91.7)</th>
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<td>503.bwaves_r 32</td>
<td>75.8</td>
<td>111</td>
</tr>
<tr>
<td>507.cactuBSSN_r 32</td>
<td>75.8</td>
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<td>510.parest_r 32</td>
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<tr>
<td>511.povray_r 32</td>
<td>49.6</td>
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</tr>
<tr>
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</tr>
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<td>521.wrf_r 32</td>
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<td>526.blender_r 32</td>
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<td>538.imagick_r 32</td>
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<td>544.nab_r 32</td>
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<td>549.fotonik3d_r 32</td>
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<td>554.roms_r 32</td>
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<td>132</td>
</tr>
<tr>
<td>214</td>
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</table>

**Note:**
- All SPEC benchmarks were tested with the following compiler configurations:
  - 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
- The system was tested with Ubuntu 18.04.2 LTS kernel 4.15.0-45-generic.
- The firmware version was 2.1.6 released Mar-2019.
### Results Table

<table>
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<tr>
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<th>Ratio</th>
<th>Seconds</th>
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<td>41.0</td>
<td>1240</td>
<td>41.0</td>
</tr>
</tbody>
</table>

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

Prior to runcpu invocation
## Dell Inc.

### PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
</tr>
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<tbody>
<tr>
<td>89.6</td>
<td>91.7</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>Test Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>Mar-2019</td>
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</table>

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Hardware Availability:</th>
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</thead>
<tbody>
<tr>
<td>Dell Inc.</td>
<td>Apr-2019</td>
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<table>
<thead>
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<th>Software Availability:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Inc.</td>
<td>Feb-2019</td>
</tr>
</tbody>
</table>

### General Notes (Continued)

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 enabled
- 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 Fri Mar 29 00:28:23 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) Silver 4215 CPU @ 2.50GHz
  2 "physical id"s (chips)
  32 "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 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
CPU(s): 32
```

(Continued on next page)
SPEC CPU2017 Floating Point Rate Result

Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

SPECrate2017_fp_base = 89.6

SPECrate2017_fp_peak = 91.7

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Spec CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

SPECrate2017_fp_base = 89.6

SPECrate2017_fp_peak = 91.7

CPU2017 License: 55
Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Platform Notes (Continued)

On-line CPU(s) list: 0-31
Thread(s) per core: 2
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) Silver 4215 CPU @ 2.50GHz
Stepping: 6
CPU MHz: 2301.258
BogoMIPS: 5000.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
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 dts
lms constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref perfcte cpuid_fault epb cat_l13 cdp_l13 invpcid_single ssbd mba ibrs
ibpb stibp ibrs_enhanced tpr_shadow vnum flexpriority ept vpid fsgsbase tsc_adjust
bmi1 hle avx2 smep bmi2 ets invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx
smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaves cqm_llc cqm_occu sllc
qcm_mbm_total qcm_mbm_local dtherm ida arat pln pts kpu ospke avx512_vnni flush_l1d
arch_capabilities

/platform/cpupinfo 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 16 18 20 22 24 26 28 30
    node 0 size: 96091 MB
    node 0 free: 95245 MB
    node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
    node 1 size: 96764 MB
    node 1 free: 95966 MB
    node distances:
    node 0 1
                0: 10 21
                1: 21 10

(Continued on next page)
**Dell Inc.**

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

**SPEC CPU2017 Floating Point Rate Result**

*SPECrate2017_fp_base = 89.6*

*SPECrate2017_fp_peak = 91.7*

---

**Platform Notes (Continued)**

From `/proc/meminfo`

MemTotal: 197484452 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 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 UTC 2019 x86_64
ox86_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 Mar 28 15:46

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 439G 19G 398G 5% /

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. 2.1.6 03/04/2019

Memory:
11x 002C069D002C 18ASF2G72PD2-2G9E1 16 GB 2 rank 2933, configured at 2400
1x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933, configured at 2400
4x Not Specified Not Specified

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

SPECrate2017_fp_base = 89.6
SPECrate2017_fp_peak = 91.7

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.
Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)
(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.
==============================================================================
CC  519.lbm_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.
==============================================================================
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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Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
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==============================================================================
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 19.0.1.144 Build 20181018
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.
==============================================================================
(Continued on next page)
Compiler Version Notes (Continued)

==============================================================================

CC   511.povray_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.
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) 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.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Intel(R) Fortran 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   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)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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FC  554.roms_r(peak)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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CC  521.wrf_r(base) 527.cam4_r(base)
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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
(Continued on next page)
### Compiler Version Notes (Continued)

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

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

(Continued on next page)
SPEC CPU2017 Floating Point Rate Result

Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

SPECrate2017_fp_base = 89.6
SPECrate2017_fp_peak = 91.7

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Mar-2019
Tested by: Dell Inc.
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Base Portability Flags (Continued)

511.povray_r: -DSPEC_LP64
519.stem_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
-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
**Dell Inc.**
PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

### 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

### 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
```

(Continued on next page)
**SPEC CPU2017 Floating Point Rate Result**

Dell Inc.  
PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

### Peak Optimization Flags (Continued)

- **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:**

- **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 -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++:**

- **511.povray_r**: -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


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

### SPEC CPU2017 Floating Point Rate Result

**Dell Inc.**

PowerEdge C6420 (Intel Xeon Silver 4215, 2.50GHz)

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