## Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

**SPECrate2017_fp_base = 178**  
**SPECrate2017_fp_peak = 183**

### Hardware

<table>
<thead>
<tr>
<th>Software</th>
<th></th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU Name:</strong> Intel Xeon Gold 5218</td>
<td><strong>Max MHz.:</strong> 3900</td>
<td><strong>Nominal:</strong> 2300</td>
</tr>
<tr>
<td><strong>Enabled:</strong> 32 cores, 2 chips, 2 threads/core</td>
<td><strong>Orderable:</strong> 1.2 chips</td>
<td><strong>Cache L1:</strong> 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td><strong>Orderable:</strong> 32 cores, 2 chips, 2 threads/core</td>
<td><strong>Other:</strong> None</td>
<td><strong>L2:</strong> 1 MB I+D on chip per core</td>
</tr>
<tr>
<td><strong>Cache L2:</strong> 22 MB I+D on chip per chip</td>
<td><strong>Other:</strong> None</td>
<td><strong>L3:</strong> 22 MB I+D on chip per chip</td>
</tr>
<tr>
<td><strong>Memory:</strong> 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)</td>
<td><strong>Storage:</strong> 1 x 480 GB SATA SSD</td>
<td><strong>Other:</strong> None</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>OS: Ubuntu 18.04.2 LTS</th>
<th><strong>Compiler:</strong> C/C++: Version 19.0.1.144 of Intel C/C++</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compiler Build 20181018 for Linux;</strong></td>
<td><strong>Fortran:</strong> Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td><strong>Compiler Build 20181018 for Linux</strong></td>
<td><strong>Firmware:</strong> Version 2.1.6 released Mar-2019</td>
</tr>
<tr>
<td><strong>File System:</strong> ext4</td>
<td><strong>System State:</strong> Run level 5 (multi-user)</td>
</tr>
<tr>
<td><strong>Base Pointers:</strong> 64-bit</td>
<td><strong>Peak Pointers:</strong> 64-bit</td>
</tr>
<tr>
<td><strong>Other:</strong> None</td>
<td><strong>Other:</strong> None</td>
</tr>
</tbody>
</table>

---

**Test Sponsor:** Dell Inc.  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019
SPEC CPU2017 Floating Point Rate Result

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

SPECrate2017_fp_base = 178
SPECrate2017_fp_peak = 183

Results Table

<table>
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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
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<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>64</td>
<td>1408</td>
<td>456</td>
<td>1409</td>
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<td>1411</td>
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<td>1412</td>
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<td>1417</td>
<td>453</td>
<td>1413</td>
<td>454</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>64</td>
<td><strong>540</strong></td>
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<tr>
<td>508.namd_r</td>
<td>64</td>
<td>463</td>
<td>131</td>
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<td>132</td>
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<tr>
<td>510.parest_r</td>
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<td><strong>1569</strong></td>
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<td>538.imagick_r</td>
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<tr>
<td>554.roms_r</td>
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<td><strong>83.3</strong></td>
<td>1221</td>
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<td>1222</td>
<td>83.2</td>
<td>64</td>
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<td><strong>85.4</strong></td>
<td>1187</td>
<td>85.7</td>
<td>1194</td>
<td>85.2</td>
</tr>
</tbody>
</table>

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

Submit Notes

The numacl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numacl 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

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

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_peak</th>
<th>SPECrate2017_fp_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>183</td>
<td>178</td>
</tr>
</tbody>
</table>

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

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 9bcede8f2999c33d61f64985e45859ea9
running on intel-sut Thu Mar 21 01:59:27 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 5218 CPU @ 2.30GHz
  2 "physical id"s (chips)
  64 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following
certs from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From 1scpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64

(Continued on next page)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

**SPECrate2017_fp_base = 178**

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**Platform Notes (Continued)**

- On-line CPU(s) list: 0-63
- Thread(s) per core: 2
- Core(s) per socket: 16
- Socket(s): 2
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 5218 CPU @ 2.30GHz
- Stepping: 6
- CPU MHz: 3733.368
- BogoMIPS: 4600.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 22528K

NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63

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 aperfmperf 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 vmmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  ernes invpccid rtm cqm mpx rdtd_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsaves cgx_lcc cgx_occup_llc cgx_mbb_total cgx_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

```
From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60
node 0 size: 46784 MB
node 0 free : 46226 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
node 1 size: 48380 MB
node 1 free : 47806 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
node 2 size: 48380 MB
```

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)   SPECrate2017_fp_base = 178

SPECrate2017_fp_peak = 183

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

Platform Notes (Continued)

node 2 free: 47951 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63
node 3 size: 48358 MB
node 3 free: 47830 MB
node distances:
node 0 1 2 3
0: 10 21 11 21
1: 21 10 21 11
2: 11 21 10 21
3: 21 11 21 10

From /proc/meminfo
MemTotal: 196511040 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/us/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
  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 Mar 20 16:15

SPEC is set to: /home/cpu2017

(Continued on next page)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

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Platform Notes (Continued)

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:
1x 002C069D002C 18ASF2G72FDZ-2G9E1 16 GB 2 rank 2933, configured at 2666
1x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933, configured at 2666
4x 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)
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,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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CXXC 508.namd_r(peak)
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(Continued on next page)
Dell Inc.  

PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)  

**SPEC CPU2017 Floating Point Rate Result**

**CPU2017 License:** 55  
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**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
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### Compiler Version Notes (Continued)

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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,
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FC  507.cactuBSSN_r(base, peak)
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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,
   Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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.

------------------------------
FC  554.roms_r(peak)
------------------------------
(Continued on next page)```

**SPECrate2017_fp_base = 178**

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Compiler Version Notes (Continued)

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.

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
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5218, 2.30GHz)

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<td>Software Availability: Feb-2019</td>
</tr>
</tbody>
</table>

### 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 -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:
```sh
icc -m64 -std=c11
```

C++ benchmarks:
```sh
icpc -m64
```

Fortran benchmarks:
```sh
ifort -m64
```

Benchmarks using both Fortran and C:
```sh
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:
```sh
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```sh
icpc -m64 icc -m64 -std=c11 ifort -m64
```

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:
```sh
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
```

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

```sh
544.nab_r: Same as 538.imagick_r
```

C++ benchmarks:
```sh
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
```
## 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:

- `-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` `-auto -nostandard-realloc-lhs` `-align array32byte`

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:


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 Gold 5218, 2.30GHz)

<table>
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<th>SPECrate2017_fp_peak = 183</th>
<th>SPECrate2017_fp_base = 178</th>
</tr>
</thead>
</table>

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

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

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