# SPEC® CPU2017 Floating Point Rate Result

## Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4216, 2.10GHz)  

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base = 163</th>
<th>SPECrate2017_fp_peak = 168</th>
</tr>
</thead>
</table>

### CPU2017 License: 55

Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: May-2019  
Hardware Availability: Apr-2019  
Software Availability: Feb-2019

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
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<tbody>
<tr>
<td>503.bwaves_r 64</td>
<td>132</td>
<td>421</td>
</tr>
<tr>
<td>507.cacluBSSN_r 64</td>
<td>131</td>
<td>420</td>
</tr>
<tr>
<td>508.namd_r 64</td>
<td>112</td>
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</tr>
<tr>
<td>510.parest_r 64</td>
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<tr>
<td>511.povray_r 64</td>
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<td>519.lbm_r 64</td>
<td>95.4</td>
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<td>521.wrf_r 64</td>
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<td>526.blender_r 64</td>
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<td>527.cam4_r 64</td>
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<td>538.imagick_r 64</td>
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<td>376</td>
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<td>544.nab_r 64</td>
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<td>549.fotonik3d_r 64</td>
<td>135</td>
<td>272</td>
</tr>
<tr>
<td>554.roms_r 64</td>
<td>135</td>
<td>273</td>
</tr>
</tbody>
</table>

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## Hardware

<table>
<thead>
<tr>
<th>CPU Name: Intel Xeon Silver 4216</th>
<th>OS: Ubuntu 18.04.2 LTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz.: 3200</td>
<td>kernel 4.15.0-45-generic</td>
</tr>
<tr>
<td>Nominal: 2100</td>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td>Enabled: 32 cores, 2 chips, 2 threads/core</td>
<td>Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
<td>Fortran Build 20181018 for Linux</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>Parallel: No</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td>Firmware: Version 2.2.6 released Apr-2019</td>
</tr>
<tr>
<td>L3: 22 MB I+D on chip per chip</td>
<td>File System: ext4</td>
</tr>
<tr>
<td>Other: None</td>
<td>System State: Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Storage: 1 x 1.6 TB NVMe SSD</td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Other: None</td>
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## Software

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- May-2019

### Hardware Availability:

- Apr-2019

### Software Availability:

- Feb-2019
SPEC CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4216, 2.10GHz)

SPECrate2017_fp_base = 163

SPECrate2017_fp_peak = 168

Results Table

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SPECrate2017_fp_base = 163

SPECrate2017_fp_peak = 168

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.

(Continued on next page)
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 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 May 8 20:46:03 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 4216 CPU @ 2.10GHz
  2 "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: 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 lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
Dell Inc.  

PowerEdge T640 (Intel Xeon Silver 4216, 2.10GHz)  

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CPU2017 License: 55  
Test Sponsor:  Dell Inc.  
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Test Date:  May-2019  
Hardware Availability:  Apr-2019  
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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) Silver 4216 CPU @ 2.10GHz
Stepping:  6
CPU MHz:  2728.704
BogoMIPS:  4200.00
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr 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 intel_pcin
ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid
fsgsbase tsc_adjust bitalg hle avx2 smep bmi2 erms invpcid rtm cqm mpx rd_t a avx512f
avx512dq rdseed adx clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaves opt xsaves xgetbv1 xsaves cqm_llc cqm_occu l1c cqm_mbb_total cqm_mbb_local
dtherm ida arat pln pts pkus ospke avx512_vnni flush_lld arch_capabilities

/pro/cpumodefined cache data
    cache size :  22528 KB

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:  95147 MB
    node 0 free:  94646 MB
    node 1 cpus:  1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
    node 1 size:  96764 MB
    node 1 free:  96259 MB
    node 2 cpus:  2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
    node 2 size:  96764 MB

(Continued on next page)
Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4216, 2.10GHz)

**SPEC CPU2017 Floating Point Rate Result**

**SPECrate2017_fp_peak = 168**

**SPECrate2017_fp_base = 163**

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**Platform Notes (Continued)**

- node 2 free: 96293 MB  
- node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63  
- node 3 size: 96742 MB  
- node 3 free: 96271 MB  
- node distances:
  - node 0: 10 21 11 21  
  - node 1: 21 10 21 11  
  - node 2: 11 21 10 21  
  - node 3: 21 11 21 10  

From /proc/meminfo

- MemTotal: 394670420 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 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 8 14:13

SPEC is set to: /home/cpu2017

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/nvme0n1p2 ext4</td>
<td>439G</td>
<td>19G</td>
<td>398G</td>
<td>5%</td>
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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. 2.2.6 04/16/2019

Memory:
- 12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400
- 12x Not Specified Not Specified

(End of data from sysinfo program)

**Compiler Version Notes**

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**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 20180108
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 20180108
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 20180108
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,
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64, Version 19.0.1.144 Build 20181018  
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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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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.
```

**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
```
SPEC CPU2017 Floating Point Rate Result

Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4216, 2.10GHz)

SPECrate2017_fp_base = 163
SPECrate2017_fp_peak = 168

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

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
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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)
**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

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 T640 (Intel Xeon Silver 4216, 2.10GHz)

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