# SPEC® CPU2017 Floating Point Rate Result

## Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6244, 3.60GHz)

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate2017_fp_base = 147</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
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<td>32</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>32</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6244
- **Max MHz.:** 4400
- **Nominal:** 3600
- **Enabled:** 16 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **Cache L2:** 1 MB I+D on chip per core
- **Cache L3:** 24.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (12 x 32 GB 2Rx8 PC4-2933Y-R)
- **Storage:** 1 x 480 GB SATA SSD
- **Other:** None

**Software**

- **OS:** Ubuntu 18.04.2 LTS
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++
- **Parallel:** No
- **System State:** Run level 5 (multi user)
- **Base Pointers:** 64-bit
- **Other:** None
- **Firmware:** Version 2.1.7 released Apr-2019
- **File System:** ext4
- **Peak Pointers:** 64-bit
- **Other:** None
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<table>
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<tr>
<th>Benchmark</th>
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**Results Table**

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<td>86.1</td>
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</tbody>
</table>

**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

Yes: 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.

Prior to runcpu invocation

Filesystem page cache synced and cleared with:

(Continued on next page)
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** Apr-2019  
**Hardware Availability:** Apr-2019  
**Tested by:** Dell Inc.  
**Software Availability:** Feb-2019

**General Notes (Continued)**

```bash
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 Apr 10 19:05:50 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
```plaintext
model name : Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz  
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 2 3 4 9 17 18 25 27
  physical 1: cores 2 3 4 9 17 18 25 27
```

From lscpu:
```plaintext
Architecture:      x86_64
CPU op-mode(s):   32-bit, 64-bit
Byte Order:       Little Endian
CPU(s):           32
On-line CPU(s) list: 0-31
```

(Continued on next page)
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Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
Stepping: 6
CPU MHz: 2416.294
BogoMIPS: 2416.294
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0,6,8,12,16,22,24,28
NUMA node1 CPU(s): 1,7,9,13,17,23,25,29
NUMA node2 CPU(s): 2,4,10,14,18,20,26,30
NUMA node3 CPU(s): 3,5,11,15,19,21,27,31

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts mpx cpl mxr vs nx pdm pae mce cmov cx8
<nonexistent flags>

/proc/cpuinfo cache data
cache size: 25344 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 6 8 12 16 22 24 28
node 0 size: 95169 MB
node 0 free: 94771 MB
node 1 cpus: 1 7 9 13 17 23 25 29
node 1 size: 96766 MB
node 1 free: 96373 MB
node 2 cpus: 2 4 10 14 18 20 26 30
node 2 size: 96766 MB
node 2 free: 96359 MB

(Continued on next page)
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Platform Notes (Continued)

node 3 cpus: 3 5 11 15 19 21 27 31
node 3 size: 96744 MB
node 3 free: 96289 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: 394698224 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 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 Apr 10 14:49

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/sda2</td>
<td>ext4</td>
<td>439G</td>
<td>27G</td>
<td>390G</td>
<td>7%</td>
<td>/</td>
</tr>
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Additional information from dmidecode follows. WARNING: Use caution when you interpret

(Continued on next page)
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Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)

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. 2.1.7 04/03/2019
Memory:
12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
12x 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.
------------------------------------------------------------------------------
==============================================================================
CC   519.lbm_r(peak)
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==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base, peak)
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### Compiler Version Notes (Continued)

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---

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CC  521.wrf_r(base) 527.cam4_r(base)
```

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```
CC   521.wrf_r(peak) 527.cam4_r(peak)
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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`
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### 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)
SPEC CPU2017 Floating Point Rate Result

Dell Inc.
PowerEdge R640 (Intel Xeon Gold 6244, 3.60GHz)

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

SPECrate2017_fp_base = 147
SPECrate2017_fp_peak = 151

Test Date: Apr-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++:

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 R640 (Intel Xeon Gold 6244, 3.60GHz)

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<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
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<td>147</td>
<td>151</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Apr-2019  
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Tested with SPEC CPU2017 v1.0.5 on 2019-04-10 15:05:50-0400.  