# SPEC CPU® 2017 Floating Point Rate Result

## Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

<table>
<thead>
<tr>
<th>Test Sponsor: Dell Inc.</th>
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<td>Tested by: Dell Inc.</td>
<td>Hardware Availability: Feb-2020</td>
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### SPECrate® 2017 FP Results

- **SPECrate® 2017_fp_base = 261**
- **SPECrate® 2017_fp_peak = 281**

### Hardware

- **CPU Name:** Intel Xeon Gold 6248R
- **Max MHz:** 4000
- **Nominal:** 3000
- **Enabled:** 48 cores, 2 chips, 2 threads/core
- **Orderable:** 1, 2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 1 MB I+D on chip per core
- **L3:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP1
  - kernel 4.12.14-195-default
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
  - Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- **Parallel:** No
- **Firmware:** Version 2.5.4 released Jan-2020
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

### Copy Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate® 2017_fp_base</th>
<th>SPECrate® 2017_fp_peak</th>
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<td>503.bwaves_r</td>
<td>96</td>
<td>238</td>
<td>546</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<tr>
<td>544.nab_r</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>140</td>
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**SPEC CPU 2017 License:** 55

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**Software Availability:** Jun-2019

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**Software Availability:** Jun-2019
Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)  

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<td>105</td>
<td>48</td>
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</tr>
</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"

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.
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

Test Date: Jan-2020
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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:
Sub NUMA Cluster enabled
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 set to standard
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f88a3d7edble6e46a485a0011
running on linux-g3ob Tue Jan 21 21:59:18 2020

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 6248R CPU @ 3.00GHz
2 "physical id"s (chips)
96 "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 : 24
siblings : 48
physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

(Continued on next page)
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SPECrater®2017_fp_peak = 281

CPU2017 License: 55
Test Sponsor: Dell Inc.
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Platform Notes (Continued)

physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 46 bits physical, 48 bits virtual
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6248R CPU @ 3.00GHz
Stepping: 7
CPU MHz: 3000.000
BogoMIPS: 6000.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92
NUMA node1 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93
NUMA node2 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94
NUMA node3 CPU(s):
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 tsc_deadline_timer aes xsave
    avx f16c rdrand lahf_lm abmlong mcmov pkTransactional msr anon MSR bps rep_good nopl xtopology nonstop_tsc cpuid
    epb cat L3 cdp L3
    invpcid_single intel_pda iiss mba ibrs ibpd stibp ibrs_enhanced tpr_shadow vnmi
    flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invvpid rtm
    cmqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
    avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaveas cmqm llc cmq_occus llc cmq_mbt_total
    cmq_mbt_local dtherm ida arat pfn pts pku ospke avx512_vnni md_clear flush_l1d
    arch_capabilities

/proc/cpuinfo cache data

(Continued on next page)
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Platform Notes (Continued)

cache size : 36608 KB

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

From numactl --hardware available: 4 nodes (0-3)
node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92
node 0 size: 95303 MB
node 0 free: 94631 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93
node 1 size: 96733 MB
node 1 free: 96314 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94
node 2 size: 96763 MB
node 2 free: 96250 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95
node 3 size: 96761 MB
node 3 free: 96222 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: 394816452 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
  NAME="SLES"
  VERSION="15-SP1"
  VERSION_ID="15.1"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-g3ob 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2018-3620 (L1 Terminal Fault): Not affected

(Continued on next page)
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Platform Notes (Continued)

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: __user pointer sanitization  
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Jan 21 10:16 last=5

SPEC is set to: /home/cpu2017  
Filesystem     Type  Size  Used Avail Use% Mounted on  
/dev/sda2      xfs   440G   48G  393G  11% /

From /sys/devices/virtual/dmi/id  
BIOS: Dell Inc. 2.5.4 01/13/2020  
Vendor: Dell Inc.  
Product: PowerEdge R740xd  
Product Family: PowerEdge  
Serial: F5BLCS2

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:  
2x 002C069D002C 18ASF2G72PDZ-2G9E1 16 GB 2 rank 2933  
7x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933  
3x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933  
12x 00AD069D00AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(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)  
==============================================================================

(Continued on next page)
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**Compiler Version Notes (Continued)**

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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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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
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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, Fortran | 507.cactuBSSN_r(base, peak)
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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.

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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,
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Compiler Version Notes (Continued)

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

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
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**SPECrate®2017 fp_base = 261**  
**SPECrate®2017 fp_peak = 281**

**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:
- `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`

(Continued on next page)
Peak Compiler Invocation (Continued)

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: basepeak = yes

544.nab_r: basepeak = yes

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: basepeak = yes

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

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

PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)  

**SPECrate®2017_fp_base = 261**  
**SPECrate®2017_fp_peak = 281**

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<th>Test Date: Jan-2020</th>
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<td>Hardware Availability: Feb-2020</td>
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<tr>
<td>Tested by: Dell Inc.</td>
<td>Software Availability: Jun-2019</td>
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**Peak Optimization Flags (Continued)**

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++:

507.cactuBSSN_r:  
- `basepeak = yes`

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:


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