## SPEC CPU®2017 Floating Point Rate Result

**Dell Inc.**

PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 248</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak = 266</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Date:** Jan-2020  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Hardware Availability:** Feb-2020  
**Software Availability:** Jun-2019

### Hardware

- **CPU Name:** Intel Xeon Gold 6238R  
- **Max MHz:** 4000  
- **Nominal:** 2200  
- **Enabled:** 56 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:** 38.5 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

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP1  
- **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  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Results

<table>
<thead>
<tr>
<th>Test Program</th>
<th>Copies</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>112</td>
<td>230</td>
<td>266</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>112</td>
<td>230</td>
<td>250</td>
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<td>508.namd_r</td>
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<td>544.nab_r</td>
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<td>549.fotonik3d_r</td>
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<td>554.roms_r</td>
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**Copies**

- **SPECrate®2017_fp_base (248)**  
- **SPECrate®2017_fp_peak (266)**
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz)  

SPECrate®2017_fp_base = 248  
SPECrate®2017_fp_peak = 266

Results Table

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<td>1794</td>
<td>99.2</td>
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</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"

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.

(Continued on next page)
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

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
running on linux-g3ob Tue Jan 14 21:26:57 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 6238R CPU @ 2.20GHz
  2  "physical id"s (chips)
112 "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 : 28
  siblings : 56
  physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz)

SPECrater®2017_fp_base = 248
SPECrater®2017_fp_peak = 266

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

Test Date: Jan-2020
Hardware Availability: Feb-2020
Software Availability: Jun-2019

Platform Notes (Continued)

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): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 2200.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K

NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108

NUMA node1 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109

NUMA node2 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102,106,110

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 pdpeslb rdtsscp
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
xtrp pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpx cat_l3 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnumi
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsxavaleopt xsaveopt xsavec xgetbv1 xsavees cqm_llc cqm_occup_llc
cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
arch_capabilitlies

/proc/cpuinfo cache data

 cache size : 39424 KB

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz)

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Copyright 2017-2020 Standard Performance Evaluation Corporation

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Test Date: Jan-2020
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Platform Notes (Continued)

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 64 68 72 76 80 84 88 92 96 100 104 108
node 0 size: 95302 MB
node 0 free: 81173 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 97 101 105 109
node 1 size: 96762 MB
node 1 free: 85161 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 98 102 106 110
node 2 size: 96733 MB
node 2 free: 84877 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 99 103 107 111
node 3 size: 96761 MB
node 3 free: 85160 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: 394813440 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:

(Continued on next page)
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Platform Notes (Continued)

CVE-2018-3620 (L1 Terminal Fault): Not affected
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 14 14:20 last=5

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 440G 120G 321G 28% /

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 18ASF2G72PD2-2G9E1 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.

(Continued on next page)
Dell Inc. | PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz) | SPECrate\textsuperscript{\textregistered}2017\_fp\_base = 248
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| Test Sponsor: Dell Inc. | Hardware Availability: Feb-2020 |
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### Compiler Version Notes (Continued)

| C++, C++ | 508.namd\_r(base, peak) 510.parest\_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++, 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) |
| 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. |

| 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 |
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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.

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.cactusBSSN_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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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)
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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: basepeak = yes
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(pass1) -prof-use(pass2) -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: Same as 503.bwaves_r
554.roms_r: -prof-gen(pass1) -prof-use(pass2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -norelease -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:
-prof-gen(pass1) -prof-use(pass2) -ipo -xCORE-AVX2 -O3

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238R, 2.20 GHz)

SPECrate®2017_fp_base = 248
SPECrate®2017_fp_peak = 266

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Jan-2020
Hardware Availability: Feb-2020
Tested by: Dell Inc.
Software Availability: Jun-2019

Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
- 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: basepeak = yes

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:

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