Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

<table>
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<th>SPECrate2017_fp_peak</th>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Jul-2019  
**Hardware Availability:** Jun-2019  
**Software Availability:** Feb-2019

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**CPU Name:** Intel Xeon Gold 6238  
**Max MHz.:** 3700  
**Nominal:** 2100  
**Enabled:** 44 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:** 30.25 MB I+D on chip per chip  
**Other:** None  
**Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)  
**Storage:** 1 x 960 GB SATA SSD  
**Other:** None

**OS:** Ubuntu 18.04.2 LTS  
**Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++  
**Compiler Build:** 20181018 for Linux  
**Fortran:** Version 19.0.1.144 of Intel Fortran  
**Compiler Build:** 20181018 for Linux  
**System State:** Run level 5 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 64-bit  
**Other:** None

**Parallel:** No  
**Firmware:** Version 2.2.11 released Jun-2019  
**File System:** ext4
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_fp_base = 224
SPECrate2017_fp_peak = 230

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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
Prior to runcpu invocation

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_fp_base = 224
SPECrate2017_fp_peak = 230

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.
Test Date: Jul-2019
Hardware Availability: Jun-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>

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
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on intel-sut Sun Jul 7 16:56:32 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 6238 CPU @ 2.10GHz
 2 "physical id"s (chips)
 88 "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 : 22
siblings : 44
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
  physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 88
On-line CPU(s) list: 0-87

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPEC CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECrate2017_fp_base = 224
SPECrate2017_fp_peak = 230

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

Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: Feb-2019

Platform Notes (Continued)

Thread(s) per core: 2
Core(s) per socket: 22
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
Stepping: 7
CPU MHz: 1206.180
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 30976K
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
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
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
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 nospm xtopology nonstop_tsc
  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 nospm xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtstes64 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 3nowprefetch cpuid_f
  auent epb cat_l3 cdp_l3 invpcid_single intel_pplin ssbd mba ibrs ibpb ibrs_enh
  nced tpr_shadow vnmi 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 xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm Occup_llc cqm_mbb_total
  cqm_mbb_local dtherm ida arat pln pts pkus ospke avx512_vnni flush llid
  arch_capabilities

/proc/cpuinfo cache data
  cache size : 30976 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 64 68 72 76 80 84
  node 0 size: 95146 MB
  node 0 free: 94385 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
  node 1 size: 96763 MB
  node 1 free: 95846 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
  node 2 size: 96763 MB
  node 2 free: 96006 MB

(Continued on next page)
Platform Notes (Continued)

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
node 3 size: 96741 MB
node 3 free: 96018 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: 394665480 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
  IDLIKE=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 Jul 5 15:05

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 439G 24G 393G 6% /

Additional information from dmidecode follows. WARNING: Use caution when you interpret
## Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

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

### SPEC CPU2017 Floating Point Rate Result

- **SPECrate2017_fp_base** = 224
- **SPECrate2017_fp_peak** = 230

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**Platform Notes (Continued)**

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. 2.2.11 06/13/2019

Memory:
- 12x 00AD00B300AD 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)
------------------------------------------------------------------------------
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.
------------------------------------------------------------------------------
==============================================================================
CXXC 508.namd_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.
------------------------------------------------------------------------------
==============================================================================
CC  511.povray_r(base) 526.blender_r(base, peak)
(Continued on next page)
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Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)  

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

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<td>Jun-2019</td>
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Compiler Version Notes (Continued)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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(Continued on next page)
## Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

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### Compiler Version Notes (Continued)

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```
CC  521.wrf_r(base) 527.cam4_r(base)
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.
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  521.wrf_r(peak) 527.cam4_r(peak)
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.
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 ifort -m64
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```
## Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tr>
<td>503.bwaves_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>508.namd_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>510.parest_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>511.povray_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>519.lbm_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX -funsigned-char</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>544.nab_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>554.roms_r</td>
<td>-DSPEC_LP64</td>
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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
SPEC CPU2017 Floating Point Rate Result

Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_fp_base = 224
SPECrate2017_fp_peak = 230

Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

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 -03
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

538.imagick_r: -xCORE-AVX2 -ipo -03 -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 -03
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

**SPECrate2017_fp_base** = 224

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**Hardware Availability:** Jun-2019
**Software Availability:** Feb-2019

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**Peak Optimization Flags (Continued)**

510.parest_r: -xCORE-AVX2 -ipo -03 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -03 -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 -03 -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 -03 -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 -03 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX2 -ipo -03 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -03 -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:


## Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

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