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

### SPECrate2017_int_base = 245
### SPECrate2017_int_peak = 256

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

<table>
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<tr>
<th>Copies</th>
<th>SPECrate2017_int_base</th>
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<td>750</td>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6238  
- **Max MHz.:** 3700  
- **Nominal:** 2100  
- **Enabled:** 44 cores, 2 chips, 2 threads/core  
- **Orderable:** 2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 1 MB I+D on chip per core  
- **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

**Software**

- **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  
- **Parallel:** No  
- **Firmware:** Version 2.2.11 released Jun-2019  
- **File System:** ext4  
- **System State:** Run level 5 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:** jemalloc memory allocator V5.0.1
Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>486</td>
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<td>196</td>
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<td>190</td>
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<td>748</td>
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<td>548.exchange2_r</td>
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<td>437</td>
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<td>527</td>
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<td>557.xz_r</td>
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<td>167</td>
<td>88</td>
<td>570</td>
</tr>
</tbody>
</table>

SPECrate2017_int_base = 245
SPECrate2017_int_peak = 256

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:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

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
Filesystem page cache synced and cleared with:
  sync; echo 3 > /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:

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

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>245</th>
</tr>
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<tbody>
<tr>
<td>SPECrate2017_int_peak</td>
<td>256</td>
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</table>

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)

numactl --interleave=all runcpu <etc>
jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  

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  
Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
runtime on intel-sut Sun Jul 7 10:48:17 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

<table>
<thead>
<tr>
<th>model name</th>
<th>: Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 &quot;physical id&quot;s (chips)</td>
</tr>
<tr>
<td></td>
<td>88 &quot;processors&quot;</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Architecture:</th>
<th>x86_64</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU op-mode(s):</td>
<td>32-bit, 64-bit</td>
</tr>
<tr>
<td>Byte Order:</td>
<td>Little Endian</td>
</tr>
<tr>
<td>CPU(s):</td>
<td>88</td>
</tr>
<tr>
<td>On-line CPU(s) list:</td>
<td>0-87</td>
</tr>
</tbody>
</table>

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_int_base = 245
SPECrate2017_int_peak = 256

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: 1335.535
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 nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xptr pdcm pcd dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_pni
ssbd mba ibrs ibsp stibp ibrs_enabled tpr_shadow vnumi flexpriority ept vpid
fs_base tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cqm mpx rdt_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local
dtherm ida arat pln pts pkg ospe avx512_vnni flush_l1d arch_capabilities

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: 94489 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: 95937 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: 96128 MB

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_int_base = 245
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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: 96127 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
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 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 (Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

**SPEC CPU2017 Integer Rate Result**

<table>
<thead>
<tr>
<th>SPECrate2017_int_peak</th>
<th>SPECrate2017_int_base</th>
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<tbody>
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**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. 2.2.11 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  502.gcc_r(peak)
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

```
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_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  500.perlbench_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 523.xalancbmk_r(peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

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

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Compiler Version Notes (Continued)

CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_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.

FC 548.exchange2_r(base, 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.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
### Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

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</tbody>
</table>

#### Base Optimization Flags

C benchmarks:
- `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

C++ benchmarks:
- `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

Fortran benchmarks:
- `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

#### Peak Compiler Invocation

C benchmarks (except as noted below):
- `icc -m64 -std=c11`


C++ benchmarks (except as noted below):
- `icpc -m64`

523.xalancbmk_r: `icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin`

Fortran benchmarks:
- `ifort -m64`

#### Peak Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-D_FILE_OFFSET_BITS=64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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Peak Portability Flags (Continued)

531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:
500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

502.gcc_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

525.x264_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:
520.omnetpp_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

523.xalancbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6238, 2.10GHz)

SPECrate2017_int_base = 245
SPECrate2017_int_peak = 256

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

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

Peak Optimization Flags (Continued)

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout=trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.5 on 2019-07-07 06:48:16-0400.
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