### Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>Dell Inc.</th>
<th>Specrate2017_int_peak</th>
<th>Test Sponsor: Dell Inc.</th>
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<tbody>
<tr>
<td>176</td>
<td>Dell Inc.</td>
<td>181</td>
<td>Dell Inc.</td>
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**CPU2017 License:** 55  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019

<table>
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<tr>
<th>Software Availability: Feb-2019</th>
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</table>

- **500.perlbench_r** 64  
- **502.gcc_r** 64  
- **505.mcf_r** 64  
- **520.omnetpp_r** 64  
- **523.xalancbmk_r** 64  
- **525.x264_r** 64  
- **531.deepsjeng_r** 64  
- **541.leela_r** 64  
- **548.exchange2_r** 64  
- **557.xz_r** 64

#### Hardware

<table>
<thead>
<tr>
<th>CPU Name</th>
<th>Intel Xeon Silver 4216</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz.</td>
<td>3200</td>
</tr>
<tr>
<td>Nominal</td>
<td>2100</td>
</tr>
<tr>
<td>Enabled</td>
<td>32 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>22 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</tbody>
</table>

#### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Ubuntu 18.04.2 LTS</th>
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</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler Build:</td>
<td>20181018 for Linux;</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Fortran: Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td>File System:</td>
<td>ext4</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 5 (multi user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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</tbody>
</table>
SPEC CPU2017 Integer Rate Result

Dell Inc.
PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

SPECrate2017_int_base = 176
SPECrate2017_int_peak = 181

Results Table

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<tr>
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<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>64</td>
<td>749</td>
<td>136</td>
<td>752</td>
<td>136</td>
<td>64</td>
<td>656</td>
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<tr>
<td>502.gcc_r</td>
<td>64</td>
<td>613</td>
<td>148</td>
<td>610</td>
<td>149</td>
<td>64</td>
<td>544</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>64</td>
<td>441</td>
<td>235</td>
<td>441</td>
<td>235</td>
<td>64</td>
<td>443</td>
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<tr>
<td>520.omnetpp_r</td>
<td>64</td>
<td>699</td>
<td>120</td>
<td>698</td>
<td>120</td>
<td>64</td>
<td>700</td>
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<td>523.xalanbmk_r</td>
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<td>203</td>
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<td>203</td>
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<td>315</td>
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<tr>
<td>525.x264_r</td>
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<td>337</td>
<td>64</td>
<td>320</td>
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<tr>
<td>531.deepsjeng_r</td>
<td>64</td>
<td>504</td>
<td>146</td>
<td>503</td>
<td>146</td>
<td>64</td>
<td>503</td>
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<tr>
<td>541.leela_r</td>
<td>64</td>
<td>769</td>
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<td>770</td>
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<td>548.exchange2_r</td>
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<td>307</td>
<td>546</td>
<td>307</td>
<td>64</td>
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<td>557.xz_r</td>
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<td>119</td>
<td>582</td>
<td>119</td>
<td>64</td>
<td>582</td>
</tr>
</tbody>
</table>

SPECrate2017_int_base = 176
SPECrate2017_int_peak = 181

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
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:
 sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
umactl --interleave=all runcpu <etc>

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

SPECrate2017_int_base = 176

SPECrate2017_int_peak = 181

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

General Notes (Continued)

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:
ADDCD setting disabled
Sub NUMA Cluster enabled
Virtualization Technology disabled
DCU Streamer Prefetcher enabled
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 Mon Mar 11 20:51:30 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) Silver 4216 CPU @ 2.10GHz
2 "physical id"s (chips)
64 "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 : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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Platform Notes (Continued)

Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 2329.299
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60
NUMA node1 CPU(s): 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61
NUMA node2 CPU(s): 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62
NUMA node3 CPU(s): 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63
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 pdelgb 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 dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept_vpid fsgsbase tsc_adjust bmi1 hle axv2 smep bmi2 erts invpcid rtm cmp mbp rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavec qmmi qmovvec qmonitor q恤_mda q恤_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni flush_lld 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
node 0 size: 46784 MB
node 0 free: 46539 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
node 1 size: 48359 MB
node 1 free: 48141 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
node 2 size: 48380 MB
node 2 free: 48165 MB

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

SPECrate2017_int_base = 176
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CPU2017 License: 55
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Tested by: Dell Inc.

Test Date: Mar-2019
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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
node 3 size: 48379 MB
node 3 free: 30773 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: 196511028 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /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 Mar 11 20:01

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 439G 27G 390G 7% /

Additional information from dmidecode follows. WARNING: Use caution when you interpret

(Continued on next page)
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. 2.1.6 03/03/2019
Memory:
10x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666, configured at 2400
2x 00AD063200AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666, configured at 2400
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.
==============================================================================
Dell Inc.
PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

SPEC CPU2017 Integer Rate Result
Copyright 2017-2019 Standard Performance Evaluation Corporation

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

SPECrate2017_int_base = 176
SPECrate2017_int_peak = 181

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Compiler Version Notes (Continued)

CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_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 R640 (Intel Xeon Silver 4216 2.10GHz)**

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<td>Feb-2019</td>
</tr>
</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):**

```bash
data64 -std=c11
```

**502.gcc_r**

```bash
data64 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin
```

**C++ benchmarks (except as noted below):**

```bash
data64
```

**523.xalancbmk_r**

```bash
data64 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin
```

**Fortran benchmarks:**

```bash
data64
```

#### 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)
Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)

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

TEST DATE: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

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
-ndo-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)
**SPEC CPU2017 Integer Rate Result**

**Dell Inc.**

**PowerEdge R640 (Intel Xeon Silver 4216 2.10GHz)**

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

---

**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 2019-03-11 16:51:29-0400.  