# Dell Inc.

**PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)**

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>Dell Inc.</th>
</tr>
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<tbody>
<tr>
<td>SPECrate2017_int_base</td>
<td>170</td>
</tr>
<tr>
<td>SPECrate2017_int_peak</td>
<td>177</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** Intel Xeon Silver 4216  
  **Max MHz.:** 3200  
  **Nominal:** 2100  
  **Enabled:** 32 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:** 22 MB I+D on chip per chip  
  **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)  
  **Storage:** 1 x 480 GB SATA SSD  
  **Other:** None

## Software

- **OS:** Ubuntu 18.04.2 LTS  
  **Kernel:** 4.15.0-45-generic  
  **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  
  **Firmware:** Version 2.2.2 released Mar-2019  
  **File System:** ext4  
  **System State:** Run level 3 (multi-user)  
  **Base Pointers:** 64-bit  
  **Peak Pointers:** 32/64-bit  
  **Other:** jemalloc memory allocator V5.0.1

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  Peak Pointers: 32/64-bit  
  Other: jemalloc memory allocator V5.0.1

---

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

---

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

**PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)***

**SPECrate2017_int_base = 170**

**SPECrate2017_int_peak = 177**

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### Results Table

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**SPECrate2017_int_base = 170**

**SPECrate2017_int_peak = 177**

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 M640 (Intel Xeon Silver 4216, 2.10GHz)

SPECrate2017_int_base = 170
SPECrate2017_int_peak = 177

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)

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 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 Fri May 3 02:28:01 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

(Continued on next page)
## Platform Notes (Continued)

On-line CPU(s) list: 0–63  
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: 2854.820  
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 pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperffperf 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 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 vnni flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ermv invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsxsaveopt xsaves cqm_llc cqm_occurllc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni flush_lld arch_capabilities

```bash
/proc/cpuinfo cache data
    cache size : 22528 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
node 0 size: 95144 MB
node 0 free: 94768 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
node 1 size: 96764 MB
node 1 free: 96530 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
node 2 size: 96764 MB
### Dell Inc.

**PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)**

**SPECrate2017_int_peak** = 177  
**SPECrate2017_int_base** = 170

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

#### Platform Notes (Continued)

```
node 2 free: 96544 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63
node 3 size: 96763 MB
node 3 free: 96557 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:       394688844 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 3 May 3 02:27

**SPEC is set to:** /home/cpu2017

```
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      ext4  439G  19G  398G  5%  /
```

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

Dell Inc.

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

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

SPECrate2017_int_base = 170
SPECrate2017_int_peak = 177

Platform Notes (Continued)

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.

BIOS Dell Inc. 2.2.2 03/05/2019
Memory:
  6x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400
  6x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400
  4x 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) 507.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.
==============================================================================

==============================================================================
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)
## SPEC CPU2017 Integer Rate Result

**Dell Inc.**

PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

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CPU2017 License: 55  
Test Sponsor: Dell Inc.  
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### Compiler Version Notes (Continued)

```plaintext
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:  
```shell
icc -m64 -std=c11
```

C++ benchmarks:  
```shell
icpc -m64
```

Fortran benchmarks:  
```shell
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 M640 (Intel Xeon Silver 4216, 2.10GHz)

SPECrate2017_int_base = 170
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CPU2017 License: 55  Test Date: Mar-2019
Test Sponsor: Dell Inc.  Hardware Availability: Apr-2019
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Base Optimization Flags

C benchmarks:
- Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-ipo
-ipopt-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
-ipo
-ipopt-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
-ipo
-ipopt-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)
Dell Inc.
PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)  SPECrate2017_int_base = 170
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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 M640 (Intel Xeon Silver 4216, 2.10GHz)

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<table>
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<th>Test Date:</th>
<th>Mar-2019</th>
</tr>
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<td>Apr-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Feb-2019</td>
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</table>

### 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.

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