## Dell Inc.

PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
<td>119</td>
<td>120</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>82.0</td>
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| SPECspeed2017_fp_base (112) | SPECspeed2017_fp_peak (113) |

### Hardware

- **CPU Name:** Intel Xeon Silver 4216
- **Max MHz.:** 3200
- **Nominal:** 2100
- **Enabled:** 32 cores, 2 chips
- **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
- **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
- **Paralle:** Yes
- **Firmware:** Version 2.2.2 released Mar-2019
- **File System:** ext4
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
Dell Inc.  
PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)  

SPECspeed2017_fp_base = 112  
SPECspeed2017_fp_peak = 113  

Results Table

<table>
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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
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>
SPEC CPU2017 Floating Point Speed Result

Dell Inc.

PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

SPECspeed2017_fp_base = 112
SPECspeed2017_fp_peak = 113

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 disabled
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 Thu May 2 20:26:52 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)
  32 "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 : 16
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): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85

(Continued on next page)
# SPEC CPU2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

| SPECspeed2017_fp_base | 112 |
| SPECspeed2017_fp_peak | 113 |

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

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

---

### Platform Notes (Continued)

- **Model name:** Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
- **Stepping:** 6
- **CPU MHz:** 2710.945
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K  
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 22528K
- **NUMA node0 CPU(s):** 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
- **NUMA node1 CPU(s):** 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31

**Flags:**  
fpus vme de pse movun mce cmov mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant tsc arch_perfmon pebs bts rep_good xtopology nonstop tsc cpuid aperfmpref pni pclmulqdq dtes64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pclid 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 vini flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ertcp idt a50 f16q msr pdor tsc tsc_adjust model name: Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz  
stepping: 6  
cpu MHz: 2710.945  
bogomips: 4200.00  
virtualization: VT-x  
l1d cache: 32K  
l1i cache: 32K  
l2 cache: 1024K  
l3 cache: 22528K  
numa node0 cpu(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30  
numa node1 cpu(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31  
flags: fpu vme de pse movun mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant tsc arch_perfmon pebs bts rep_good xtopology nonstop tsc cpuid aperfmpref pni pclmulqdq dtes64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pclid 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 vini flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ertcp idt a50 f16q msr pdor tsc tsc_adjust

---

**From numactl --hardware WARNING:** a numactl 'node' might or might not correspond to a physical chip.

- available: 2 nodes (0-1)
- node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
- node 0 size: 191933 MB  
- node 0 free: 188999 MB  
- node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31  
- node 1 size: 193511 MB  
- node 1 free: 188485 MB  
- node distances:  
- node 0 1  
  0: 10 21  
  1: 21 10

---

**From /proc/meminfo**

- MemTotal: 394695596 kB  
- HugePages_Total: 0  
- Hugepagesize: 2048 kB

---

**/usr/bin/lsb_release -d**

Ubuntu 18.04.2 LTS

(Continued on next page)
### Dell Inc.

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

<table>
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<td>Dell Inc.</td>
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</tbody>
</table>

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

---

### Platform Notes (Continued)

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 2 14:42**

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

```
Filesystem  Type Size  Used Avail Use% Mounted on
/dev/sda2   ext4  439G   25G  392G   6% /
```

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  619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
```

(Continued on next page)
## 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  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

FC 607.cactuBSSN_s(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.  
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.  
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.

---

FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base, peak)

---

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
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FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
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---

CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

---

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
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| CPU2017 License: | 55 |
| Test Sponsor:   | Dell Inc. |
| Tested by:      | Dell Inc. |
| Test Date:      | Mar-2019 |
| Hardware Availability: | Apr-2019 |
| Software Availability: | Feb-2019 |

#### Compiler Version Notes (Continued)

```plaintext
CC    621.wrf_s(peak) 628.pop2_s(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:**

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

**Fortran benchmarks:**

```plaintext
ifort -m64
```

**Benchmarks using both Fortran and C:**

```plaintext
ifort -m64 icc -m64 -std=c11
```

**Benchmarks using Fortran, C, and C++:**

```plaintext
icpc -m64 icc -m64 -std=c11 ifort -m64
```

#### Base Portability Flags

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
  -assume byterecl
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64
## SPEC CPU2017 Floating Point Speed Result

**Dell Inc.**

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

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

### Base Optimization Flags

- C benchmarks:  
  -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
  -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP  

- Fortran benchmarks:  
  -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
  -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp  
  -nostandard-realloc-lhs  

- Benchmarks using both Fortran and C:  
  -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
  -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP  
  -nostandard-realloc-lhs  

- Benchmarks using Fortran, C, and C++:  
  -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
  -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP  
  -nostandard-realloc-lhs

### Peak Compiler Invocation

- C benchmarks:  
  icc -m64 -std=c11  

- Fortran benchmarks:  
  ifort -m64  

- Benchmarks using both Fortran and C:  
  ifort -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
Dell Inc. PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)

SPECspeed2017_fp_base = 112
SPECspeed2017_fp_peak = 113

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

**Peak Optimization Flags**

C benchmarks:
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

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:
<table>
<thead>
<tr>
<th>Dell Inc.</th>
<th>SPEC CPU2017 Floating Point Speed Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerEdge M640 (Intel Xeon Silver 4216, 2.10GHz)</td>
<td>SPECspeed2017_fp_base = 112</td>
</tr>
<tr>
<td>SPECspeed2017_fp_peak = 113</td>
<td></td>
</tr>
</tbody>
</table>

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

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