## SPEC® CPU2017 Floating Point Speed Result

### Dell Inc.
**PowerEdge M640 (Intel Xeon Platinum 8276M, 2.20GHz)**

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Dell Inc.</th>
<th>Hardware Availability:</th>
<th>Apr-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Software Availability:</td>
<td>Feb-2019</td>
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<tr>
<th>CPU2017 License:</th>
<th>55</th>
<th>Test Date:</th>
<th>Mar-2019</th>
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**SPECspeed2017_fp_base = 143**

| SPECspeed2017_fp_peak = 144 |

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<th>Feb-2019</th>
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### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon Platinum 8276M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz.:</td>
<td>4000</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2200</td>
</tr>
<tr>
<td>Enabled:</td>
<td>56 cores, 2 chips</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>Cache L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>Cache L3:</td>
<td>38.5 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
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### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Ubuntu 18.04.2 LTS</th>
</tr>
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<tr>
<td>Compiler:</td>
<td>C/C++: Version 19.0.1.144 of Intel C/C++</td>
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<td>Firmware:</td>
<td>Version 2.3.1 released May-2019</td>
</tr>
<tr>
<td>File System:</td>
<td>ext4</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>64-bit</td>
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<tr>
<td>Other:</td>
<td>None</td>
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### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>56</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>56</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>56</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>56</td>
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<tr>
<td>627.cam4_s</td>
<td>56</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>56</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>56</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>56</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>56</td>
</tr>
<tr>
<td>654.roms_s</td>
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### Graphs

- SPECspeed2017_fp_base (143)
- SPECspeed2017_fp_peak (144)
**SPEC CPU2017 Floating Point Speed Result**

**Dell Inc.**

PowerEdge M640 (Intel Xeon Platinum 8276M, 2.20GHz)

---

**SPECspeed2017_fp_base = 143**

**SPECspeed2017_fp_peak = 144**

---

**Results Table**

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Base</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Peak</th>
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<tr>
<td>603.bwaves_s</td>
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<td>472</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<tr>
<td>619.llm_s</td>
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<td>627.cam4_s</td>
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<tr>
<td>628.pop2_s</td>
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<td>193</td>
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<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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</table>

**SPECspeed2017_fp_base = 143**

**SPECspeed2017_fp_peak = 144**

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>
```
Platform Notes

BIOS settings:
ADDCC 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 9bce8f2999c33d61f64985e45859ea9
running on intel-sut Wed May 29 17:42:12 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) Platinum 8276M CPU @ 2.20GHz
    2 "physical id"s (chips)
    56 "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 : 28
  siblings : 28
  physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
            28 29 30
  physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
            28 29 30

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 56
  On-line CPU(s) list: 0-55
  Thread(s) per core: 1
  Core(s) per socket: 28
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: GenuineIntel

(Continued on next page)
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**CPU2017 License:** 55  
**Test Date:** Mar-2019  
**Test Sponsor:** Dell Inc.  
**Hardware Availability:** Apr-2019  
**Tested by:** Dell Inc.  
**Software Availability:** Feb-2019

### Platform Notes (Continued)

- **CPU family:** 6  
- **Model:** 85  
- **Model name:** Intel(R) Xeon(R) Platinum 8276M CPU @ 2.20GHz  
- **Stepping:** 6  
- **CPU MHz:** 2423.272  
- **BogoMIPS:** 4400.00  
- **Virtualization:** VT-x  
- **L1d cache:** 32K  
- **L1i cache:** 32K  
- **L2 cache:** 1024K  
- **L3 cache:** 39424K  
- **NUMA node0 CPU(s):**
  - 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54  
- **NUMA node1 CPU(s):**
  - 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55  
- **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 rdtsscp
  - 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 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 intel_pinn
  - ssbd mba ibrs ibpb stibp ibrsenhanced tpr_shadow vnmiflexpriority ept vpid
  - fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  ertz invpCID rtm qcm 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 pfn pts pku ospke avx512_vnni flush_l1d arch_capabilities

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

```plaintext
From /proc/cpuinfo cache data
cache size : 39424 KB
```

From /proc/meminfo

(Continued on next page)
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  

**Platform Notes (Continued)**

```
MemTotal:       394670196 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 29 13:13  
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. 2.3.1 05/02/2019  
   Memory:  
      6x 00ADB00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
      6x 00ADB06D000AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
      4x Not Specified Not Specified  

(End of data from sysinfo program)
Dell Inc.

PowerEdge M640 (Intel Xeon Platinum 8276M, 2.20GHz)

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Compiler Version Notes

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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.
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FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base, peak)
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==============================================================================
CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
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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
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(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

Dell Inc.
PowerEdge M640 (Intel Xeon Platinum 8276M, 2.20GHz)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 143</th>
<th>SPECspeed2017_fp_peak = 144</th>
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Compiler Version Notes (Continued)

==============================================================================
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
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==============================================================================

Base 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

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
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### Dell Inc.

**PowerEdge M640 (Intel Xeon Platinum 8276M, 2.20GHz)**

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### 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
**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:

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