**SPEC® CPU2017 Floating Point Speed Result**

**Dell Inc.**

PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Dell Inc.</th>
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<td>Dell Inc.</td>
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**CPU2017 License:** 55  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** May-2019

**Threads**

<table>
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<th>Benchmark</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
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<td>127</td>
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<td>607.cactuBSSN_s</td>
<td></td>
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<td>619.llvm_s</td>
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<td></td>
</tr>
<tr>
<td>654.rom_s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6230  
- **Max MHz.:** 3900  
- **Nominal:** 2100  
- **Enabled:** 40 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:** 27.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)  
- **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 19.0.4.227 of Intel  
- **Compiler Build 20190416 for Linux;**  
- **Fortran:** Version 19.0.4.227 of Intel Fortran  
- **Compiler Build 20190416 for Linux**  
- **Parallel:** Yes  
- **Firmware:** Version 2.3.1 released May-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 Gold 6230, 2.10GHz)

SPECspeed2017_fp_base = 126

SPECspeed2017_fp_peak = 127

Results Table

| Benchmark     | Threads | Seconds | Ratio | Threads | Seconds | Ratio | Threads | Seconds | Ratio 
|---------------|---------|---------|-------|---------|---------|-------|---------|---------|-------
| 603.bwaves_s  | 40      | 126     | 469   | 40      | 125     | 471   | 40      | 125     | 471   
| 607.cactuBSSN_s | 40     | 120     | 139   | 40      | 119     | 140   | 40      | 119     | 140   
| 619.lbm_s     | 40      | 55.7    | 94.0  | 40      | 55.6    | 94.3  | 40      | 55.3    | 94.7  
| 621.wrf_s     | 40      | 118     | 112   | 40      | 112     | 118   | 40      | 112     | 118   
| 627.cam4_s    | 40      | 100     | 88.4  | 40      | 100     | 88.7  | 40      | 100     | 88.7  
| 628.pop2_s    | 40      | 185     | 64.2  | 40      | 182     | 65.3  | 40      | 182     | 65.3  
| 638.imagick_s | 40      | 129     | 112   | 40      | 129     | 112   | 40      | 129     | 112   
| 644.nab_s     | 40      | 83.0    | 210   | 40      | 83.0    | 210   | 40      | 83.0    | 210   
| 649.fotonik3d_s | 40   | 109     | 83.5  | 40      | 110     | 82.6  | 40      | 110     | 82.6  
| 654.roms_s    | 40      | 122     | 129   | 40      | 122     | 129   | 40      | 122     | 129   

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>
Dell Inc.  
PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)  

Dell Inc.  
PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)  

| SPECspeed2017_fp_base | 126  
| SPECspeed2017_fp_peak | 127  

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

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 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 9bcde8f2999c33d61f649bb5ea9
- running on intel-sut Tue Jul 2 21:13:20 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) Gold 6230 CPU @ 2.10GHz
- 2 "physical id"s (chips)
- 40 "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: 20
- siblings: 20
- physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
- physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 40
- On-line CPU(s) list: 0-39
- Thread(s) per core: 1
- Core(s) per socket: 20
- 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 Gold 6230, 2.10GHz)**

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

---

### SPECspeed2017_fp_base = 126

### SPECspeed2017_fp_peak = 127

---

#### Platform Notes (Continued)

- **Model name:** Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz
- **Stepping:** 6
- **CPU MHz:** 3675.798
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 28160K
- **NUMA node0 CPU(s):** 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38
- **NUMA node1 CPU(s):** 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39
- **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 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 xtrnas pdcm pcid 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_pinn ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 3dsim invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512bw avx512vl xsavesopt xsaveopt xsave xstate xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pin pts pku ospke avx512_vnni flush_l1d arch_capabilities

```
From /proc/cpuinfo cache data
  cache size : 28160 KB
```

```
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 32 34 36 38
  node 0 size: 191912 MB
  node 0 free: 188136 MB
  node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
  node 1 size: 193510 MB
  node 1 free: 189292 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10
```

```
From /proc/meminfo
  MemTotal: 394673144 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB
```

```
From /usr/bin/lsb_release -d
  Ubuntu 18.04.2 LTS
```

---

(Continued on next page)
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 Jul 2 16:36

SPEC is set to: /home/cpu2017
  Filesystem  Type  Size  Used Avail Use% Mounted on
  /dev/sda2    ext4  439G  37G  380G   9% /

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 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
    6x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
    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)
Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)

**SPEC CPU2017 Floating Point Speed Result**

**SPECspeed2017_fp_base = 126**

**SPECspeed2017_fp_peak = 127**

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

---

**Compiler Version Notes (Continued)**

Intel (R) C Intel (R) 64 Compiler for applications running on Intel (R) 64,  
Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 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 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 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) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

---

```
FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)
```

---

Intel (R) Fortran Intel (R) 64 Compiler for applications running on Intel (R) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

---

```
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) 64, Version 19.0.4.227 Build 20190416  
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## Compiler Version Notes (Continued)

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416
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## Base Compiler Invocation

### C benchmarks:

```bash
icc -m64 -std=c11
```

### Fortran benchmarks:

```bash
ifort -m64
```

### Benchmarks using both Fortran and C:

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

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

```bash
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 -assume byterecl`
- `638.imagick_s: -DSPEC_LP64`
- `644.nab_s: -DSPEC_LP64`
- `649.fotonik3d_s: -DSPEC_LP64`
- `654.roms_s: -DSPEC_LP64`
Dell Inc.  

PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)  

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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
SPEC CPU2017 Floating Point Speed Result

Dell Inc. PowerEdge M640 (Intel Xeon Gold 6230, 2.10GHz)

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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Hardware Availability: Apr-2019
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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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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 2019-07-02 17:13:19-0400.
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