### Dell Inc.

#### PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

<table>
<thead>
<tr>
<th>SPECspeed©2017_fp_base = 176</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed©2017_fp_peak = 176</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Sep-2019  
**Hardware Availability:** Jun-2019  
**Software Availability:** May-2019

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed©2017_fp_base</th>
<th>SPECspeed©2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
<td>72</td>
<td>166</td>
<td>174*</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>72</td>
<td>158</td>
<td>175</td>
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<tr>
<td>619.lbm_s</td>
<td>72</td>
<td>133</td>
<td>131</td>
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<tr>
<td>621.wrf_s</td>
<td>72</td>
<td>129</td>
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<tr>
<td>627.cam4_s</td>
<td>72</td>
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<td>60.1</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>72</td>
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<tr>
<td>638.imagick_s</td>
<td>72</td>
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<tr>
<td>644.nab_s</td>
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<td>315</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>72</td>
<td>230</td>
<td>231</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>72</td>
<td>230</td>
<td>231</td>
</tr>
</tbody>
</table>

**Software**

- **OS:** Ubuntu 18.04.2 LTS  
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.2.9 released May-2019
- **File System:** ext4
- **System State:** Run level 5 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Power Management:** --

**Hardware**

- **CPU Name:** Intel Xeon Gold 5220
- **Max MHz:** 3900
- **Nominal:** 2200
- **Enabled:** 72 cores, 4 chips
- **Orderable:** 2.4 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **Cache L2:** 1 MB I+D on chip per core
- **Cache L3:** 24.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
- **Storage:** 1 x 480 GB SATA SSD
- **Other:** None
Dell Inc. PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

SPECspeed®2017_fp_base = 176
SPECspeed®2017_fp_peak = 176

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>662</td>
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<td>77.9</td>
<td>757</td>
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<td>230</td>
<td>67.8</td>
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</tr>
</tbody>
</table>

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = ""/home/cpu2017/lib/intel64"
OMP_STACKSIZE = "192M"

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

Platform Notes

BIOS settings:
ADDCD setting disabled
Sub NUMA Cluster disabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous

(Continued on next page)
Dell Inc.  

**SPEC CPU®2017 Floating Point Speed Result**  

Dell Inc.  

PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)  

SPECspeed®2017_fp_base = 176  

SPECspeed®2017_fp_peak = 176  

---  

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

---

**Platform Notes (Continued)**

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 9bcede8f2999c33d61f64985e45859ea9  
running on intel-sut Fri Sep 6 05:14:16 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 5220 CPU @ 2.20GHz  
  4 "physical id"s (chips)  
  72 "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 : 18  
  siblings : 18  
  physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27  
  physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27  
  physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27  
  physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:

- Architecture: x86_64  
- CPU op-mode(s): 32-bit, 64-bit  
- Byte Order: Little Endian  
- CPU(s): 72  
- On-line CPU(s) list: 0-71  
- Thread(s) per core: 1  
- Core(s) per socket: 18  
- Socket(s): 4  
- NUMA node(s): 4  
- Vendor ID: GenuineIntel  
- CPU family: 6  
- Model: 85  
- Model name: Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz  
- Stepping: 6  
- CPU MHz: 1000.143  
- BogoMIPS: 4400.00  
- Virtualization: VT-x  
- L1d cache: 32K

(Continued on next page)
Dell Inc.  

PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)  

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

Platform Notes (Continued)

L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 25344K  
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68  
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69  
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70  
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71  
Flags: fpu vme vmx sm m32xsse3 sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cdp_13 invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs Enhanced tpr_shadow vmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdtr_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsave cs q.Align mhm cqm_llc cqm_occq_llc cqm_mbms local dtherm ida arat pin pts pku ospke avx512_vnni flush l1d arch_capabilities

From /proc/cpuinfo cache data  
cache size : 25344 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 64 68  
node 0 size: 191914 MB  
node 0 free: 189206 MB  
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69  
node 1 size: 193532 MB  
node 1 free: 192591 MB  
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70  
node 2 size: 193532 MB  
node 2 free: 191708 MB  
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71  
node 3 size: 193509 MB  
node 3 free: 190728 MB  
node distances:  
node 0 1 2 3  
0: 10 21 31 21  
1: 21 10 21 31  
2: 31 21 10 21  
3: 21 31 21 10

From /proc/meminfo  
MemTotal: 791029752 KB  
HugePages_Total: 0

(Continued on next page)
Dell Inc.

PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

**SPEC CPU®2017 Floating Point Speed Result**

---

**CPU2017 License:** 55  
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---

### SPECspeed®2017_fp_base = 176

### SPECspeed®2017_fp_peak = 176

---

**Platform Notes (Continued)**

- **Hugepagesize:** 2048 kB

```bash
/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/"

```bash
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 Sep 5 22:11**

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

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda2</td>
<td>ext4</td>
<td>439G</td>
<td>43G</td>
<td>374G</td>
<td>11%</td>
<td>/</td>
</tr>
</tbody>
</table>

**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. 2.2.9 05/08/2019**
- **Memory:**
  - 24x 00AD00B300AD HMA84GR7CEJNR-WM 32 GB 2 rank 2933, configured at 2666
  - 24x Not Specified Not Specified

(End of data from sysinfo program)
Dell Inc.
PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

**SPECspeed®2017_fp_base = 176**

**SPECspeed®2017_fp_peak = 176**

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</table>

### Compiler Version Notes

```text
C

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

```text
C++, C, Fortran

| 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.

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.

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.
```

```text
Fortran

| 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
| 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.
```

```text
Fortran, C

| 621.wrf_s(base, peak) 627.cam4_s(base, peak)
| 628.pop2_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.

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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```text
Compiler Version Notes

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CPU2017 License: 55
Test Sponsor: Dell Inc.
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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

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

(Continued on next page)
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PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

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</table>

### Base Optimization Flags (Continued)

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:**

```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
```

### Peak Portability Flags

Same as Base Portability Flags

### Peak Optimization Flags

**C benchmarks:**

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

**Fortran benchmarks:**

```bash
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
```

```bash
649.fotonik3d_s: Same as 603.bwaves_s
```

```bash
654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
```

(Continued on next page)
Dell Inc.

PowerEdge R840 (Intel Xeon Gold 5220, 2.20GHz)

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

**SPEC CPU®2017 Floating Point Speed Result**

**SPECspeed®2017_fp_base = 176**

**SPECspeed®2017_fp_peak = 176**

Peak Optimization Flags (Continued)

654.roms_s (continued):
-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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