**Dell Inc.**

PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

**SPECspeed®2017_fp_base = 133**

**SPECspeed®2017_fp_peak = 134**

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<td>621.wrf_s</td>
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<td>627.cam4_s</td>
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<td>649.fotonik3d_s</td>
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</tr>
<tr>
<td>654.roms_s</td>
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</tr>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6226R
- **Max MHz:** 3900
- **Nominal:** 2900
- **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 (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)
- **Storage:** 1 x 1.92 TB SATA SSD
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.1
- **Compiler:** C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux;
  Fortran: Version 19.0.5.281 of Intel Fortran Compiler for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.5.4 released Jan-2020
- **File System:** tmpfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
Dell Inc. PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Results Table

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</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 133
SPECspeed®2017_fp_peak = 134

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

Environment Variables Notes

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

General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
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
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"
**Platform Notes**

BIOS settings:
- Sub NUMA Cluster disabled
- Virtualization Technology disabled
- 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 set to standard
- Logical Processor disabled
- CPU Interconnect Bus Link Power Management disabled
- PCI ASPM L1 Link Power Management disabled
- UPI Prefetch enabled
- LLC Prefetch disabled
- Dead Line LLC Alloc enabled
- Directory AtoS disabled

Sysinfo program /mnt/ramdisk/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed9f86e46a485a0011
running on rhel-8-1-sut Mon Apr 20 12:24:50 2020

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 6226R CPU @ 2.90GHz
  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
```

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeed®2017_fp_base = 133
SPECspeed®2017_fp_peak = 134

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Platform Notes (Continued)

Vendor ID:           GenuineIntel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
Stepping:            7
CPU MHz:             1200.041
CPU max MHz:         3900.0000
CPU min MHz:         1200.0000
BogoMIPS:            5800.00
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 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 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 tsc_deadline_timer aes xsave avx f16c rdconv ldconv
                      dtes64_64 tsc Sind我不想显示这部分的输出。但是，我们可以看到一些关键信息，如处理器的厂商ID为GenuineIntel，CPU family为6，Model为85，Model name为Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz，Stepping为7，CPU MHz为1200.041，CPU max MHz为3900.0000，CPU min MHz为1200.0000等。另外，我们还可以看到一些虚拟化和 cache的相关信息。
### Platform Notes (Continued)

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<tr>
<th>MemTotal:</th>
<th>394834824 kB</th>
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<tbody>
<tr>
<td>HugePages_Total:</td>
<td>0</td>
</tr>
<tr>
<td>Hugepagesize:</td>
<td>2048 kB</td>
</tr>
</tbody>
</table>

From `/etc/*release*` /etc/*version*:

```
os-release:
  NAME="Red Hat Enterprise Linux"
  VERSION="8.1 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.1"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
  ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga
```

```
uname -a:
  Linux rhel-8-1-sut 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019 x86_64
  x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **CVE-2018-3620 (L1 Terminal Fault):** Not affected
- **Microarchitectural Data Sampling:** Not affected
- **CVE-2017-5754 (Meltdown):** Not affected
- **CVE-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: usercopy/swapgs barriers and __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

```
run-level 3 Apr 20 08:53 last=5
```

```
SPEC is set to: /mnt/ramdisk/cpu2017
  Filesystem  Type Size  Used Avail Use% Mounted on
tmpfs   tmpfs  225G  14G  212G   6% /mnt/ramdisk
```

From `/sys/devices/virtual/dmi/id`:

- **BIOS:** Dell Inc. 2.5.4 01/13/2020
- **Vendor:** Dell Inc.
- **Product:** PowerEdge R640
- **Product Family:** PowerEdge
- **Serial:** FPFXCH2

(Continued on next page)
Dell Inc.
PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeed\textsuperscript{\textregistered}2017\_fp\_base = 133
SPECspeed\textsuperscript{\textregistered}2017\_fp\_peak = 134

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.
Test Date: Apr-2020
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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.

Memory:
10x 002C069D002C 18ASF2G72PDZ-2G9E1 16 GB 2 rank 2933
4x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933
8x 00AD00B300AD HMA82GR7CJR8N-XN 16 GB 2 rank 3200
2x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

| C | 619.lbm\_s(base, peak) 638.imagick\_s(base, peak) |
|----------------------------------|
| Intel\textsuperscript{(R)} C Intel\textsuperscript{(R)} 64 Compiler for applications running on Intel\textsuperscript{(R)} 64, |
| Version 19.0.5.281 Build 20190815 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |

| C++, C, Fortran | 607.cactuBSSN\_s(base, peak) |
|-----------------|
| Intel\textsuperscript{(R)} C++ Intel\textsuperscript{(R)} 64 Compiler for applications running on Intel\textsuperscript{(R)} 64, |
| Version 19.0.5.281 Build 20190815 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |

| Fortran | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak) |
|---------|
| Intel\textsuperscript{(R)} Fortran Intel\textsuperscript{(R)} 64 Compiler for applications running on Intel\textsuperscript{(R)} 64, |
| Version 19.0.5.281 Build 20190815 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
## SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

<table>
<thead>
<tr>
<th>SPECs不通®2017_fp_peak</th>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** Apr-2020  
**Tested by:** Dell Inc.  
**Hardware Availability:** Feb-2020  
**Software Availability:** Nov-2019

### Compiler Version Notes (Continued)

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</table>

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

### Base Compiler Invocation

**C benchmarks:**  
`icc`

**Fortran benchmarks:**  
`ifort`

**Benchmarks using both Fortran and C:**  
`ifort icc`

**Benchmarks using Fortran, C, and C++:**  
`icpc icc ifort`

### 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`
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

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

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

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<tr>
<td>Software Availability:</td>
<td>Nov-2019</td>
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</table>

### Base Optimization Flags

**C benchmarks:**
- `-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

**Fortran benchmarks:**
- `-m64 -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:**
- `-m64 -std=c11 -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++:**
- `-m64 -std=c11 -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`

**Fortran benchmarks:**
- `ifort`

**Benchmarks using both Fortran and C:**
- `ifort icc`

**Benchmarks using Fortran, C, and C++:**
- `icpc icc ifort`

### Peak Portability Flags

Same as Base Portability Flags
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeed®2017_fp_base = 133
SPECspeed®2017_fp_peak = 134

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Apr-2020
Hardware Availability: Feb-2020
Tested by: Dell Inc.
Software Availability: Nov-2019

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: -m64 -std=c11 -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: basepeak = yes

649.fotonik3d_s: -m64 -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

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -std=c11 -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: -m64 -std=c11 -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: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

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>
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</tr>
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<tr>
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</table>

| CPU2017 License: | 55          |
| Test Sponsor:    | Dell Inc.   |
| Tested by:       | Dell Inc.   |
| Test Date:       | Apr-2020    |
| Hardware Availability: | Feb-2020 |
| Software Availability: | Nov-2019 |

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2020-04-20 13:24:50-0400.
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