**Dell Inc.**  

PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)  

- **SPECspeed®2017_fp_base** = 155  
- **SPECspeed®2017_fp_peak** = 158

### Hardware

<table>
<thead>
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<th>SPECspeed®2017_fp_peak (158)</th>
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<td>638.imagick_s</td>
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<td>644.nab_s</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>40</td>
<td>160</td>
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</tbody>
</table>

**CPU Name:** Intel Xeon Silver 4316  
**Max MHz:** 3400  
**Nominal:** 2300  
**Enabled:** 40 cores, 2 chips  
**Orderable:** 1.2 chips  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**L2:** 1.25 MB I+D on chip per core  
**L3:** 30 MB I+D on chip per chip  
**Other:** None  
**Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
**Storage:** 225 GB on tmpfs  
**Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)  
  4.18.0-240.15.1.el8_3.x86_64  
- **Compiler:**  
  C/C++: Version 2021.1 of Intel oneAPI DPC++/C++  
  Compiler Build 20201113 for Linux;  
  Fortran: Version 2021.1 of Intel Fortran Compiler  
  Classic Build 20201112 for Linux;  
  C/C++: Version 2021.1 of Intel C/C++ Compiler  
  Classic Build 20201112 for Linux
- **Parallel:** Yes
- **Firmware:** Version 1.2.1 released May-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.
PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

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

Results Table

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<td>97.8</td>
<td>161</td>
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</tbody>
</table>

SPECspeed®2017_fp_base = 155
SPECspeed®2017_fp_peak = 158

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/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/je5.0.1-64"
MALLOCONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
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
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

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

Dell Inc.
PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 155
SPECspeed®2017_fp_peak = 158

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

General Notes (Continued)
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.

Benchmark run from a 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"

Platform Notes

BIOS Settings:
Logical Processor : Disabled
Virtualization Technology : Disabled

System Profile : Custom
CPU Power Management : Maximum Performance
C1E : Disabled
C States : Autonomous
Memory Patrol Scrub : Disabled
Energy Efficiency Policy : Performance
CPU Interconnect Bus Link
Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Fri May 14 09:39:09 2021

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 4316 CPU @ 2.30GHz
  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 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian

(Continued on next page)
Dell Inc.

PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 155
SPECspeed®2017_fp_peak = 158

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

SPECspeed®2017_fp_base = 155
SPECspeed®2017_fp_peak = 158

Platform Notes (Continued)

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: 106
Model name: Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
Stepping: 6
CPU MHz: 1938.000
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
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 pdelgb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xptr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abal更重要的内容start
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: 249238 MB
node 0 free: 236482 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: 249552 MB
node 1 free: 255424 MB
node distances:

(Continued on next page)
## Dell Inc.

### PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

<table>
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### CPU2017 License: 55

- **Test Sponsor:** Dell Inc.
- **Test Date:** May-2021
- **Tested by:** Dell Inc.
- **Hardware Availability:** May-2021
- **Software Availability:** Feb-2021

### Platform Notes (Continued)

#### node 0 1

<p>| | |</p>
<table>
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<th></th>
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<tbody>
<tr>
<td>0:</td>
<td>10</td>
</tr>
<tr>
<td>1:</td>
<td>20</td>
</tr>
</tbody>
</table>

From `/proc/meminfo`

- MemTotal: 527813836 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

/sbin/tuned-adm active

- Current active profile: throughput-performance

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

#### os-release:

- NAME="Red Hat Enterprise Linux"
- VERSION="8.3 (Ootpa)"
- ID="rhel"
- ID_LIKE="fedora"
- VERSION_ID="8.3"
- PLATFORM_ID="platform:el8"
- PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
- ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)

system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)

system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:

Linux localhost.localdomain 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 2021 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

- CVE-2018-12207 (iTLB Multihit): Not affected
- CVE-2018-3620 (L1 Terminal Fault): Not affected
- Microarchitectural Data Sampling: Not affected
- CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapsqs barriers and __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
- CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
- CVE-2019-11135 (TSX Asynchronous Abort): Not affected

(Continued on next page)
Dell Inc.

PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

| SPECspeed®2017_fp_base = 155 |
| SPECspeed®2017_fp_peak = 158 |

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

----------

**Platform Notes (Continued)**

run-level 5 May 14 05:32

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  225G   13G  213G   6% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor:         Dell Inc.
Product:        PowerEdge R650
Product Family: PowerEdge
Serial:         1234567

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:
7x 00AD00B300AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666
9x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.2.1
BIOS Date: 05/06/2021
BIOS Revision: 1.2

(End of data from sysinfo program)

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**Compiler Version Notes**

==============================================================================
<table>
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<tr>
<th>C</th>
<th>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base)</th>
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<tbody>
<tr>
<td>Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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<tr>
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Dell Inc.

PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

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

---

**Specspeed®2017_fp_base = 155**
**Specspeed®2017_fp_peak = 158**

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### Compiler Version Notes (Continued)

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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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## SPEC CPU®2017 Floating Point Speed Result

### Dell Inc.

**PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)**

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| CPU2017 License: | 55 |
| Test Sponsor:   | Dell Inc. |
| Tested by:      | Dell Inc. |
| Test Date:      | May-2021 |
| Hardware Availability: | May-2021 |
| Software Availability: | Feb-2021 |

---

**Compiler Version Notes (Continued)**

Intel (R) 64, Version 2021.1 Build 20201112_000000
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Intel (R) C Intel (R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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---

### 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

---

### Base Optimization Flags

C benchmarks:
- -m64
- -std=c11
- -xCORE-AVX512
- -ipo
- -03
- -no-prec-div
- -qopt-prefetch
- -ffinite-math-only
- -qopt-mem-layout-trans=4
- -qopenmp
- -DSPEC_OPENMP
- -mbranches-within-32B-boundaries

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

PowerEdge R650 (Intel Xeon Silver 4316, 2.30 GHz)

<table>
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#### Base Optimization Flags (Continued)

Fortran benchmarks:
- `-m64`  
- `-Wl,-z,muldefs`  
- `-DSPEC_OPENMP`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-qopenmp`  
- `-nostandard-realloc-lhs`  
- `-mbranches-within-32B-boundaries`  
- `-L/usr/local/jemalloc64-5.0.1/lib`  
- `-ljemalloc`

Benchmarks using both Fortran and C:
- `-m64`  
- `-std=c11`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-mbranches-within-32B-boundaries`  
- `-nostandard-realloc-lhs`  
- `-L/usr/local/jemalloc64-5.0.1/lib`  
- `-ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64`  
- `-std=c11`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-mbranches-within-32B-boundaries`  
- `-nostandard-realloc-lhs`  
- `-L/usr/local/jemalloc64-5.0.1/lib`  
- `-ljemalloc`

#### Peak Compiler Invocation

C benchmarks (except as noted below):
- `icc`

- `644.nab_s: icx`

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 R650 (Intel Xeon Silver 4316, 2.30 GHz)

**SPECspeed®2017_fp_base = 155**

**SPECspeed®2017_fp_peak = 158**

**Peak Optimization Flags**

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -fiopenmp
-DSPEC_OPENMP -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
-prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP -gopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

627.cam4_s: basepeak = yes

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:

http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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