Dell Inc.

PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

SPECrates:
- SPECrate®2017_fp_base = 163
- SPECrate®2017_fp_peak = 167

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

Caches:
- L1: 32 KB I + 48 KB D on chip per core
- L2: 1.25 MB I+D on chip per core
- L3: 12 MB I+D on chip per core

Memory: 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)
Storage: 125 GB on tmpfs

OS: Red Hat Enterprise Linux 8.4 (Ootpa)
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
Firmware: No
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.
Dell Inc. PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

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

Results Table

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<th>Benchmark</th>
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</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 163  SPECrate®2017_fp_peak = 167

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"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.0-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1 Transparent Huge Pages enabled by default

(Continued on next page)
General Notes (Continued)

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>
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.
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 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
  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
  PCI ASPM L1 Link
    Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Wed Dec  8 21:13:14 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) Gold 5315Y CPU @ 3.20GHz
  2 "physical id"s (chips)
Dell Inc.

PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

SPEC CPU®2017 Floating Point Rate Result

SPECrater®2017_fp_base = 163
SPECrater®2017_fp_peak = 167

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

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 : 8
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

From lscpu from util-linux 2.32.1:
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: 2
Core(s) per socket: 8
NUMA node(s): 2
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5315Y CPU @ 3.20GHz
BIOS Model name: Intel(R) Xeon(R) Gold 5315Y CPU @ 3.20GHz
Stepping: 6
CPU MHz: 2867.289
BogoMIPS: 6400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 12288K
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
auperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt pdcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512ifma
cflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsavec xgetbv1
xsavees cmq_llc cmq_occopus llc cmq_mbm_total cmq_mbm_local split_lock_detect wboinve
nd dtherm ida arat pln pts avx512vbm1 umip pku ospke avx512_vbmi gfini vaes vpcmulqdq
avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid fsgs md_clear pconf
flush_l1d arch_capabilities

(Continued on next page)
Platform Notes (Continued)

/proc/cpuinfo cache data
   cache size : 12288 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
node 0 size: 257182 MB
node 0 free: 245736 MB
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
node 1 size: 258004 MB
node 1 free: 242451 MB
node distances:
node 0 1
  0: 10 20
  1: 20 10

From /proc/meminfo
MemTotal: 527552060 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="8.4 (Ootpa)"
   ID="rhel"
   ID_LIKE="fedora"
   VERSION_ID="8.4"
   PLATFORM_ID="platform:el8"
   PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
   ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
   system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

uname -a:
   Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2018-12207 (iTLB Multihit): Not affected

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

Dell Inc.
PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)  

CPU2017 License: 55  
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Tested by: Dell Inc.  

SPECrater®2017_fp_base = 163  
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Test Date: Dec-2021  
Hardware Availability: Oct-2021  
Software Availability: May-2021

Platform Notes (Continued)

CVE-2018-3620 (L1 Terminal Fault): Not affected  
Microarchitectural Data Sampling: Not affected  
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prct1 and seccomp  
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapgs barriers and __user pointer sanitization  
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling  
CVE-2017-5715 (Spectre variant 2): Not affected  
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected  
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Dec 8 16:55

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1

Additional information from dmidecode 3.2 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:
16x 002C00B3002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.3.8
BIOS Date: 08/31/2021
BIOS Revision: 1.3

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
544.nab_r(base, peak)

(Continued on next page)
Compiler Version Notes (Continued)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

=================================================================================
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
=================================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

=================================================================================
C++, C | 511.povray_r(peak)
=================================================================================

Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

=================================================================================
C++, C | 511.povray_r(base) 526.blender_r(base, peak)
=================================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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=================================================================================
C++, C | 511.povray_r(peak)
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(Continued on next page)
Dell Inc.
PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

SPECrater®2017_fp_base = 163
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Compiler Version Notes (Continued)

C++, C | 511.povray_r(base) 526.blender_r(base, peak)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C++, C, Fortran | 507.cactuBSSN_r(base, peak)
---
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
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Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
554.roms_r(base, peak)
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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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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**SPEC CPU®2017 Floating Point Rate Result**

**Dell Inc.**

PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

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**Test Date:** Dec-2021  
**Hardware Availability:** Oct-2021  
**Software Availability:** May-2021

---

**Base Compiler Invocation**

- **C benchmarks:**  
  icx

- **C++ benchmarks:**  
  icpx

- **Fortran benchmarks:**  
  ifort

- **Benchmarks using both Fortran and C:**  
  ifort icx

- **Benchmarks using both C and C++:**  
  icpx icx

- **Benchmarks using Fortran, C, and C++:**  
  icpx icx ifort

---

**Base Portability Flags**

503.bwaves_r: -DSPEC_LP64  
507.cactuBSSN_r: -DSPEC_LP64  
508.namd_r: -DSPEC_LP64  
510.parest_r: -DSPEC_LP64  
511.povray_r: -DSPEC_LP64  
519.lbm_r: -DSPEC_LP64  
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian  
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char  
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG  
538.imagick_r: -DSPEC_LP64  
544.nab_r: -DSPEC_LP64  
549.fotonik3d_r: -DSPEC_LP64  
554.roms_r: -DSPEC_LP64

---

**Base Optimization Flags**

- **C benchmarks:**  
  -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math  
  -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
  -mbranches-within-32B-boundaries -ljemalloc  
  -L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)
## Dell Inc.

**PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)**

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**Software Availability:** May-2021

### Base Optimization Flags (Continued)

**C++ benchmarks:**
- `-w`  
- `-m64`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-Ofast`  
- `-ffast-math`  
- `-flto`  
- `-mfpmath=sse`  
- `-funroll-loops`  
- `-qopt-mem-layout-trans=4`  
- `-mbranches-within-32B-boundaries`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

**Fortran benchmarks:**
- `-w`  
- `-m64`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-O3`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-multiply-gather-scatter-by-shuffles`  
- `-qopt-mem-layout-trans=4`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto`  
- `-mbranches-within-32B-boundaries`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

**Benchmarks using both Fortran and C:**
- `-w`  
- `-m64`  
- `-std=c11`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-Ofast`  
- `-ffast-math`  
- `-flto`  
- `-mfpmath=sse`  
- `-funroll-loops`  
- `-qopt-mem-layout-trans=4`  
- `-O3`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-multiply-gather-scatter-by-shuffles`  
- `-mbranches-within-32B-boundaries`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

**Benchmarks using both C and C++:**
- `-w`  
- `-m64`  
- `-std=c11`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-Ofast`  
- `-ffast-math`  
- `-flto`  
- `-mfpmath=sse`  
- `-funroll-loops`  
- `-qopt-mem-layout-trans=4`  
- `-mbranches-within-32B-boundaries`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

**Benchmarks using Fortran, C, and C++:**
- `-w`  
- `-m64`  
- `-std=c11`  
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-Ofast`  
- `-ffast-math`  
- `-flto`  
- `-mfpmath=sse`  
- `-funroll-loops`  
- `-qopt-mem-layout-trans=4`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-multiply-gather-scatter-by-shuffles`  
- `-mbranches-within-32B-boundaries`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

### Peak Compiler Invocation

**C benchmarks:**
- `icx`

**C++ benchmarks:**
- `icpx`

(Continued on next page)
Dell Inc.

PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)  

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</table>

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

---

### PeakCompiler Invocation (Continued)

Fortran benchmarks:

```plaintext
ifort
```

Benchmarks using both Fortran and C:

```plaintext
ifort icx
```

Benchmarks using both C and C++:

- `511.povray_r`: icpc icc
- `526.blender_r`: icpx icx

Benchmarks using Fortran, C, and C++:

```plaintext
icpx icx ifort
```

---

### Peak Portability Flags

Same as Base Portability Flags

---

### Peak Optimization Flags

**C benchmarks:**

- `519.lbm_r`: basepeak = yes
- `538.imagick_r`: basepeak = yes

**C++ benchmarks:**

- `508.namd_r`: basepeak = yes

(Continued on next page)
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PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)

SPECrate®2017_fp_base = 163
SPECrate®2017_fp_peak = 167

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

Peak Optimization Flags (Continued)

Fortran benchmarks:

503.bwaves_r:basepeak = yes
549.fotonik3d_r:basepeak = yes
554.roms_r -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:

521.wrf_r:basepeak = yes
527.cam4_r:basepeak = yes

Benchmarks using both C and C++:

511.povray_r -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r:basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: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
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.5.xml
Dell Inc.  
PowerEdge R450 (Intel Xeon Gold 5315Y, 3.20 GHz)  

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<td>167</td>
</tr>
</tbody>
</table>

| CPU2017 License: | 55 |
| Test Sponsor:   | Dell Inc. |
| Tested by:      | Dell Inc. |
| Test Date:      | Dec-2021 |
| Hardware Avail.:| Oct-2021  |
| Software Avail.:| May-2021  |

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