## Dell Inc.

**PowerEdge R750 (Intel Xeon Gold 6330, 2.00 GHz)**

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Dell Inc.</th>
<th>Hardware Availability</th>
<th>May-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Dell Inc.</td>
<td>Software Availability</td>
<td>Feb-2021</td>
</tr>
</tbody>
</table>

### SPEC CPU 2017 Floating Point Rate Result

**SPECrate®2017_fp_base = 352**

**SPECrate®2017_fp_peak = 369**

### Hardware

<table>
<thead>
<tr>
<th>CPU Name: Intel Xeon Gold 6330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz: 3100</td>
</tr>
<tr>
<td>Nominal: 2000</td>
</tr>
<tr>
<td>Enabled: 56 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2: 1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3: 42 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other: None</td>
</tr>
</tbody>
</table>

### Memory:

- 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)
- 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++
  - Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux
- **Parallel:** No
- **Firmware:** Version 1.1.2 released Apr-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

jemalloc memory allocator V5.0.1

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

Dell Inc.
PowerEdge R750 (Intel Xeon Gold 6330, 2.00 GHz)

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

SPECrate®2017_fp_base = 352
SPECrate®2017_fp_peak = 369

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

Software (Continued)
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>112</td>
<td>1684</td>
<td>667</td>
<td>1683</td>
<td>667</td>
<td>56</td>
<td>837</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>112</td>
<td>284</td>
<td>499</td>
<td>286</td>
<td>495</td>
<td>112</td>
<td>284</td>
</tr>
<tr>
<td>508.namd_r</td>
<td>112</td>
<td>390</td>
<td>273</td>
<td>390</td>
<td>273</td>
<td>112</td>
<td>390</td>
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<tr>
<td>510.parest_r</td>
<td>112</td>
<td>1569</td>
<td>187</td>
<td>1571</td>
<td>187</td>
<td>56</td>
<td>617</td>
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<tr>
<td>511.povray_r</td>
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<td>640</td>
<td>408</td>
<td>639</td>
<td>409</td>
<td>112</td>
<td>559</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>112</td>
<td>481</td>
<td>246</td>
<td>479</td>
<td>246</td>
<td>112</td>
<td>481</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>112</td>
<td>810</td>
<td>310</td>
<td>807</td>
<td>311</td>
<td>56</td>
<td>405</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>112</td>
<td>449</td>
<td>380</td>
<td>448</td>
<td>381</td>
<td>112</td>
<td>449</td>
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<tr>
<td>527.cam4_r</td>
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<td>299</td>
<td>932</td>
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<td>925</td>
<td>112</td>
<td>299</td>
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<tr>
<td>544.nab_r</td>
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<td>628</td>
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<td>628</td>
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<td>296</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>206</td>
<td>2121</td>
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<td>2121</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>112</td>
<td>1264</td>
<td>141</td>
<td>1266</td>
<td>141</td>
<td>56</td>
<td>511</td>
</tr>
</tbody>
</table>

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/ramdisk2/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk2/cpu2017-1.1.5-ic2021.1/je5.0.1-64"
MALLOC_CONF = "retain:true"
### Dell Inc.

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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

---

### 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
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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"

---

### Platform Notes

#### BIOS Settings:
- Sub NUMA Cluster : 2-Way Clustering
- 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/ramdisk2/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Mon May 3 15:27:06 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

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(Continued on next page)
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Platform Notes (Continued)

model name : Intel(R) Xeon(R) Gold 6330 CPU @ 2.00GHz
2 "physical id"s (chips)
112 "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 : 28
siblings : 56
physical 0: cores 0 1 2 3 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
physical 1: cores 0 1 2 3 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6330 CPU @ 2.00GHz
Stepping: 6
CPU MHz: 1842.860
BogoMIPS: 4000.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108
NUMA node1 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102,106,110
NUMA node2 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109
NUMA node3 CPU(s):
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 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 xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pwpin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbse tsc_adjust bmi1 hle avx2

(Continued on next page)
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Platform Notes (Continued)

smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma
clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsaves xgetbv1
xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wboinvd
dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d
arch_capabilities

/proc/cpuinfo cache data
cache size : 43008 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 72 76 80 84 88 92 96
          100 104 108
   node 0 size: 125540 MB
   node 0 free: 126967 MB
   node 1 cpus: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98
          102 106 110
   node 1 size: 126289 MB
   node 1 free: 128042 MB
   node 2 cpus: 1  5  9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97
          101 105 109
   node 2 size: 126775 MB
   node 2 free: 113843 MB
   node 3 cpus: 3  7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99
          103 107 111
   node 3 size: 126047 MB
   node 3 free: 128312 MB
dnode distances:
      node 0 1 2 3
     0:  10  11  20  20
       1:  11  10  20  20
       2:  20  20  10  11
       3:  20  20  11  10

From /proc/meminfo
MemTotal:      527797592 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"

(Continued on next page)
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Platform Notes (Continued)

```
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): 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/swapsgs barriers and __user pointer sanitation
- 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

run-level 5 May 3 09:45

SPECrater®2017 fp_base = 352
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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

(Continued on next page)
Platform Notes (Continued)

frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:
12x 002C069D002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2933
4x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2933
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.2
BIOS Date: 04/09/2021
BIOS Revision: 1.1

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

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Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on  
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on  
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Fortran  
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#### Compiler Version Notes (Continued)

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<th>554.roms_r(base, peak)</th>
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---

Fortran, C | 521.wrf_r(peak)

---

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Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)

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### Compiler Version Notes (Continued)

**Version 2021.1 Build 20201113**

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### 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.cactusBSSN_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
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### 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`

#### 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-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:

- `-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-multiple-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`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-multiple-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

Fortran benchmarks:
- ifort

Benchmarks using both Fortran and C:
- 521.wrf_r: ifort icc
- 527.cam4_r: ifort icx

Benchmarks using both C and C++:
- 511.povray_r: icpc icc
- 526.blender_r: icpx icx

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

(Continued on next page)
Dell Inc. PowerEdge R750 (Intel Xeon Gold 6330, 2.00 GHz) SPECrate®2017_fp_base = 352 SPECrate®2017_fp_peak = 369

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

Peak Optimization Flags (Continued)

C++ benchmarks:

508.namd_r: basepeak = yes


Fortran benchmarks:


549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:


527.cam4_r: basepeak = yes

Benchmarks using both C and C++:


526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

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

Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6330, 2.00 GHz)

| SPECrate®2017_fp_base | 352 |
| SPECrate®2017_fp_peak | 369 |

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

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**Peak Optimization Flags (Continued)**

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:


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