Dell Inc.

PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)

SPECrated®2017_fp_base = 388
SPECrated®2017_fp_peak = 411

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

Test Date: Aug-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Dell Inc.
2.10 GHz)
PowerEdge R650xs (Intel Xeon Platinum 8352V,

CPU Name: Intel Xeon Platinum 8352V
Max MHZ: 3500
Nominal: 2100
Enabled: 72 cores, 2 chips, 2 threads/core
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: 54 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at
    2933)
Storage: 225 GB on tmpfs
Other: None

OS: Red Hat Enterprise Linux 8.3 (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
Parallel: No
Firmware: Version 1.1.3 released Apr-2021
File System: tmpfs
System State: Run level 3 (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.

503.bwaves_r 144
    72
507.caactuBSSN_r 144
508.namd_r 144
    193
510.parest_r 144
    72
511.povray_r 144
    482
519.lbm_r 144
    251
521.wrf_r 144
    318
526.blender_r 144
    445
527.cam4_r 144
    427
538.imagick_r 144
    1120
544.nab_r 144
    740
549.fotonik3d_r 144
    213
554.roms_r 144
    147

Copyright 2017-2021 Standard Performance Evaluation Corporation
Results Table

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<td>147</td>
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<td>630</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/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.1-64"
MALLOCS_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)
Dell Inc.
PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)

SPECrate®2017_fp_base = 388
SPECrate®2017_fp_peak = 411

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

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 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
    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 982a61ec0915b55891ef0e16a6caf64d
running on r650xs.h2zrh5y.inside.dell.com Sun Aug 15 02:07:47 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) Platinum 8352V CPU @ 2.10GHz

(Continued on next page)
Dell Inc.
PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 388
SPECrate®2017_fp_peak = 411

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

Test Date: Aug-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Platform Notes (Continued)

2 "physical id"s (chips)
144 "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 : 36
siblings : 72
physical 0: cores 0 1 2 3 4 5 6 7 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
physical 1: cores 0 1 2 3 4 5 6 7 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

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): 144
On-line CPU(s) list: 0-143
Thread(s) per core: 2
Core(s) per socket: 36
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Platinum 8352V CPU @ 2.10GHz
Stepping: 6
CPU MHz: 1696.238
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 55296K
NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108,112,116,120,124,128,132,136,140
NUMA node1 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102,106,110,114,118,122,126,130,134,138,142
NUMA node2 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109,113,117,121,125,129,133,137,141
NUMA node3 CPU(s):
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clf flush dt acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp

(Continued on next page)
Dell Inc.
PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)  

| SPECrate\textsuperscript{\textregistered}2017\_fp\_base | = 388 |
|SPECrate\textsuperscript{\textregistered}2017\_fp\_peak | = 411 |

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: Aug-2021  
Hardware Availability: Jul-2021  
Software Availability: Dec-2020

Platform Notes (Continued)

lm constant_tsc art arch_perfmon pebs bts rep_good nop1 xt topology nonstop_tsc cpuid aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrpr pdcmd cpcid dca sse4\_l 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\_ppin ssbd mba ibrs ibpb stibp ibrs\_enhanced fsgsbase tsc\_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt\_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel\_pt avx512cd sha\_ni avx512bw avx512vl xsaveopt xsaveopt xgetbv1 xsaves cqm\_llc cqm\_occup\_llc cqm\_mbm\_total cqm\_mbm\_local split\_lock\_detect wbnoinvd 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\_lid arch\_capabilities

```
/lproc/cpuinfo cache data
  cache size : 55296 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
  100 104 108 112 116 120 124 128 132 136 140
  node 0 size: 124372 MB
  node 0 free: 100703 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
  102 106 110 114 118 122 126 130 134 138 142
  node 1 size: 125636 MB
  node 1 free: 115269 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
  101 105 109 113 117 121 125 129 133 137 141
  node 2 size: 125759 MB
  node 2 free: 115212 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
  103 107 111 115 119 123 127 131 135 139 143
  node 3 size: 125613 MB
  node 3 free: 115405 MB
  node 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: 527393060 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
/sbin/tuned-adm active

(Continued on next page)
## Platform Notes (Continued)

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 r650xs.h2zrh5y.inside.dell.com 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020 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/swapgs 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

```
run-level 3 Aug 14 20:02
```

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

```
Filesystem  Type     Size  Used Avail Use% Mounted on
tmpfs      tmpfs     225G   61G  165G  27% /mnt/ramdisk
```

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

(Continued on next page)
Platform Notes (Continued)

Serial: H2ZRH5Y

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 00AD063200AD HMA84GR7DJR4N-XN 32 GB 2 rank 3200, configured at 2933

BIOS:
- BIOS Vendor: Dell Inc.
- BIOS Version: 1.1.3
- BIOS Date: 04/27/2021
- BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

```
```
```
```
```
```
```
```
Compiler Version Notes (Continued)

==============================================================================
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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
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.
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Compiler Version Notes (Continued)

Fortran          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                  | 554.roms_r(base, peak)

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(peak)

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.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

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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)

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

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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  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

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
Dell Inc.
PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)

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<td>388</td>
<td>CPU2017 License: 55</td>
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<td>Test Date: Aug-2021</td>
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<td></td>
<td>Test Sponsor: Dell Inc.</td>
<td></td>
<td>Hardware Availability: Jul-2021</td>
</tr>
<tr>
<td></td>
<td>Tested by: Dell Inc.</td>
<td></td>
<td>Software Availability: Dec-2020</td>
</tr>
</tbody>
</table>

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 -O3`
- `-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

- Fortran flags:

  - 544.nab_r: -W -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
  - Ofast -gopt-mem-layout-trans=4
  - -fimf-accuracy-bits=14:sqrt
  - -mbranches-within-32B-boundaries -ljemalloc
  - -L/usr/local/jemalloc64-5.0.1/lib

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

**PowerEdge R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)**

<table>
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| SPECrate®2017_fp_base = 388 | SPECrate®2017_fp_peak = 411 |

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### 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 R650xs (Intel Xeon Platinum 8352V, 2.10 GHz)  

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<tr>
<td>SPECrate®2017_fp_peak</td>
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| CPU2017 License: | 55 |
| Test Sponsor: | Dell Inc. |
| Tested by: | Dell Inc. |
| Test Date: | Aug-2021 |
| Hardware Availability: | Jul-2021 |
| Software Availability: | Dec-2020 |

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-08-15 03:07:47-0400.  
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