Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)

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

Test Date: Nov-2021
Hardware Availability: Apr-2019
Software Availability: Dec-2020

SPECrater®2017 fp_base = 294
SPECrater®2017 fp_peak = 313

503.bwaves_r 112
507.caetuBSSN_r 112
508.namd_r 112
510.parest_r 112
511.povray_r 112
519.lbm_r 112
521.wrf_r 112
526.blender_r 112
527.cam4_r 112
538.imagick_r 112
544.nab_r 112
549.fotonik3d_r 112
554.roms_r 112

Hardware

CPU Name: Intel Xeon Gold 6258R
Max MHz: 4000
Nominal: 2700
Enabled: 56 cores, 2 chips, 2 threads/core
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: 38.5 MB I+D on chip per chip
Other: None
Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 125 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 8.3 (Ootpa)
4.18.0-240.el8.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: No
Firmware: Version 2.13.1 released Nov-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.
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)

SPECrates®2017_fp_base = 294
SPECrates®2017_fp_peak = 313

Results Table

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<th>Copies</th>
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<th>Ratio</th>
<th>Seconds</th>
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<tr>
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<td>660</td>
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<td>181</td>
<td>112</td>
<td>660</td>
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<td>521.wrf_r</td>
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<td>227</td>
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<td>526.blender_r</td>
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<td>1000</td>
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<td>280</td>
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<tr>
<td>544.nab_r</td>
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<td>612</td>
<td>306</td>
<td>615</td>
<td>112</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>2698</td>
<td>162</td>
<td>112</td>
<td>2700</td>
</tr>
<tr>
<td>554.roms_r</td>
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<td>1772</td>
<td>100</td>
<td>1779</td>
<td>100</td>
<td>56</td>
<td>726</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"
MALLOCONF = "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)
# SPEC CPU®2017 Floating Point Rate Result

**Dell Inc.**  
PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)  

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## 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 numacl 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:
- 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 982a61ec0915b55891ef0e16aca64d
running on localhost.localdomain Thu Nov 11 17:32:07 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 6258R CPU @ 2.70GHz

(Continued on next page)
Platform Notes (Continued)

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 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

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): 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: 85
Model name: Intel(R) Xeon(R) Gold 6258R CPU @ 2.70GHz
Stepping: 7
CPU MHz: 3106.062
CPU max MHz: 4000.000
CPU min MHz: 1000.000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
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):
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 node2 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 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 pdpeslb 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
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

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Test Date: Nov-2021
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Platform Notes (Continued)

xtpr 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 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust
bm1 hle avx2 smep bmi2 erms invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap
clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavees
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke
avx512_vnni md_clear flush_l1d arch_capabilities

/pro c/proc/cpuinfo cache data
cache size : 39424 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: 90932 MB
     node 0 free: 80259 MB
     node 1 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 1 size: 91681 MB
     node 1 free: 80259 MB
     node 2 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 2 size: 91747 MB
     node 2 free: 83339 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: 91475 MB
     node 3 free: 86006 MB
     node distances:
     node 0 1 2 3
       0: 10 21 11 21
       1: 21 10 21 11
       2: 11 21 10 21
       3: 21 11 21 10

From /proc/meminfo
MemTotal: 394802948 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

(Continued on next page)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)  

**Platform Notes (Continued)**

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.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):**  
  Mitigation: Split huge pages

- **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 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):**  
  Mitigation: TSX disabled

run-level 3 Nov 11 11:37

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

From /sys/devices/virtual/dmi/id

```
Vendor: Dell Inc.
Product: PowerEdge C6420
Product Family: PowerEdge
```

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)

**SPECCrate®2017_fp_base = 294**

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**Platform Notes (Continued)**

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:

- 7x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 2x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 4x Not Specified Not Specified

**BIOS:**

- BIOS Vendor: Dell Inc.
- BIOS Version: 2.13.1
- BIOS Date: 11/03/2021
- BIOS Revision: 2.13

(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++ | 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.
```

(Continued on next page)
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---

**Compiler Version Notes (Continued)**

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

---

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---

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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) C, Fortran | 507.cactuBSSN_r(base, peak)

---

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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: 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.ibm_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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<td>Tested by: Dell Inc.</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`
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)  

<table>
<thead>
<tr>
<th>Spec CPU®2017_FP_base</th>
<th>294</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spec CPU®2017_FP_peak</td>
<td>313</td>
</tr>
</tbody>
</table>

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

Test Date: Nov-2021  
Hardware Availability: Apr-2019  
Software Availability: Dec-2020

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

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

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

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</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Nov-2021  
**Hardware Availability:** Apr-2019  
**Software Availability:** Dec-2020

---

**Peak Optimization Flags (Continued)**

**C++ benchmarks:**

508.namd_r: basepeak = yes

510.parest_r: -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:**

503.bwaves_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 -mbranches-within-32B-boundaries  
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

**Benchmarks using both Fortran and C:**

521.wrf_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  
-nostandard-realloc-lhs -align array32byte -auto  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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++:**

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

**PowerEdge C6420 (Intel Xeon Gold 6258R, 2.70 GHz)**

| SPECrate®2017_fp_base = 294 |
| SPECrate®2017_fp_peak = 313 |

| CPU2017 License: 55 | Test Date: Nov-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: