# SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>254</td>
<td>270</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** Intel Xeon Gold 6242R
- **Max MHz:** 4100
- **Nominal:** 3100
- **Enabled:** 40 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:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (10 x 32 GB 2Rx4 PC4-2933Y-R; 2 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

## Software

- **OS:** Red Hat Enterprise Linux 8.1
  - kernel 4.18.0-147.el8.x86_64
- **Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux;
  - Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Version 2.7.3 released Mar-2020
- **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 set to prefer performance at the cost of additional power usage
**SPEC CPU® 2017 Floating Point Rate Result**

**Dell Inc.**

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**Compiler Notes**

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

**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 = 
"/dev/shm/cpu2017-ic19.1u1/lib/intel64:/dev/shm/cpu2017-ic19.1u1/je5.0.1-64"

MALLOC_CONF = "retain:true"
```
SPEC CPU®2017 Floating Point Rate Result

Dell Inc. PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

SPECrater®2017_fp_base = 254
SPECrater®2017_fp_peak = 270

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

General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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.
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>
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS settings:
Sub NUMA Cluster enabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /dev/shm/cpu2017-ic19.1u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edeb1e6e46a485a0011
running on localhost.localdomain Mon Jun 29 23:07:27 2020

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

(Continued on next page)
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Tested by: Dell Inc.

SPECrade®2017_fp_base = 254
SPECrade®2017_fp_peak = 270

Test Date: Jul-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Platform Notes (Continued)

From /proc/cpuinfo

model name : Intel(R) Xeon(R) Gold 6242R CPU @ 3.10GHz
2 "physical id"s (chips)
80 "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 : 40
physical 0: cores 0 1 2 4 5 6 8 9 10 11 12 13 16 17 18 19 21 26 28 29
physical 1: cores 0 1 3 5 6 8 10 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 80
On-line CPU(s) list: 0-79
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6242R CPU @ 3.10GHz
Stepping: 7
CPU MHz: 3532.483
CPU max MHz: 4100.0000
CPU min MHz: 1200.0000
BogoMIPS: 6200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71,75,79
Flags: fpu vme de pse tsc msr mcr mca 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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmonperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrc 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_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

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

SPECRate®2017 fp_peak = 270
SPECRate®2017 fp_base = 254

Test Date: Jul-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Platform Notes (Continued)

flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavec cqm_llc cqm_occud_llc cqm_mbm_total
cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lid
arch_capabilities

/proccpuinfo cache data
cache size : 36608 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
node 0 size: 95305 MB
node 0 free: 85568 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77
node 1 size: 96738 MB
node 1 free: 96495 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78
node 2 size: 96763 MB
node 2 free: 96338 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79
node 3 size: 96763 MB
node 3 free: 96368 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: 394824712 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID=rhel
ID_LIKE=fedora
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)  

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CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Test Date: Jul-2020  
Hardware Availability: Feb-2020  
Tested by: Dell Inc.  
Software Availability: Apr-2020  

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**Platform Notes (Continued)**

```plaintext
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)  
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga
```

```
uname -a:  
Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019  
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- 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

```
run-level 3 Jun 29 06:59
```

```
SPEC is set to: /dev/shm/cpu2017-ic19.1u1
```

```
Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  189G  4.2G  185G   3% /dev/shm
```

From `/sys/devices/virtual/dmi/id`

- BIOS: Dell Inc. 2.7.3 03/25/2020
- Vendor: Dell Inc.
- Product: PowerEdge C6420
- Product Family: PowerEdge

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:  
6x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
2x 00AD063200AD HMA84GR7CJR4N-XN 32 GB 2 rank 3200  
3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
4x Not Specified Not Specified
```

(End of data from sysinfo program)
Compiler Version Notes

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<table>
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<th>C</th>
<th>519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)</th>
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SPECrater®2017_fp_base = 254
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Compiler Version Notes (Continued)

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Test Hardware Availability: Feb-2020  
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Compiler Version Notes (Continued)

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
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==============================================================================

Base Compiler Invocation

C benchmarks:  
icc

C++ benchmarks:  
icpc

Fortran benchmarks:  
ifort

(Continued on next page)
Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

SPECrater®2017_fp_base = 254
SPECrater®2017_fp_peak = 270

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

Test Date: Jul-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc 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_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -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:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xcORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xcORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs

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SPEC CPU®2017 Floating Point Rate Result

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

SPECrate®2017_fp_base = 254
SPECrate®2017_fp_peak = 270

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<td>Jul-2020</td>
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Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Hardware Availability: Feb-2020

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- `-fuse-ld=gold -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`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using both Fortran and C:
- `-m64 -gnxtnge -std=c11`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -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 -nostandard-realloc-lhs`
- `-align array32byte -auto -mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using both C and C++:
- `-m64 -gnxtnge -std=c11`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse`
- `-funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64 -gnxtnge -std=c11`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -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 -nostandard-realloc-lhs`
- `-align array32byte -auto -mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Peak Compiler Invocation

C benchmarks:
- `icc`

C++ benchmarks:
- `icpc`

Fortran benchmarks:
- `ifort`
Dell Inc.  
PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)  

SPECRate®2017_fp_base = 254  
SPECRate®2017_fp_peak = 270

CPU2017 License: 55  
Test Date: Jul-2020  
Test Sponsor: Dell Inc.  
Hardware Availability: Feb-2020  
Tested by: Dell Inc.  
Software Availability: Apr-2020

Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc 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: basepeak = yes

C++ benchmarks:
508.namd_r: basepeak = yes

510.parest_r: -m64 -qnextgen
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -fto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
503.bwaves_r: -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles

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### Dell Inc. PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)

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

#### Peak Optimization Flags (Continued)

503.bwaves\_r (continued):
- \texttt{-qopt-mem-layout-trans=4 -nostandard-realloc-lhs}
- \texttt{-align array32byte -auto -mbranches-within-32B-boundaries}
- \texttt{-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc}

549.fotonik3d\_r basepeak = yes

554.roms\_r: Same as 503.bwaves\_r

Benchmarks using both Fortran and C:

521.wrf\_r: \texttt{-prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3}
- \texttt{-ipo -no-prec-div -qopt-prefetch -ffinite-math-only}
- \texttt{-qopt-multiple-gather-scatter-by-shuffles}
- \texttt{-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries}
- \texttt{-nostandard-realloc-lhs -align array32byte -auto}
- \texttt{-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc}

527.cam4\_r basepeak = yes

Benchmarks using both C and C++:

511.povray\_r: \texttt{-prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3}
- \texttt{-ipo -no-prec-div -qopt-prefetch -ffinite-math-only}
- \texttt{-qopt-multiple-gather-scatter-by-shuffles}
- \texttt{-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries}
- \texttt{-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

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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:

Dell Inc.  
PowerEdge C6420 (Intel Xeon Gold 6242R, 3.10GHz)  

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