# SPEC CPU®2017 Integer Rate Result

## Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 5218R, 2.10 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>223</td>
<td>231</td>
</tr>
</tbody>
</table>

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

### Hardware

- **CPU Name**: Intel Xeon Gold 5218R  
- **Max MHz**: 4000  
- **Nominal**: 2100  
- **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**: 27.5 MB I+D on chip per chip  
- **Other**: None  
- **Memory**: 384 GB (12 x 32 GB 2Rx8 PC4-2933V-R, running at 2666)  
- **Storage**: 1 x 480 GB SATA SSD  
- **Other**: None  

### Software

- **OS**: CentOS Linux release 8.1.1911  
- **Kernel**: 4.18.0-147.el8.x86_64  
- **Compiler**: C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux;  
- **Fortran**: Version 19.0.5.281 of Intel Fortran Compiler for Linux  
- **Parallel**: No  
- **Firmware**: Version 2.7.3 released Mar-2020  
- **File System**: ext4  
- **System State**: Run level 3 (multi-user)  
- **Base Pointers**: 64-bit  
- **Peak Pointers**: 32/64-bit  
- **Other**: jemalloc memory allocator V5.0.1  
- **Power Management**: BIOS set to prefer performance at the cost of additional power usage.

---

### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
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<tr>
<td>perlbench_r</td>
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<tr>
<td>gcc_r</td>
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<td>xz_r</td>
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**Notes**

- Test sponsored by Dell Inc.
- Tested by Dell Inc.
- Hardware ordered: Feb-2020
- Software ordered: Jan-2020
- Test run: Apr-2020

---

**Software**

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Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5218R, 2.10 GHz)

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SPECraté®2017_int_peak = 231

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

Results Table

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</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 =
MALLOC_CONF = "retain:true"

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.

(Continued on next page)
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Test Date: Apr-2020
Hardware Availability: Feb-2020
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General Notes (Continued)

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.:
umactl --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

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
Memory Patrol Scrub set to standard
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled

Sysinfo program /root/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
running on localhost.localdomain Thu Apr 9 21:06:07 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

From /proc/cpuinfo
  model name : Intel(R) Xeon(R) Gold 5218R CPU @ 2.10GHz
  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 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

(Continued on next page)
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Platform Notes (Continued)

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 5218R CPU @ 2.10GHz
Stepping: 7
CPU MHz: 924.318
CPU max MHz: 4000.0000
CPU min MHz: 800.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 28160K
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 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
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xptr 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 cd p13
invpcid_single intel_puin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmni
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 xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld
arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.

(Continued on next page)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5218R, 2.10 GHz)

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### Platform Notes (Continued)

```
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: 95017 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: 82209 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: 96450 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: 96386 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*

```
centos-release: CentOS Linux release 8.1.1911 (Core)
centos-release-upstream: Derived from Red Hat Enterprise Linux 8.1 (Source)
```

```
os-release:
  NAME="CentOS Linux"
  VERSION="8 (Core)"
  ID="centos"
  ID_LIKE="rhel fedora"
  VERSION_ID="8"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="CentOS Linux 8 (Core)"
  ANSI_COLOR="0;31"
redhat-release: CentOS Linux release 8.1.1911 (Core)
system-release: CentOS Linux release 8.1.1911 (Core)
system-release-cpe: cpe:/o:centos:centos:8
```

```
uname -a:
Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Wed Dec 4 21:51:45 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux
```

**Kernel self-reported vulnerability status:**

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

SPECrate®2017_int_peak = 231  
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Platform Notes (Continued)  

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 Apr 9 17:41 last=5  
SPEC is set to: /root/cpu2017  
/function/ /dev/sda2  
ext4 439G 16G 401G 4% /

From /sys/devices/virtual/dmi/id  
BIOS: Dell Inc. 2.7.3 03/25/2020  
Vendor: Dell Inc.  
Product: PowerEdge C6420  
Product Family: PowerEdge  
Serial: 1234567  

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:  
8x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933  
4x Not Specified Not Specified  

(End of data from sysinfo program)  

Compiler Version Notes  

==============================================================================  
C | 502.gcc_r(peak)  
==============================================================================  
Intel(R) C Compiler for applications running on IA-32, Version 19.0.5 NextGen Technology Build 20190729  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
==============================================================================  

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| Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.0.5 NextGen Technology Build 20190729 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |

| C | 500.perlbench_r(peak) 557.xz_r(peak) |
| Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |

| C | 502.gcc_r(peak) |
| Intel(R) C Compiler for applications running on IA-32, Version 19.0.5 NextGen Technology Build 20190729 |
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Dell Inc.

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spec

SPEC CPU®2017 Integer Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

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Test Sponsor:
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Test Date:
Apr-2020

CPU2017 License:
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Tested by:
Dell Inc.

Hardware Availability:
Feb-2020

Compiler Version Notes (Continued)

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|         | NextGen Technology Build 20190729                                     |
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|         | Version 19.0.5.281 Build 20190815                                    |
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------------------------------------------------------------------------------

| C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)                 |
|         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)                   |
------------------------------------------------------------------------------
|         | Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 19.0.5 |
|         | NextGen Technology Build 20190729                                    |
|         | Copyright (C) 1985–2019 Intel Corporation. All rights reserved.         |
------------------------------------------------------------------------------

| Fortran | 548.exchange2_r(base, peak)                                           |
------------------------------------------------------------------------------
|         | Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) |
|         | 64, Version 19.0.5.281 Build 20190815                                 |
|         | Copyright (C) 1985–2019 Intel Corporation. All rights reserved.         |
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort
SPEC CPU®2017 Integer Rate Result

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 5218R, 2.10 GHz)

SPECrate®2017_int_base = 223
SPECrate®2017_int_peak = 231

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

Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -flto
-mfpmath=sse -funroll-loops -qnextgen -fuse-ld=gold
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -flto -mfpmath=sse
-funroll-loops -qnextgen -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort
# SPEC CPU®2017 Integer Rate Result

## Dell Inc.

**PowerEdge C6420 (Intel Xeon Gold 5218R, 2.10 GHz)**

<table>
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<th>CPU2017 License:</th>
<th>55</th>
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<td>Dell Inc.</td>
</tr>
</tbody>
</table>

| SPECrate®2017_int_base = | 223 |
| SPECrate®2017_int_peak = | 231 |

### Peak Portability Flags

- **500.perlbench_r**: -DSPEC_LP64 -DSPEC_LINUX_X64
- **502.gcc_r**: -D_FILE_OFFSET_BITS=64
- **505.mcf_r**: -DSPEC_LP64
- **520.omnetpp_r**: -DSPEC_LP64
- **523.xalancbmk_r**: -DSPEC_LP64 -DSPEC_LINUX
- **525.x264_r**: -DSPEC_LP64
- **531.deepsjeng_r**: -DSPEC_LP64
- **541.leela_r**: -DSPEC_LP64
- **548.exchange2_r**: -DSPEC_LP64
- **557.xz_r**: -DSPEC_LP64

### Peak Optimization Flags

**C benchmarks:**

- **500.perlbench_r**: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
  -xCORE-AVX512 -ipo -O3 -no-prec-div
  -gopt-mem-layout-trans=4 -fno-strict-overflow
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
  -ljemalloc

- **502.gcc_r**: -m32
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/ia32_lin
  -std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
  -fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
  -Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold
  -gopt-mem-layout-trans=4 -L/usr/local/je5.0.1-32/lib
  -ljemalloc

- **505.mcf_r**: basepeak = yes

- **525.x264_r**: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -flto -O3
  -ffast-math -qnextgen -fuse-ld=gold
  -gopt-mem-layout-trans=4 -fno-alias
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
  -ljemalloc

- **557.xz_r**: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  -gopt-mem-layout-trans=4
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
  -ljemalloc

**C++ benchmarks:**

(Continued on next page)
Dell Inc.

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Test Date: Apr-2020  
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Peak Optimization Flags (Continued)

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: -m64 -Wl,-z,muldefs -fprofile-generate(pass 1)
               -fprofile-use=default.profdatal -xCORE-AVX512 -flto
               -Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold
               -qopt-mem-layout-trans=4
               -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
               -lqkmalloc
541.leela_r: basepeak = yes

Fortran benchmarks:
548.exchange2_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.

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