Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

**SPECspeed®2017_int_base = 11.5**

**SPECspeed®2017_int_peak = 11.8**

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

<table>
<thead>
<tr>
<th>Thread</th>
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<th>SPECspeed®2017_int_peak</th>
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<td>6.02</td>
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<td>641.leela_s</td>
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</tr>
<tr>
<td>657.xz_s</td>
<td>23.6</td>
<td></td>
</tr>
</tbody>
</table>

**Software**

- **OS:** Red Hat Enterprise Linux 8.4 (Ootpa)  
  4.18.0-305.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:** Yes  
- **Firmware:** Version 2.11.2 released Apr-2021  
- **File System:** xfs  
- **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.

**Hardware**

- **CPU Name:** Intel Xeon Gold 5220R  
  Max MHz: 4000  
  Nominal: 2200  
  Enabled: 48 cores, 2 chips  
  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 (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
- **Storage:** 1 x 1.6 TB SATA SSD  
- **Other:** None
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>600.perlbench_s</th>
<th>602.gcc_s</th>
<th>605.mcf_s</th>
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<td>23.9</td>
<td>48</td>
<td>262</td>
<td>23.6</td>
<td>259</td>
</tr>
</tbody>
</table>

### 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:

- KMP_AFFINITY = "granularity=fine,scatter"
- LD_LIBRARY_PATH = "/root/cpu2017-1.1.8-ic2021.1/lib/intel64:/root/cpu2017-1.1.8-ic2021.1/j e5.0.1-64"
- MALLOC_CONF = "retain:true"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

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
```


NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
## Dell Inc. PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
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<tr>
<td>11.5</td>
<td>11.8</td>
</tr>
</tbody>
</table>

### General Notes (Continued)

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.

### Platform Notes

**BIOS settings:**
- Logical Processor: Disabled
- 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 /root/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6a4d4
running on localhost.localdomain Mon Nov 15 23:45:42 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 5220R CPU @ 2.20GHz
  2 "physical id"s (chips)
  48 "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 : 24
  siblings : 24
  physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
  physical 1: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

From lscpu from util-linux 2.32.1:

```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
```

(Continued on next page)
Platform Notes (Continued)

CPU(s):              48
On-line CPU(s) list: 0-47
Thread(s) per core:  1
Core(s) per socket:  24
Socket(s):           2
NUMA node(s):        2
Vendor ID:           GenuineIntel
BIOS Vendor ID:      Intel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
BIOS Model name:     Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping:            7
CPU MHz:             2325.488
CPU max MHz:         4000.0000
CPU min MHz:         1000.0000
BogoMIPS:            4400.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            36608K
NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46
NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47
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 art arch_perfmon pebs bts rep_good nop1 xtitype cs nondis interrupt
                     arch_perfmonitor monitor ds_cpl vmx smx est tm mss ssse3 sdbg fma cx16
                     xtpr pdcm pccid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
                     avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3
                     invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust
                     bmi1 hle avx2 smep bmi2  invpcid cmx mpx rdt_a avx512f avx512dq rdseed adx smap
                     clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsavesopt xsaveopt xsvmmvx xsvme
                     xsavec qm _m _mm _total _mm _m _local dtherm ida arat pni pts k suicide avx512_vnni
                     md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 36608 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
  node 0 cpus:  0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
  node 0 size: 192035 MB
  node 0 free: 182658 MB

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

**Dell Inc.**

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base = 11.5</th>
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<tr>
<td>SPECspeed®2017_int_peak = 11.8</td>
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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:** May-2021

**Platform Notes (Continued)**

- node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47  
- node 1 size: 193530 MB  
- node 1 free: 190169 MB  
- node distances:  
  - 0: 10 21  
  - 1: 21 10

From /proc/meminfo  
MemTotal: 394818984 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

From /etc/*release*/etc/*version*  
NAME="Red Hat Enterprise Linux"  
VERSION="8.4 (Ootpa)"  
ID="rhel"  
ID_LIKE="fedora"  
VERSION_ID="8.4"  
PLATFORM_ID="platform:el8"  
PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"  
ANSI_COLOR="0;31"  
redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)  
system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)  
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

uname -a:  
Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021  
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

- CVE-2018-12207 (iTLB Multi-hit): KVM: 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

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

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = 11.8

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

Test Date: Nov-2021
Hardware Availability: Apr-2019
Software Availability: May-2021

Platform Notes (Continued)

barriers and __user pointer sanitization
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
MITIGATION: TSX disabled

CVE-2019-11135 (TSX Asynchronous Abort):

run-level 3 Nov 15 14:35

SPEC is set to: /root/cpu2017-1.1.8-ic2021.1
From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge C6420
Product Family: PowerEdge

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:
1x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933, configured at 2666
4x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
6x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
1x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 2.11.2
BIOS Date: 04/22/2021
BIOS Revision: 2.11

(End of data from sysinfo program)

Compiler Version Notes

============================================================================================================
C       | 600.perlbench_s(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)
## Compiler Version Notes (Continued)

<table>
<thead>
<tr>
<th></th>
<th>perlbench_s(base)</th>
<th>gcc_s(base, peak)</th>
<th>mcf_s(base, peak)</th>
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<tbody>
<tr>
<td>C</td>
<td>600</td>
<td>602</td>
<td>605</td>
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<tr>
<td></td>
<td>x264_s(base, peak)</td>
<td>xz_s(base, peak)</td>
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</tr>
</tbody>
</table>

---

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.

---

<table>
<thead>
<tr>
<th></th>
<th>perlbench_s(peak)</th>
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<tbody>
<tr>
<td>C</td>
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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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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<table>
<thead>
<tr>
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<tr>
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<td>leela_s(base, peak)</td>
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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<th>exchange2_s(base, peak)</th>
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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.
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

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

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = 11.8

Test Date: Nov-2021
Hardware Availability: Apr-2019
Software Availability: May-2021

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX512
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-DSPEC_OPENMP -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin/
-lqkmalloc

Fortran benchmarks:
-m64 -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries
Peak Compiler Invocation

C benchmarks (except as noted below):
- icx

600.perlbench_s: icc

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -DSPEC_OPENMP -fopenmp -std=c11 -m64 -Wl,-z,muldefs
-xCORE-AVX512 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 5220R, 2.20 GHz)

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = 11.8

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

Peak Optimization Flags (Continued)

C++ benchmarks:
620.omnetpp_s: basepeak = yes
623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes
641.leela_s: basepeak = yes

Fortran benchmarks:
648.exchange2_s: 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:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.xml