Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPECspeed®2017_int_base = 11.1
SPECspeed®2017_int_peak = 11.4

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

Threads

<table>
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<th>Test</th>
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<td>perlbench_s 112</td>
<td>6.72</td>
<td>8.00</td>
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<tr>
<td>gcc_s 112</td>
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<td>mcf_s 112</td>
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<tr>
<td>omnetpp_s 112</td>
<td>8.09</td>
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</tr>
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<td>xalancbmk_s 112</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>x264_s 112</td>
<td>15.9</td>
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</tr>
<tr>
<td>deepsjeng_s 112</td>
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</tr>
<tr>
<td>leela_s 112</td>
<td>4.91</td>
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<tr>
<td>exchange2_s 112</td>
<td>17.3</td>
<td></td>
</tr>
<tr>
<td>xz_s 112</td>
<td>24.7</td>
<td></td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Gold 6238R
Max MHz: 4000
Nominal: 2200
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: 1 x 960 GB SATA SSD
Other: None

Software

OS: CentOS Linux 8.1.1911
Kernel: 4.18.0-147.5.1.el8_1.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: Yes
Firmware: Version 2.8.1 released Jun-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 Integer Speed Result

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

SPECspeed®2017_int_base = 11.1
SPECspeed®2017_int_peak = 11.4

Results Table

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<thead>
<tr>
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<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
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<tr>
<td>631.deepsjeng_s</td>
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<td>348 4.91</td>
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<td>349 4.89</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>112</td>
<td>170 17.3</td>
<td>170 17.3</td>
<td>170 17.3</td>
<td>112</td>
<td>170 17.3</td>
<td>170 17.3</td>
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<tr>
<td>657.xz_s</td>
<td>112</td>
<td>250 24.7</td>
<td>250 24.8</td>
<td>250 24.7</td>
<td>112</td>
<td>250 24.7</td>
<td>250 24.8</td>
<td>250 24.7</td>
</tr>
</tbody>
</table>
```

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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. The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux.

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 = "/dev/shm/cpu2017-ic19.1ul/lib/intel64:/dev/shm/cpu2017-ic19.1ul/je5.0.1-64"
MALLOCONF = "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
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)
Dell Inc. PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

**SPECspeed®2017_int_base = 11.1**

**SPECspeed®2017_int_peak = 11.4**

---

### 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
```

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 disabled
- 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
- UPI Prefetch disabled
- 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 295195f888a3d7ed1b1e6e46a485a0011

running on localhost.localdomain Fri Jul 17 18:09:06 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 6238R CPU @ 2.20GHz
  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.)
```

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPEC speed®2017_int_base = 11.1
SPEC speed®2017_int_peak = 11.4

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

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

Platform Notes (Continued)

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:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: LittleEndian
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 6238R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 1480.404
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: 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 pse syclall 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 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 cpe
invcpcid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erness invpcid rtm

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

**Dell Inc.**

**PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)***

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>11.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>11.4</td>
</tr>
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</table>

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

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

**Platform Notes (Continued)**

```plaintext
cqm mpx rdt_a avx512f avx512dq rsseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves 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

/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: 95303 MB
    node 0 free: 95001 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: 96737 MB
    node 1 free: 87421 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: 96762 MB
    node 2 free: 96501 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: 96761 MB
    node 3 free: 95778 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:       394818684 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"
```

(Continued on next page)
## Dell Inc.

**PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_base</td>
<td>11.1</td>
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</table>

### Platform Notes (Continued)

```bash
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
```

```bash
uname -a:
    Linux localhost.localdomain 4.18.0-147.5.1.el8_1.x86_64 #1 SMP Wed Feb 5 02:00:39 UTC 2020 x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **itlb_multihit:** Processor vulnerable
- **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/swapsgs barriers and __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
- **tsx_async_abort:** Mitigation: Clear CPU buffers; SMT vulnerable

---

### 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

---

(Continued on next page)
Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

| SPECspeed®2017_int_base = 11.1 |
| SPECspeed®2017_int_peak = 11.4 |

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

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

Platform Notes (Continued)

4x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

```
<table>
<thead>
<tr>
<th>Compiler</th>
<th>Benchmark (base)</th>
<th>Benchmark (peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>perlbench_s</td>
<td>gcc_s</td>
</tr>
<tr>
<td></td>
<td>mcf_s</td>
<td>x264_s</td>
</tr>
<tr>
<td></td>
<td>xz_s</td>
<td>Perlbench_s</td>
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<tr>
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<td>mcf_s</td>
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<tr>
<td></td>
<td>x264_s</td>
<td>xz_s</td>
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</table>

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

```
<table>
<thead>
<tr>
<th>Compiler</th>
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</table>

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```

```
<table>
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<td>xz_s</td>
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
```

```
<table>
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<th>Compiler</th>
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<td>xalanchmk_s</td>
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<tr>
<td></td>
<td>deepsjeng_s</td>
<td>leela_s</td>
</tr>
</tbody>
</table>

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
```

(Continued on next page)
## Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
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<tr>
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<th>Jul-2020</th>
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<tr>
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<td>Dell Inc.</td>
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<tr>
<td>CPU2017 License:</td>
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<td>Hardware Availability:</td>
<td>Jul-2020</td>
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<tr>
<td>Software Availability:</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

### Compiler Version Notes (Continued)

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

Fortran | 648.exchange2_s (base, peak)

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

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

### Base Compiler Invocation

C benchmarks:
```bash
icc
```

C++ benchmarks:
```bash
icpc
```

Fortran benchmarks:
```bash
ifort
```

### Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Portability Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbmk_s</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
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<tr>
<td>602.gcc_s</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>605.mcf_s</td>
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<td>623.xalancbmk_s</td>
<td>-DSPEC_LP64 -DSPEC_LINUX</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>-DSPEC_LP64</td>
</tr>
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<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### Base Optimization Flags

C benchmarks:
```bash
-m64 -qnextgen -std=c11 -Wl,-plugin-opt=-x86-branches-within-32B-bounds -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
```

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

Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPECspeed®2017_int_base = 11.1
SPECspeed®2017_int_peak = 11.4

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

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

Base Optimization Flags (Continued)

C benchmarks (continued):
- fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
- m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse
- funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
- m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX2
- O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
- nostandard-realloc-lhs -align array32byte
- mbranches-within-32B-boundaries

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64(*) -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalanbk_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

(*) Indicates a portability flag that was found in a non-portability variable.
SPEC CPU®2017 Integer Speed Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.
PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPECspeed®2017_int_base = 11.1
SPECspeed®2017_int_peak = 11.4

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

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX2 -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 -qnextgen -std=c11 -fuse-ld=gold
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Oofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -flto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

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-ic19.1u1-official-linux64_revA.xml
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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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