Dell Inc.

PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench</td>
<td>44</td>
<td>6.20</td>
<td>6.97</td>
</tr>
<tr>
<td>gcc</td>
<td>44</td>
<td>8.86</td>
<td>9.08</td>
</tr>
<tr>
<td>mcf</td>
<td>44</td>
<td>11.3</td>
<td>11.6</td>
</tr>
<tr>
<td>omnetpp</td>
<td>44</td>
<td>8.27</td>
<td>8.27</td>
</tr>
<tr>
<td>xalancbmk</td>
<td>44</td>
<td>9.87</td>
<td></td>
</tr>
<tr>
<td>x264</td>
<td>44</td>
<td></td>
<td>13.5</td>
</tr>
<tr>
<td>deepsjeng</td>
<td>44</td>
<td>5.12</td>
<td></td>
</tr>
<tr>
<td>leela</td>
<td>44</td>
<td>4.23</td>
<td></td>
</tr>
<tr>
<td>exchange2</td>
<td>44</td>
<td></td>
<td>15.0</td>
</tr>
<tr>
<td>xz</td>
<td>44</td>
<td></td>
<td>21.8</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6238
- **Max MHz:** 3700
- **Nominal:** 2100
- **Enabled:** 44 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:** 30.25 MB I+D on chip per core
- **Other:** None
- **Memory:** 384 GB (12 x 32 GB 2Rx8 PC4-3200V-R, running at 2666)
- **Storage:** 1 x 1.92 TB SATA SSD
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.1
- **Kernel:** 4.18.0-147.el8.x86_64
- **Compiler:** C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux;
  Fortran: Version 19.0.5.281 of Intel Fortran Compiler for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.6.3 released Jan-2020
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
- **Power Management:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.

**Test Details**

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

PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

SPEC CPU®2017 Integer Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>44</td>
<td>286</td>
<td>6.21</td>
<td>286</td>
<td>6.20</td>
<td>287</td>
<td>6.18</td>
<td>44</td>
<td>254</td>
<td>6.99</td>
<td>255</td>
<td>6.97</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>44</td>
<td>450</td>
<td>8.86</td>
<td>448</td>
<td>8.89</td>
<td>450</td>
<td>8.84</td>
<td>44</td>
<td>439</td>
<td>9.06</td>
<td>442</td>
<td>9.01</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>44</td>
<td>420</td>
<td>11.12</td>
<td>417</td>
<td>11.13</td>
<td>416</td>
<td>11.4</td>
<td>44</td>
<td>407</td>
<td>11.6</td>
<td>408</td>
<td>11.6</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>44</td>
<td>196</td>
<td>8.31</td>
<td>198</td>
<td>8.24</td>
<td>197</td>
<td>8.27</td>
<td>44</td>
<td>203</td>
<td>8.04</td>
<td>197</td>
<td>8.27</td>
</tr>
<tr>
<td>623.xalanchmk_s</td>
<td>44</td>
<td>144</td>
<td>9.83</td>
<td>143</td>
<td>9.88</td>
<td>144</td>
<td>9.87</td>
<td>44</td>
<td>144</td>
<td>9.83</td>
<td>143</td>
<td>9.88</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>44</td>
<td>130</td>
<td>13.5</td>
<td>130</td>
<td>13.5</td>
<td>130</td>
<td>13.5</td>
<td>44</td>
<td>130</td>
<td>13.5</td>
<td>130</td>
<td>13.5</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>44</td>
<td>280</td>
<td>5.13</td>
<td>280</td>
<td>5.12</td>
<td>280</td>
<td>5.12</td>
<td>44</td>
<td>280</td>
<td>5.13</td>
<td>280</td>
<td>5.12</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>44</td>
<td>403</td>
<td>4.23</td>
<td>403</td>
<td>4.23</td>
<td>404</td>
<td>4.22</td>
<td>44</td>
<td>403</td>
<td>4.23</td>
<td>403</td>
<td>4.23</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>44</td>
<td>196</td>
<td>15.0</td>
<td>196</td>
<td>15.0</td>
<td>196</td>
<td>15.0</td>
<td>44</td>
<td>196</td>
<td>15.0</td>
<td>196</td>
<td>15.0</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>44</td>
<td>284</td>
<td>21.8</td>
<td>283</td>
<td>21.8</td>
<td>284</td>
<td>21.8</td>
<td>44</td>
<td>280</td>
<td>22.1</td>
<td>280</td>
<td>22.1</td>
</tr>
</tbody>
</table>

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

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 = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K 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) 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
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:
- 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 disabled
- 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 /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe16e46a485a0011
running on localhost.localdomain Sun Apr 26 15:46:04 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 6238 CPU @ 2.10GHz
- 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 : 22
  - siblings : 22
  - physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
  - physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 44
- On-line CPU(s) list: 0-43
- Thread(s) per core: 1
- Core(s) per socket: 22
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel

(Continued on next page)
## Dell Inc. PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

### SPEC CPU®2017 Integer Speed Result

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>55</th>
<th>Test Sponsor:</th>
<th>Dell Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Hardware Availability:</td>
<td>Feb-2020</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Apr-2020</td>
<td>Software Availability:</td>
<td>Nov-2019</td>
</tr>
</tbody>
</table>

### SPEC Speed®2017 Int Base = 9.31

### SPEC Speed®2017 Int Peak = 9.47

### Platform Notes (Continued)

```
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
Stepping:            7
CPU MHz:             2289.209
CPU max MHz:         3700.0000
CPU min MHz:         1000.0000
BogoMIPS:            4200.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            30976K
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
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
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 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_l3
                      invpcid_single intel_pmx ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
                      flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
                      cqm mpx rdt_a avx512f avx512dq rsenos adx smap clflushopt clwb intel_pt avx512cd
                      avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occuc_llc cqm_mbm_total
                      cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld
                      arch_capabilities

/proc/cpuinfo cache data
  cache size : 30976 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
  node 0 size: 192048 MB
  node 0 free: 190758 MB
  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
  node 1 size: 193531 MB
  node 1 free: 192813 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 394833064 KB
```

(Continued on next page)
Dell Inc.

PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

SPECspeed®2017_int_base = 9.31
SPECspeed®2017_int_peak = 9.47

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

Platform Notes (Continued)

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

run-level 3 Apr 26 15:45 last=5

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 1.7T 20G 1.7T 2% /home

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.6.3 01/18/2020
Vendor: Dell Inc.
Product: PowerEdge R440
Product Family: PowerEdge
Serial: F9TD613

Additional information from dmidecode follows. WARNING: Use caution when you interpret
**Dell Inc.**

**PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)**

**SPEC CPU®2017 Integer Speed Result**

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.31</td>
<td>9.47</td>
</tr>
</tbody>
</table>

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

**Platform Notes (Continued)**

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:
12x 002C069D002C 36ASF4G72PZ-3G2E2 32 GB 2 rank 3200
4x Not Specified Not Specified

(End of data from sysinfo program)

---

**Compiler Version Notes**

==============================================================================
C       | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, 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++     | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, 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.

==============================================================================
Fortran  | 648.exchange2_s(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

(Continued on next page)
Dell Inc.

PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

SPEC CPU®2017 Integer Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

| SPECspeed®2017_int_base = 9.31 |
| SPECspeed®2017_int_peak = 9.47 |

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Base Compiler Invocation (Continued)

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:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-m64 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

Peak Compiler Invocation

C benchmarks:
icc
C++ benchmarks:
icpc

(Continued on next page)
Dell Inc.
PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>9.31</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>9.47</td>
</tr>
</tbody>
</table>

---

**Peak Compiler Invocation (Continued)**

Fortran benchmarks:
```
ifort
```

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**Peak Optimization Flags**

C benchmarks:

```
600.perlbench_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -fno-strict-overflow -L/usr/local/je5.0.1-64/lib -ljemalloc
```

```
602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div -DSPEC_SUPPRESS_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc
```

```
605.mcf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc
```

```
625.x264_s: basepeak = yes
```

```
657.xz_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc
```

C++ benchmarks:

(Continued on next page)
Dell Inc. PowerEdge R440 (Intel Xeon Gold 6238, 2.10 GHz)

SPECspeed®2017_int_base = 9.31
SPECspeed®2017_int_peak = 9.47

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

Peak Optimization Flags (Continued)

620.omnetpp_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-ipo -xCORE-AVX2 -O3 -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

623.xalancbnk_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:

SPEC CPU and SPECspeed are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product
names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2020-04-26 16:46:03-0400.
Originally published on 2020-05-12.