## SPEC CPU®2017 Integer Speed Result

### Dell Inc.

**PowerEdge R640 (Intel Xeon Gold 6230R, 2.10 GHz)**

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>May-2020</th>
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<tbody>
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<td>Feb-2020</td>
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| CPU2017 License: | 55 |
| Test Sponsor: | Dell Inc. |
| Tested by: | Dell Inc. |

| SPECspeed®2017_int_base | 10.1 |
| SPECspeed®2017_int_peak | 10.3 |

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>52</td>
<td>6.64</td>
<td>7.50</td>
</tr>
<tr>
<td>gcc_s</td>
<td>52</td>
<td>5.50</td>
<td></td>
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<tr>
<td>mcf_s</td>
<td>52</td>
<td>4.70</td>
<td></td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>52</td>
<td></td>
<td></td>
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<tr>
<td>xalancbmk_s</td>
<td>52</td>
<td>10.7</td>
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<tr>
<td>x264_s</td>
<td>52</td>
<td>14.5</td>
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<tr>
<td>deepsjeng_s</td>
<td>52</td>
<td>15.7</td>
<td></td>
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<tr>
<td>leela_s</td>
<td>52</td>
<td>23.4</td>
<td></td>
</tr>
<tr>
<td>exchange2_s</td>
<td>52</td>
<td>23.4</td>
<td></td>
</tr>
<tr>
<td>xz_s</td>
<td>52</td>
<td></td>
<td></td>
</tr>
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### Hardware

**CPU Name:** Intel Xeon Gold 6230R  
**Max MHz:** 4000  
**Nominal:** 2100  
**Enabled:** 52 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 (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)  
**Storage:** 1 x 1.92 TB SATA SSD  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.1  
**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 2.5.4 released Jan-2020  
**File System:** tmpfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 64-bit  
**Other:** None  
**Power Management:** BIOS set to prefer performance at the cost of additional power usage  
**jemalloc memory allocator V5.0.1**
### 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>
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</tr>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>52</td>
<td>267.664</td>
<td>6.64</td>
<td>266.667</td>
<td>6.67</td>
<td>52</td>
<td>236.753</td>
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<tr>
<td>602.gcc_s</td>
<td>52</td>
<td>393.101</td>
<td>10.1</td>
<td>401.92</td>
<td>9.92</td>
<td>52</td>
<td>388.103</td>
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<tr>
<td>605.mcf_s</td>
<td>52</td>
<td>379.125</td>
<td>12.5</td>
<td>376.126</td>
<td>12.6</td>
<td>52</td>
<td>376.126</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>52</td>
<td>180.906</td>
<td>181.900</td>
<td>181.900</td>
<td>181.900</td>
<td>52</td>
<td>177.920</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>52</td>
<td>121.145</td>
<td>121.146</td>
<td>121.146</td>
<td>121.146</td>
<td>52</td>
<td>121.145</td>
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<tr>
<td>631.deepsjeng_s</td>
<td>52</td>
<td>260.5.50</td>
<td>261.5.50</td>
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<td>261.5.50</td>
<td>52</td>
<td>260.5.50</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>52</td>
<td>363.4.70</td>
<td>363.4.70</td>
<td>363.4.70</td>
<td>363.4.70</td>
<td>52</td>
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<tr>
<td>648.exchange2_s</td>
<td>52</td>
<td>188.15</td>
<td>188.15</td>
<td>188.15</td>
<td>188.15</td>
<td>52</td>
<td>188.15</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>52</td>
<td>264.23</td>
<td>264.23</td>
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<td>52</td>
<td>264.23</td>
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SPECSpeed\textsuperscript{2017\_int\_base} = 10.1
SPECSpeed\textsuperscript{2017\_int\_peak} = 10.3

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** = "/mnt/ramdisk/cpu2017/lib/intel64:/mnt/ramdisk/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:

```bash
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

(Continued on next page)
Dell Inc.  
PowerEdge R640 (Intel Xeon Gold 6230R, 2.10 GHz)  

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

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**General Notes (Continued)**

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 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 /mnt/ramdisk/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edbe6e46a485a0011  
running on rhel-8-1-sut Fri May 1 12:29:27 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

From /proc/cpuinfo  
model name : Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz  
2 "physical id"s (chips)  
52 "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 : 26  
siblings : 26  
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29  
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29

From lscpu:  
Architecture: x86_64

(Continued on next page)
### Platform Notes (Continued)

- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU(s):** 52
- **On-line CPU(s) list:** 0-51
- **Thread(s) per core:** 1
- **Core(s) per socket:** 26
- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
- **Stepping:** 7
- **CPU MHz:** 1971.454
- **CPU max MHz:** 4000.0000
- **CPU min MHz:** 1000.0000
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 36608K
- **NUMA node0 CPU(s):** 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50
- **NUMA node1 CPU(s):** 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51
- **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 pdemsg 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 abal Sam 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_ppin ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsavesopt xsaves xgetbv1 xsaveopt xsave cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida atar pln pts pku ospke 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 48 50
  - node 0 size: 192046 MB

(Continued on next page)
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6230R, 2.10 GHz)  

**SPECspeed**\textsuperscript{®}2017\textsubscript{int\_peak} = 10.3

**SPECspeed**\textsuperscript{®}2017\textsubscript{int\_base} = 10.1

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**Platform Notes (Continued)**

- node 0 free: 190914 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 45 47 49 51
- node 1 size: 193530 MB
- node 1 free: 177647 MB
- node distances:
  - node 0 1
    - 0: 10 21
    - 1: 21 10

From /proc/meminfo
- MemTotal: 394831056 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
- 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 rhel-8-1-sut 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: userscopy/swapgs barriers and __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 May 1 11:48 last=5

SPEC is set to: /mnt/ramdisk/cpu2017

(Continued on next page)
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PowerEdge R640 (Intel Xeon Gold 6230R, 2.10 GHz)

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

Test Date: May-2020
Hardware Availability: Feb-2020
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Platform Notes (Continued)

Filesystem   Type  Size  Used  Avail  Use%  Mounted on
            tmpfs   225G  7.5G  218G  4%  /mnt/ramdisk

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.5.4 01/13/2020
Vendor: Dell Inc.
Product: PowerEdge R640
Product Family: PowerEdge
Serial: FPFXCH2

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:
10x 002C069D002C 18ASF2G72PDZ-2G9E1 16 GB 2 rank 2933
4x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933
8x 00AD00B300AD HMA82GR7CJR8N-XN 16 GB 2 rank 3200
2x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(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)
(Continued on next page)
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### Compiler Version Notes (Continued)

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

### Base Portability Flags

- 600.perlbmk_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-AVX512 -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-AVX512 -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

(Continued on next page)
### Dell Inc. PowerEdge R640 (Intel Xeon Gold 6230R, 2.10 GHz)

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### Base Optimization Flags (Continued)

Fortran benchmarks:
- `-m64`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=4`  
- `-nostandard-realloc-lhs`

### Peak Compiler Invocation

- **C benchmarks:** `icc`  
- **C++ benchmarks:** `icpc`  
- **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-AVX512`
  - `-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-AVX512`
  - `-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-AVX512 -O3 -no-prec-div`
  - `-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp`
  - `-DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc`

(Continued on next page)
Peak Optimization Flags (Continued)

625.x264_s: 
basepeak = yes

657.xz_s: 
-m64 -std=c11 -W1,-z,muldefs -prof-gen(pass 1)
-prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:

620.omnetpp_s: 
-m64 -W1,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-ipo -xCORE-AVX512 -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.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-ic19.0u5-official-linux64_rev0.xml

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Tested with SPEC CPU®2017 v1.1.0 on 2020-05-01 13:29:27-0400.