# SPEC CPU®2017 Integer Speed Result

**Dell Inc.**

PowerEdge M640 (Intel Xeon Gold 6230N, 2.30GHz)

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed²017_int_base = 9.99</th>
<th>SPECspeed²017_int_peak = 10.2</th>
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</thead>
<tbody>
<tr>
<td>40</td>
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<tr>
<td>600.perlbench_s</td>
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<td>7.73</td>
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<tr>
<td>602.gcc_s</td>
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<td>9.79</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>12.0</td>
<td>11.9</td>
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<tr>
<td>620.omnetpp_s</td>
<td>8.04</td>
<td>8.33</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>12.4</td>
<td>12.4</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>14.4</td>
<td>14.3</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>5.49</td>
<td>5.39</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>4.77</td>
<td>4.77</td>
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<tr>
<td>648.exchange2_s</td>
<td>16.6</td>
<td>16.7</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>21.1</td>
<td>21.2</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Sep-2019

**Hardware Availability:** Apr-2019

**Software Availability:** Sep-2019

## Hardware

- **CPU Name:** Intel Xeon Gold 6230N
- **Max MHz:** 3500
- **Nominal:** 2300
- **Enabled:** 40 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:** 27.5 MB I+D on chip per chip
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
- **Storage:** 1 x 480 GB SATA SSD
- **Other:** None

## Software

- **OS:** Ubuntu 18.04.2 LTS
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
  Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.2.11 released Jun-2019
- **File System:** ext4
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** --
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SPECspeed®2017_int_base = 9.99
SPECspeed®2017_int_peak = 10.2

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Threads</th>
<th>Seconds</th>
<th>Base Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak Threads</th>
<th>Seconds</th>
<th>Peak Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td>176</td>
<td>16.7</td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 9.99
SPECspeed®2017_int_peak = 10.2

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"

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

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.
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
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Software Availability: Sep-2019

BIOS settings:
ADDDC setting disabled
Sub NUMA Cluster disabled
Virtualization Technology disabled
DCU Streamer Prefetcher 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 disabled
Logical Processor disabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd8f2999c33d61f64985e45859ea9
running on intel-sut Fri Sep 13 20:37:45 2019

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 6230N CPU @ 2.30GHz
  2 "physical id"s (chips)
  40 "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 : 20
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

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 1
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85

(Continued on next page)
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Platform Notes (Continued)

Model name: Intel(R) Xeon(R) Gold 6230N CPU @ 2.30GHz
Stepping: 6
CPU MHz: 3376.540
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 28160K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39
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 rdtsscp
   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 lse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
   avx f16c rdrand lahf_lm lahfc_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdq_l3
   invpcid_single intel_pmm ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi
   flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erva invpcid rtm
   cmpx mpl rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
   avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occu_llc cqm_mbb_total
   cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld
   arch_capabilities

/proc/cpuinfo cache data
   cache size : 28160 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
   node 0 size: 191912 MB
   node 0 free: 191473 MB
   node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
   node 1 size: 193510 MB
   node 1 free: 192836 MB
   node distances:
   node 0 1
   0: 10 21
   1: 21 10

From /proc/meminfo
   MemTotal: 394673276 kB
   HugePages_Total: 0
   Hugepagesize: 2048 kB

/usr/bin/lsb_release -d

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Ubuntu 18.04.2 LTS

From /etc/*release* /etc/*version*

debian_version: buster/sid
os-release:
NAME="Ubuntu"
VERSION="18.04.2 LTS (Bionic Beaver)"
ID=ubuntu
ID_LIKE=debian
PRETTY_NAME="Ubuntu 18.04.2 LTS"
VERSION_ID="18.04"
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
Linux intel-sut 4.15.0-62-generic #69-Ubuntu SMP Wed Sep 4 20:55:53 UTC 2019 x86_64
x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown): Not affected
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 Sep 13 19:49

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 439G 32G 385G 8% /

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.

BIOS Dell Inc. 2.2.11 06/14/2019

Memory:
6x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
3x 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       | 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 19.0.4.227 Build 20190416
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 19.0.4.227 Build 20190416
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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
```

**Base Compiler Invocation**

C benchmarks:
```
icc -m64 -std=c11
```

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

**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
```

(Continued on next page)
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Base Portability Flags (Continued)

- 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:
- -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:
- -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4
- -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
- -lqkmalloc

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

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Peak Portability Flags

Same as Base Portability Flags
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| SPECspeed®2017_int_peak = 10.2 |

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### Peak Optimization Flags

#### C benchmarks:

- **600.perlbench_s:** 
  - `-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` 
  - `-L/usr/local/je5.0.1-64/lib` 
  - `-ljemalloc`

- **602.gcc_s:** 
  - `-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`

- **605.mcf_s:** 
  - `-Wl,-z,muldefs` 
  - `-prof-gen(pass 1)` 
  - `-prof-use(pass 2)` 
  - `-ipo` 
  - `-xCORE-AVX512` 
  - `-O3` 
  - `-no-prec-div` 
  - `-DSPEC_SUPPRESS_OPENMP`

- **625.x264_s:** 
  - `-Wl,-z,muldefs` 
  - `-xCORE-AVX512` 
  - `-ipo` 
  - `-O3` 
  - `-no-prec-div` 
  - `-DSPEC_SUPPRESS_OPENMP`

#### C++ benchmarks:

- **620.omnetpp_s:** 
  - `-Wl,-z,muldefs` 
  - `-prof-gen(pass 1)` 
  - `-prof-use(pass 2)` 
  - `-ipo` 
  - `-xCORE-AVX512` 
  - `-O3` 
  - `-no-prec-div` 
  - `-DSPEC_SUPPRESS_OPENMP`

- **623.xalancbmk_s:** 
  - `-Wl,-z,muldefs` 
  - `-xCORE-AVX512` 
  - `-ipo` 
  - `-no-prec-div` 
  - `-DSPEC_OPENMP`

- **631.deepsjeng_s:** Same as 623.xalancbmk_s

- **641.leela_s:** Same as 623.xalancbmk_s

#### Fortran benchmarks:

- `-xCORE-AVX512` 
  - `-ipo` 
  - `-no-prec-div` 
  - `-DSPEC_OPENMP`

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

Fortran benchmarks (continued):
-nostandard-realloc-lhs

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: