# SPEC CPU®2017 Integer Speed Result

## Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License</td>
<td>55</td>
</tr>
<tr>
<td>Test Sponsor</td>
<td>Dell Inc.</td>
</tr>
<tr>
<td>Tested by</td>
<td>Dell Inc.</td>
</tr>
<tr>
<td>SPECspeed\textsuperscript{®}2017\textsubscript{int_peak}</td>
<td>11.6</td>
</tr>
<tr>
<td>SPECspeed\textsuperscript{®}2017\textsubscript{int_base}</td>
<td>11.3</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6246R
- **Max MHz:** 4100
- **Nominal:** 3400
- **Enabled:** 32 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:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (12 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
  - kernel 4.18.0-147.el8.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 2.6.3 released Feb-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
### Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

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

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</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>
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<tbody>
<tr>
<td>600.perlbench_s</td>
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<td><strong>8.06</strong></td>
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<td>8.05</td>
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<td><strong>17.3</strong></td>
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<td>249</td>
<td>24.8</td>
<td>249</td>
</tr>
</tbody>
</table>

**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.

**Submit Notes**

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

**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-ic19.1u1/lib/intel64:/dev/shm/cpu2017-ic19.1u1/je5.0.1 -64"
- `MALLOC_CONF = "retain:true"
- `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
runcpu command invoked through numaclt i.e.:
umactl --interleave=all runcpu <etc>
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 enabled
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 enabled
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 295195f888a3d7edbble6e46a485a0011
running on localhost.localdomain Sat May 23 12:02:58 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

(Continued on next page)
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PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

SPECspeed®2017_int_base = 11.3
SPECspeed®2017_int_peak = 11.6

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

Platform Notes (Continued)

From /proc/cpuinfo

model name : Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
2 "physical id"s (chips)
64 "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 : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 13 16 17 18 19 21 24 28 29
physical 1: cores 0 1 2 6 12 13 16 17 18 19 21 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
Stepping: 7
CPU MHz: 1781.550
CPU max MHz: 4100.0000
CPU min MHz: 1200.0000
BogoMIPS: 6800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60
NUMA node1 CPU(s): 1,5,7,13,17,21,25,29,33,37,39,45,49,53,57,61
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62
NUMA node3 CPU(s): 3,9,11,15,19,23,27,31,35,41,43,47,51,55,59,63
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
xtrunc 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_pni ssbd mba ibrs ibpb stibp ibrs_enabled tpr_shadow vnmi

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

---

**Platform Notes (Continued)**

```plaintext
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occput_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 : 36608 KB
```

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.

```plaintext
available: 4 nodes (0-3)
  node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60
  node 0 size: 95304 MB
  node 0 free: 94694 MB
  node 1 cpus: 1 5 7 13 17 21 25 29 33 37 39 45 49 53 57 61
  node 1 size: 96764 MB
  node 1 free: 96382 MB
  node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
  node 2 size: 96739 MB
  node 2 free: 87325 MB
  node 3 cpus: 3 9 11 15 19 23 27 31 35 39 43 47 51 55 59 63
  node 3 size: 96764 MB
  node 3 free: 96247 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`

```plaintext
MemTotal:       394826696 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

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

```plaintext
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)
```

(Continued on next page)
Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

---

SPEC CPU®2017 Integer Speed Result

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Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

---

SPECspeed®2017_int_base = 11.3

SPECspeed®2017_int_peak = 11.6

---

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CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

---

Platform Notes (Continued)

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 sanitization

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

run-level 3 May 22 11:53

SPEC is set to: /dev/shm/cpu2017-ic19.1u1

Filesystem Type Size Used Avail Use% Mounted on

tmpfs tmpfs 189G 4.2G 185G 3% /dev/shm

From /sys/devices/virtual/dmi/id

BIOS: Dell Inc. 2.6.3 02/03/2020

Vendor: Dell Inc.

Product: PowerEdge M640

Product Family: PowerEdge

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:

5x 00ADD0B3OOAD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x 00ADD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
3x 00ADD069D00AD 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) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
| 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
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.
------------------------------------------------------------------------------

==============================================================================
C       | 600.perlbench_s(peak)
------------------------------------------------------------------------------
Intel(R) C 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.
------------------------------------------------------------------------------

==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
| 625.x264_s(base, peak) 657.xz_s(base, peak)
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==============================================================================
C       | 600.perlbench_s(peak)
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Copyright (C) 1985-2020 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++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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)

(Continued on next page)
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<td>SPECspeed®2017_int_peak</td>
<td>11.6</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

**Test Date:** May-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

## Compiler Version Notes (Continued)

64, Version 19.1.1.217 Build 20200306  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

## Base Compiler Invocation

**C benchmarks:**

- `icc`

**C++ benchmarks:**

- `icpc`

**Fortran benchmarks:**

- `ifort`

## Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Portability Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
</tr>
<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:**

- `m64 -qnextgen -std=c11`  
- `Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`  
- `xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops`  
- `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-AVX512 -O3 -ffast-math -flto -mfpmath=sse`  
- `funroll-loops -fuse=ld=gold -qopt-mem-layout-trans=4`

(Continued on next page)
Dell Inc.

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<table>
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<th>SPECspeed®2017_int_base = 11.3</th>
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<td>SPECspeed®2017_int_peak = 11.6</td>
<td>Hardware Availability: Feb-2020</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

---

### Base Optimization Flags (Continued)

**C++ benchmarks (continued):**

```
-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-AVX512
-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.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
```

(*) Indicates a portability flag that was found in a non-portability variable.

---

### Peak Optimization Flags

**C benchmarks:**

(Continued on next page)
Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6246R, 3.40 GHz)

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

SPECspeed®2017_int_base = 11.3
SPECspeed®2017_int_peak = 11.6

Test Date: May-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Peak Optimization Flags (Continued)

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 -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-AVX512 -flto
-Ofast(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-AVX512 -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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<th>Dell Inc.</th>
<th>SPEC speed®2017_int_base = 11.3</th>
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<td>SPEC speed®2017_int_peak = 11.6</td>
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