**SPEC® CPU2017 Integer Rate Result**

**Dell Inc.**

PowerEdge R640 (Intel Xeon Gold 6230, 2.10GHz)  

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

**SPECrate2017_int_peak = 234**  
**SPECrate2017_int_base = 225**

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate2017_int_base</th>
<th>SPECrate2017_int_peak</th>
</tr>
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<tbody>
<tr>
<td>500.perlbench_r 80</td>
<td>177</td>
<td>201</td>
</tr>
<tr>
<td>502.gcc_r 80</td>
<td>184</td>
<td>211</td>
</tr>
<tr>
<td>505.mcf_r 80</td>
<td>152</td>
<td>257</td>
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<tr>
<td>520.omnetpp_r 80</td>
<td>152</td>
<td>246</td>
</tr>
<tr>
<td>523.xalancbmk_r 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>525.x264_r 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>531.deepsjeng_r 80</td>
<td>189</td>
<td>442</td>
</tr>
<tr>
<td>541.leela_r 80</td>
<td>173</td>
<td>456</td>
</tr>
<tr>
<td>548.exchange2_r 80</td>
<td>153</td>
<td>397</td>
</tr>
<tr>
<td>557.xz_r 80</td>
<td>152</td>
<td>397</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6230  
- **Max MHz.:** 3900  
- **Nominal:** 2100  
- **Enabled:** 40 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:** 27.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 384 GB (12 x 32 GB 2Rx8 PC4-2933Y-R)  
- **Storage:** 1 x 480 GB SATA SSD  
- **Other:** None

**Software**

- **OS:** Ubuntu 18.04.2 LTS  
- **kernel 4.15.0-45-generic**  
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++  
- **Fortran:** Version 19.0.1.144 of Intel Fortran  
- **Compiler Build 20181018 for Linux:**  
- **Firmware:** Version 2.1.7 released Apr-2019  
- **File System:** ext4  
- **System State:** Run level 5 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:** jemalloc memory allocator V5.0.1
# SPEC CPU2017 Integer Rate Result

## Dell Inc.

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

### SPECrate2017_int_base = 225

### SPECrate2017_int_peak = 234

<table>
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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>720</td>
<td>177</td>
<td>721</td>
<td>177</td>
<td>720</td>
<td>177</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>80</td>
<td>661</td>
<td>185</td>
<td>616</td>
<td>184</td>
<td>600</td>
<td>152</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>80</td>
<td>429</td>
<td>301</td>
<td>429</td>
<td>302</td>
<td>80</td>
<td>211</td>
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<tr>
<td>520.omnetpp_r</td>
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<td>80</td>
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<td>257</td>
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<td>257</td>
<td>80</td>
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<tr>
<td>525.x264_r</td>
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<td>315</td>
<td>444</td>
<td>317</td>
<td>442</td>
<td>80</td>
<td>456</td>
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<tr>
<td>531.deepsjeng_r</td>
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<tr>
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<td>753</td>
<td>176</td>
<td>764</td>
<td>173</td>
<td>80</td>
<td>173</td>
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<td>527</td>
<td>398</td>
<td>80</td>
<td>398</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>80</td>
<td>565</td>
<td>153</td>
<td>566</td>
<td>153</td>
<td>80</td>
<td>152</td>
</tr>
</tbody>
</table>

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

## 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"

## General Notes

Environment variables set by runcpu before the start of the run:

```bash
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
```

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5.

Yes: 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:

```
sync; echo 3>/proc/sys/vm/drop_caches
```

runcpu command invoked through numactl i.e.:

```
(Continued on next page)```
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6230, 2.10GHz)

SPECrate2017_int_base = 225
SPECrate2017_int_peak = 234

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

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

General Notes (Continued)

numactl --interleave=all runcpu <etc>
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:
ADDDC setting disabled
Sub NUMA Cluster enabled
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 enabled
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 9bcde8f2999c33d61f64985e45859ea9
running on intel-sut Tue Apr 9 16:47:50 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 6230 CPU @ 2.10GHz
  2 "physical id"s (chips)
  80 "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 : 40
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): 80

(Continued on next page)
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Platform Notes (Continued)

On-line CPU(s) list: 0-79
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 3356.991
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 28160K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71,75,79

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
apeffmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtr pr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
lahf_lm abm 3dnowprefetch cpuid_fault ebp cat_l3 cdp_l3 invpcid_single ssbd mba ibrs
ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust
bm1 hle avx2 smep bmi2 erms invpcid rtm cqmp mxp rdt_a avx512f avx512dq rdseed adx
smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
xsaves cmq_llc cmq_occup_llc cmq_mbm_total cmq_mbm_local dtmher ida arat pln pts pku
ospke avx512_vnni flush_l1d arch_capabilities

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
node 0 size: 95167 MB
node 0 free: 94834 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77
node 1 size: 96764 MB
node 1 free: 96525 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78
node 2 size: 96743 MB

(Continued on next page)
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Platform Notes (Continued)

node 2 free: 96505 MB  
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79  
node 3 size: 96762 MB  
node 3 free: 96538 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: 394688348 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d  
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 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 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: __user pointer sanitization  
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB

run-level 5 Apr 9 16:46

SPEC is set to: /home/cpu2017  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda2 ext4 439G 27G 390G 7% /
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Platform Notes (Continued)
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. 2.1.7 04/03/2019
Memory:
12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
12x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC   502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
      525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

(Continued on next page)
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**SPECrate2017_int_base = 225**

**SPECrate2017_int_peak = 234**

---

**Compiler Version Notes (Continued)**

```plaintext
CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
```

---

**Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.1.144 Build 20181018**

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

**FC  548.exchange2_r(base, peak)**

---

**Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.1.144 Build 20181018**

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

---

### Compiler Invocation

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

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

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

### Base Portability Flags

- `500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64`
- `502.gcc_r: -DSPEC_LP64`
- `505.mcf_r: -DSPEC_LP64`
- `520.omnetpp_r: -DSPEC_LP64`
- `523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX`
- `525.x264_r: -DSPEC_LP64`
- `531.deepsjeng_r: -DSPEC_LP64`
- `541.leela_r: -DSPEC_LP64`
- `548.exchange2_r: -DSPEC_LP64`
- `557.xz_r: -DSPEC_LP64`
Dell Inc. PowerEdge R640 (Intel Xeon Gold 6230, 2.10GHz)

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Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icc -m64 -std=c11

502gcc_r icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin

C++ benchmarks (except as noted below):
icpc -m64

523xalanckbm_k icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin

Fortran benchmarks:
ifort -m64

Peak Portability Flags

500.perlbench_r -DSPEC_LP64 -DSPEC_LINUX_X64
502gcc_r -D_FILE_OFFSET_BITS=64
505.mcf_r -DSPEC_LP64
520.omnetpp_r -DSPEC_LP64
523xalanckbm_k_r -D_FILE_OFFSET_BITS=64 -DSPEC_LINUX
525x264_r -DSPEC_LP64

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

531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -03 -no-prec-div -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

502.gcc_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -03 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -03 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

525.x264_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -03 -no-prec-div
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -03 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

523.xalancbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -03 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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Peak Optimization Flags (Continued)

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

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:

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

Tested with SPEC CPU2017 v1.0.5 on 2019-04-09 12:47:49-0400.