## Dell Inc.

**PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)**

**SPECrate2017_int_base = 120**

**SPECrate2017_int_peak = 125**

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

### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon Gold 5215</th>
</tr>
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<tbody>
<tr>
<td>Max MHz.:</td>
<td>3400</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2500</td>
</tr>
<tr>
<td>Enabled:</td>
<td>20 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>13.75 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</tbody>
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### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Ubuntu 18.04.2 LTS</th>
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<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 19.0.1.144 of Intel C/C++</td>
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<tr>
<td>Compiler Build:</td>
<td>20181018 for Linux;</td>
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<tr>
<td>Fortran:</td>
<td>Version 19.0.1.144 of Intel Fortran</td>
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<tr>
<td>Firmware:</td>
<td>ext4</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
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<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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</table>

### SPEC Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate2017_int_base</th>
<th>SPECrate2017_int_peak</th>
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<tbody>
<tr>
<td>perlbench</td>
<td>40</td>
<td>106</td>
<td>106</td>
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<tr>
<td>gcc</td>
<td>40</td>
<td>89.8</td>
<td>89.8</td>
</tr>
<tr>
<td>mcf</td>
<td>40</td>
<td>80.2</td>
<td>80.2</td>
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<tr>
<td>omnetpp</td>
<td>40</td>
<td>80.1</td>
<td>80.1</td>
</tr>
<tr>
<td>xalancbmk</td>
<td>40</td>
<td>142</td>
<td>142</td>
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<tr>
<td>x264</td>
<td>40</td>
<td>149</td>
<td>149</td>
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<tr>
<td>deepsjeng</td>
<td>40</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>leela</td>
<td>40</td>
<td>92.7</td>
<td>92.7</td>
</tr>
<tr>
<td>exchange2</td>
<td>40</td>
<td>213</td>
<td>213</td>
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<tr>
<td>xz</td>
<td>40</td>
<td>79.8</td>
<td>79.9</td>
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<tbody>
<tr>
<td>500.perlbench_r</td>
<td>689</td>
<td>92.5</td>
<td>686</td>
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<td>601</td>
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<td></td>
<td>601</td>
<td>106</td>
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<tr>
<td>502.gcc_r</td>
<td>568</td>
<td>99.8</td>
<td>567</td>
<td>99.9</td>
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<td></td>
<td></td>
<td>501</td>
<td>113</td>
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<td>503</td>
<td>113</td>
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<tr>
<td>505.mcf_r</td>
<td>399</td>
<td>162</td>
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<td>397</td>
<td>163</td>
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<td>399</td>
<td>162</td>
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<td>520.omnetpp_r</td>
<td>654</td>
<td>80.2</td>
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<td>80.5</td>
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<td>531.deepsjeng_r</td>
<td>456</td>
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<td>101</td>
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<tr>
<td>541.leela_r</td>
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<td>92.7</td>
<td>694</td>
<td>95.4</td>
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<td>712</td>
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<td></td>
<td>705</td>
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<tr>
<td>548.exchange2_r</td>
<td>491</td>
<td>213</td>
<td>493</td>
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<td>492</td>
<td>213</td>
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<td>493</td>
<td>213</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>539</td>
<td>80.1</td>
<td>541</td>
<td>79.8</td>
<td></td>
<td></td>
<td></td>
<td>541</td>
<td>79.9</td>
<td></td>
<td>541</td>
<td>79.9</td>
</tr>
</tbody>
</table>

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:
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

Filesystem page cache synced and cleared with:
  sync; echo 3>/proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
Dell Inc.  
PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)  

SPECrate2017_int_base = 120  
SPECrate2017_int_peak = 125  

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: Mar-2019  
Hardware Availability: Apr-2019  
Software Availability: Jan-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  
Sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

Platform Notes

BIOS settings:
ADDDC setting disabled  
Sub NUMA Cluster enabled  
Virtualization Technology disabled  
DCU Streamer Prefetcher enabled  
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 Interconnet 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 Mar 12 20:28:48 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 5215 CPU @ 2.50GHz  
  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 : 10  
siblings : 20  
physical 0: cores 0 1 2 3 4 8 9 10 11 12  
physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 40

(Continued on next page)
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)

SPECrate2017_int_base = 120
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Mar-2019
Hardware Availability: Apr-2019
Tested by: Dell Inc.
Software Availability: Jan-2019

Platform Notes (Continued)

On-line CPU(s) list: 0-39
Thread(s) per core: 2
Core(s) per socket: 10
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5215 CPU @ 2.50GHz
Stepping: 6
CPU MHz: 3150.933
BogoMIPS: 5000.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 14080K
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 pe 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 aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebx cat_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid rtm cqm mpx rtm_a avx512f rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vpp xsaves cmvt_legacy cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm 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: 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: 95167 MB
node 0 free: 94679 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: 96742 MB
node 1 free: 96381 MB
node distances:

node 0 0
0: 10 21
1: 21 10

(Continued on next page)
Platform Notes (Continued)

From /proc/meminfo
  MemTotal:       196515796 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 Mar 12 20:20

SPEC is set to: /home/cpu2017
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda2      ext4  439G   27G  390G   7% /

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. 2.1.6 03/03/2019
Memory:
  10x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
  2x 00AD063200AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
  12x Not Specified Not Specified

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)  SPECrate2017_int_base = 120

SPECrate2017_int_peak = 125

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Jan-2019

Platform Notes (Continued)

(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.

==============================================================================
CC   500.perlbench_r(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.

==============================================================================
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, 
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(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)

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<th>SPECrate2017_int_base</th>
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<tbody>
<tr>
<td>120</td>
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<table>
<thead>
<tr>
<th>SPECrate2017_int_peak</th>
<th>Dell Inc.</th>
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<tbody>
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<td>125</td>
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.
Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Jan-2019

Compiler Version Notes (Continued)

==============================================================================
| 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.             |
------------------------------------------------------------------------------

Base 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

Base Optimization Flags

C benchmarks:
-W1,-z,jamdefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-1/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

(Continued on next page)
Dell Inc.
PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)

**SPEC CPU2017 Integer Rate Result**

Copyright 2017-2019 Standard Performance Evaluation Corporation

**SPECrate2017_int_base = 120**

**SPECrate2017_int_peak = 125**

-CPU2017 License: 55
-Test Sponsor: Dell Inc.
-Tested by: Dell Inc.
-Test Date: Mar-2019
-Hardware Availability: Apr-2019
-Software Availability: Jan-2019

**Base Optimization Flags (Continued)**

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


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

523.xalancbmk_r: 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
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -D_FILE_OFFSET_BITS=64 -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 5215, 2.50GHz)

**SPECrate2017_int_base = 120**

**SPECrate2017_int_peak = 125**

**CPU2017 License:** 55
**Test Sponsor:** Dell Inc.
**Tested by:** Dell Inc.
**Test Date:** Mar-2019
**Hardware Availability:** Apr-2019
**Software Availability:** Jan-2019

**Peak Optimization Flags**

C benchmarks:

- **500.perlbench_r:** `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo`  
  `-xCORE-AVX512 -O3 -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 -O3 -no-prec-div -qopt-mem-layout-trans=4`  
  `-L/usr/local/jemalloc`

- **505.mcf_r:** `-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`

- **525.x264_r:** `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -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 -O3 -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 -O3 -no-prec-div -qopt-mem-layout-trans=4`  
  `-L/usr/local/jemalloc`

- **531.deepsjeng_r:** Same as 520.omnetpp_r

- **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`
Dell Inc. PowerEdge R640 (Intel Xeon Gold 5215, 2.50GHz)

SPECrate2017_int_base = 120
SPECrate2017_int_peak = 125

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Jan-2019

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: