SPEC® CPU2017 Integer Rate Result

Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

SPECrater2017_int_base = 82.0
SPECrater2017_int_peak = 84.7

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

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

Dell Inc.
PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

SPECrater2017_int_base = 82.0
SPECrater2017_int_peak = 84.7

Copies (84.7)

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Copies</th>
<th>SPECrate2017_int_peak</th>
<th>SPECrate2017_int_base</th>
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<tr>
<td>perlbench_r</td>
<td>32</td>
<td>63.0</td>
<td>73.3</td>
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<td>gcc_r</td>
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<td>70.3</td>
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<td>mcf_r</td>
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<td>59.4</td>
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<td>omnetpp_r</td>
<td>32</td>
<td>99.7</td>
<td>105</td>
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<td>xalancbmk_r</td>
<td>32</td>
<td>146</td>
<td>150</td>
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<td>x264_r</td>
<td>32</td>
<td>67.2</td>
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<td>deepsjeng_r</td>
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<td>60.5</td>
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<tr>
<td>leela_r</td>
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<td>138</td>
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<tr>
<td>exchange2_r</td>
<td>32</td>
<td>55.8</td>
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<tr>
<td>xz_r</td>
<td>32</td>
<td>55.8</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Silver 4208</td>
</tr>
<tr>
<td>Max MHz.: 3200</td>
</tr>
<tr>
<td>Nominal: 2100</td>
</tr>
<tr>
<td>Enabled: 16 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3: 11 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)</td>
</tr>
<tr>
<td>Storage: 1 x 1.6 TB NVMe SSD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software</th>
</tr>
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<tbody>
<tr>
<td>OS: Ubuntu 18.04.2 LTS</td>
</tr>
<tr>
<td>kernel 4.15.0-45-generic</td>
</tr>
<tr>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran</td>
</tr>
<tr>
<td>Compiler Build 20181018 for Linux</td>
</tr>
<tr>
<td>Parallel: No</td>
</tr>
<tr>
<td>Firmware: Version 2.2.6 released Apr-2019</td>
</tr>
<tr>
<td>File System: ext4</td>
</tr>
<tr>
<td>System State: Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Peak Pointers: 32/64-bit</td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
</tr>
</tbody>
</table>
Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

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

SPECrate2017_int_base = 82.0
SPECrate2017_int_peak = 84.7

Results Table

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<th>Benchmark</th>
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<th>Ratio</th>
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<tr>
<td>500.perlbench_r</td>
<td>32</td>
<td>809</td>
<td>63.0</td>
<td>809</td>
<td>63.0</td>
<td>32</td>
<td>695</td>
<td>73.3</td>
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<tr>
<td>502.gcc_r</td>
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<td>638</td>
<td>71.1</td>
<td>644</td>
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<td>32</td>
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<tr>
<td>505.mcf_r</td>
<td>32</td>
<td>450</td>
<td>115</td>
<td>452</td>
<td>114</td>
<td>32</td>
<td>451</td>
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<tr>
<td>520.omnetpp_r</td>
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<td>707</td>
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<td>59.0</td>
<td>708</td>
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<td>523.xalancbmk_r</td>
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<td>339</td>
<td>99.7</td>
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<td>60.6</td>
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<tr>
<td>548.exchange2_r</td>
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<td>606</td>
<td>138</td>
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<td>138</td>
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<td>607</td>
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<tr>
<td>557.xz_r</td>
<td>32</td>
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<td>620</td>
<td>55.8</td>
<td>619</td>
<td>55.8</td>
<td></td>
<td></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:
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
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

Filesystem page cache synced and cleared with:
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numacl i.e.:

(Continued on next page)
Dell Inc.
PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

SPEC CPU2017 Integer Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

SPECrate2017_int_base = 82.0
SPECrate2017_int_peak = 84.7

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

Test Date: May-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 May 14 16:09:21 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) Silver 4208 CPU @ 2.10GHz
  2 "physical id"s (chips)
  32 "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 : 8
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

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

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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SPECrate2017_int_base = 82.0
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On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4208 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 2232.307
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
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 pdpes gb rdsc
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmprefl pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrm pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_pinn
ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmiflexpriority ept vpid
fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cmq mxp rdt_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves cqm_llc 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.

Warning: a numactl 'node' might or might not correspond to a
physical chip.

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.
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Test Date: May-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)

From /proc/meminfo
   MemTotal:       394677180 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 May 14 10:03

SPEC is set to: /home/cpu2017
   Filesystem     Type Size Used Avail Use% Mounted on
   /dev/nvme0n1p2 ext4  439G  19G  398G   5% /

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. 2.2.6 04/16/2019
   Memory:
      12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400
      12x Not Specified Not Specified

(End of data from sysinfo program)
## Dell Inc.

**PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)**

| SPECrate2017_int_base = 82.0 | SPECrate2017_int_peak = 84.7 |

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

### 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, 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

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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

 Compiler Version Notes (Continued)

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------------------------------------------------------------------------------

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:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

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Dell Inc. PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz) SPECrate2017_int_base = 82.0 SPECrate2017_int_peak = 84.7

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Base Optimization Flags (Continued)

Fortran benchmarks:
- Wl, -z, muldefs -xCORE-AVX2 -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
- lqkmalloct

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

Peak Optimization Flags

C benchmarks:
500.perlbench_r: Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4

(Continued on next page)
Dell Inc. | SPECrate2017_int_base = 82.0 | SPECrate2017_int_peak = 84.7
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PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

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

### Peak Optimization Flags (Continued)

500.perlbench_r (continued):
- `-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-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4`  
- `-L/usr/local/je5.0.1-32/lib -ljemalloc`

505.mcf_r:  
- `-Wl,-z,muldefs -xCORE-AVX2 -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-AVX2 -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-AVX2 -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-AVX2 -O3 -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

541.leela_r: Same as 520.omnetpp_r

#### Fortran benchmarks:

- `-Wl,-z,muldefs -xCORE-AVX2 -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  
**SPEC CPU2017 Integer Rate Result**

Dell Inc.  
PowerEdge T640 (Intel Xeon Silver 4208, 2.10GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>SPECrate2017_int_peak</th>
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CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: May-2019  
Hardware Availability: Apr-2019  
Software Availability: Feb-2019

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.

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