## Dell Inc.

PowerEdge T640 (Intel Xeon Gold 5220, 2.20GHz)

### SPECrate2017_int_base = 200

### SPECrate2017_int_peak = 207

<table>
<thead>
<tr>
<th>Program</th>
<th>Base</th>
<th>Peak</th>
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<tbody>
<tr>
<td>perlbench_r</td>
<td>176</td>
<td></td>
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<tr>
<td>gcc_r</td>
<td>165</td>
<td>187</td>
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<tr>
<td>mcf_r</td>
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<td></td>
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<tr>
<td>omnetpp_r</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>xalancbmk_r</td>
<td></td>
<td>231</td>
</tr>
<tr>
<td>x264_r</td>
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</tr>
<tr>
<td>deepsjeng_r</td>
<td>165</td>
<td>165</td>
</tr>
<tr>
<td>leela_r</td>
<td>151</td>
<td>130</td>
</tr>
<tr>
<td>exchange2_r</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xz_r</td>
<td>134</td>
<td>134</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name**: Intel Xeon Gold 5220
- **Max MHz.**: 3900
- **Nominal**: 2200
- **Enabled**: 36 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**: 24.75 MB I+D on chip per chip
- **Other**: None
- **Memory**: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
- **Storage**: 1 x 960 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++ Compiler Build 20181018 for Linux;
  Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
- **Parallel**: No
- **Firmware**: Version 2.2.6 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 T640 (Intel Xeon Gold 5220, 2.20GHz)

Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECrate2017_int_base = 200
SPECrate2017_int_peak = 207

Results Table

<table>
<thead>
<tr>
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<th>Seconds</th>
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<td>741</td>
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<tr>
<td>548.exchange2_r</td>
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<td>557.zx_r</td>
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<td>578</td>
<td>134</td>
<td></td>
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<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
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.:

(Continued on next page)
Dell Inc.

PowerEdge T640 (Intel Xeon Gold 5220, 2.20GHz)

SPEC CPU2017 Integer Rate Result

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SPECrate2017_int_base = 200
SPECrate2017_int_peak = 207

CPU2017 License: 55
Test Date: May-2019
Test Sponsor: Dell Inc.
Hardware Availability: Apr-2019
Tested by: Dell Inc.
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 Thu May 9 21:36:39 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 5220 CPU @ 2.20GHz
  2 "physical id"s (chips)
  72 "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 : 18
siblings : 36
  physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
  physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 72

(Continued on next page)
<table>
<thead>
<tr>
<th>SPEC CPU2017 Integer Rate Result</th>
</tr>
</thead>
<tbody>
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<td>Dell Inc.</td>
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<tr>
<td>PowerEdge T640 (Intel Xeon Gold 5220, 2.20GHz)</td>
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</table>

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

**SPECrate2017_int_base = 200**  
**SPECrate2017_int_peak = 207**

---

**Platform Notes (Continued)**

On-line CPU(s) list: 0-71  
Thread(s) per core: 2  
Core(s) per socket: 18  
Socket(s): 2  
NUMA node(s): 4  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz  
Stepping: 6  
CPU MHz: 2018.445  
BogoMIPS: 4400.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 25344K  
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68  
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69  
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70  
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71  
Flags: ...  

/cacheinfo cache data  
  cache size : 25344 KB  

From numacli --hardware WARNING: a numacli '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  
  node 0 size: 95147 MB  
  node 0 free: 94865 MB  
  node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69  
  node 1 size: 96764 MB  
  node 1 free: 96554 MB  
  node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70  
  node 2 size: 96764 MB  

(Continued on next page)
SPEC CPU2017 Integer Rate Result

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Platform Notes (Continued)

node 2 free: 96538 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71
node 3 size: 96742 MB
node 3 free: 96528 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: 394668432 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
    IDLIKELY=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 9 21:08

SPEC is set to: /home/cpu2017
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda2 ext4 439G 19G 398G 5% /
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. 2.2.6 04/16/2019
- Memory:
  12x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
  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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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Compiler Version Notes (Continued)

==============================================================================
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.

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

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
SPEC CPU2017 Integer Rate Result
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

---

### 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`


**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`

(Continued on next page)
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 -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/je5.0.1-32/lib -ljemalloc

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/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

(Continued on next page)
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Test Date: May-2019
Hardware Availability: Apr-2019
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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: