Dell Inc.

PowerEdge T140 (Intel Xeon E-2288G, 3.70 GHz)

**SPECrates**
- **SPECrates**
  - **2017_int_base** = 56.7
  - **2017_int_peak** = 59.6

**CPU2017 License**: 55
**Test Sponsor**: Dell Inc.
**Tested by**: Dell Inc.
**Test Date**: Oct-2019
**Hardware Availability**: Dec-2019
**Software Availability**: Jun-2019

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate 2017_int_base (56.7)</th>
<th>SPECrate 2017_int_peak (59.6)</th>
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<td>500.perlbench_r</td>
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<td>16</td>
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</tr>
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<tr>
<td>557.xz_r</td>
<td>16</td>
<td>31.9</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware**
- **CPU Name**: Intel Xeon E-2288G
- **Max MHz**: 5000
- **Nominal**: 3700
- **Enabled**: 8 cores, 1 chip, 2 threads/core
- **Orderable**: 1 chip
- **Cache L1**: 32 KB I+ 32 KB D on chip per core
- **L2**: 256 KB I+D on chip per core
- **L3**: 16 MB I+D on chip per chip
- **Memory**: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R)
- **Storage**: 1 x 960 GB SATA SSD

**Software**
- **OS**: SUSE Linux Enterprise Server 15 SP1
- **Compiler**: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
  Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- **Parallel**: No
- **Firmware**: Version 2.1.3 released Nov-2019
- **File System**: xfs
- **System State**: Run level 3 (multi-user)
- **Base Pointers**: 64-bit
- **Peak Pointers**: 32/64-bit
- **Other**: None
- **Power Management**: jemalloc memory allocator V5.0.1
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>543</td>
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</tr>
</tbody>
</table>

**SPECrate®2017_int_base = 56.7**

**SPECrate®2017_int_peak = 59.6**

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"

## Environment Variables Notes

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

```
LD_LIBRARY_PATH = 
"/home/cpu2017/ODM-SPECcpu2017-194/cpu2017/lib/intel64:/home/cpu2017/ODM
-SPECcpu2017-194/cpu2017/lib/ia32:/home/cpu2017/ODM-SPECcpu2017-194/cpu2
017/je5.0.1-32"
```

## General Notes

Binaries compiled on a system with 1x Intel Core i9-799X 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)

(Continued on next page)
## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge T140 (Intel Xeon E-2288G, 3.70 GHz)

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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** Oct-2019  
**Tested by:** Dell Inc.  
**Hardware Availability:** Dec-2019  
**Software Availability:** Jun-2019

---

### General Notes (Continued)

- 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.:  
  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:**  
- 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 enabled  
- PCI ASPM L1 Link Power Management enabled

**Sysinfo program**  
/home/cpu2017/ODM-SPECcpu2017-194/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011  
running on linux-g3ob Thu Oct 31 05:33:14 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) E-2288G CPU @ 3.70GHz
  1 "physical id"s (chips)
  16 "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
```

(Continued on next page)
Dell Inc.

PowerEdge T140 (Intel Xeon E-2288G, 3.70 GHz)

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CPU2017 License: 55
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Test Date: Oct-2019
Hardware Availability: Dec-2019
Software Availability: Jun-2019

Platform Notes (Continued)

From lscpu:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2288G CPU @ 3.70GHz
Stepping: 13
CPU MHz: 3700.000
BogoMIPS: 7392.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 16384K
NUMA node0 CPU(s): 0-15
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
aperfmonperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdmb fma cx16 xtpr pdcm pclid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
ssbd ibrs ibpb stibp ibrs_enabled tpr_shadow vmmx flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 2em invpcid rtm mpx rdseed adx smap clflushopt
intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts md_clear flush_lid
arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  node 0 size: 64131 MB
  node 0 free: 63337 MB
  node distances:
    node 0
    0: 10

(Continued on next page)
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Software Availability: Jun-2019

Platform Notes (Continued)

From /proc/meminfo
MemTotal:       65670280 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-g3ob 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Oct 31 05:01 last=5

SPEC is set to: /home/cpu2017/ODM-SPECcpu2017-194/cpu2017
Filesystem       Type      Size  Used Avail Use% Mounted on
/dev/sda2        xfs       440G  28G  413G   7% /

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.1.3 09/27/2018
Vendor: Dell Inc.
Product: PowerEdge T140
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

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

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Platform Notes (Continued)

frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
Memory:
2x 00AD00000A02 HMA82GU7CJR8N-VK 16 GB 2 rank 2666
2x 00AD00000A07 HMA82GU7CJR8N-VK 16 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
      | 525.x264_r(base, peak) 557.xz_r(base, peak)
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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++     | 523.xalancbmk_r(peak)

(Continued on next page)
Dell Inc.  

PowerEdge T140 (Intel Xeon E-2288G, 3.70 GHz)  

**SPEC CPU®2017**  

**Integer Rate Result**  

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

---

**Compiler Version Notes (Continued)**

Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version 19.0.4.227 Build 20190416  
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```  
<table>
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<th>C++</th>
<th>520.omnetpp_r(base, peak) 523.xalancbmk_r(base)</th>
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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  

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```  
<table>
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<tr>
<th>Fortran</th>
<th>548.exchange2_r(base, peak)</th>
</tr>
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</table>
```

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  

---

---

**Base Compiler Invocation**

---

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

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

---

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

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Base Compiler Invocation (Continued)

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_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

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_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
SPEC CPU®2017 Integer Rate Result

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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_2019.4.227/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.onetpp_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
    -fno-strict-overflow
    -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
    -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin
    -Ljmalloc

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 -ljmalloc

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
    -qopt-mem-layout-trans=4

(Continued on next page)
# SPEC CPU®2017 Integer Rate Result

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## Peak Optimization Flags (Continued)

505.mcf_r (continued):
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/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_2019.4.227/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_2019.4.227/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_2019.4.227/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:
SPEC CPU®2017 Integer Rate Result

Dell Inc.

PowerEdge T140 (Intel Xeon E-2288G, 3.70 GHz)

**SPECrate®2017_int_base = 56.7**

**SPECrate®2017_int_peak = 59.6**

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<th>Test Date: Oct-2019</th>
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<td>Hardware Availability: Dec-2019</td>
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<tr>
<td>Tested by: Dell Inc.</td>
<td>Software Availability: Jun-2019</td>
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</tbody>
</table>

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

Tested with SPEC CPU®2017 v1.1.0 on 2019-10-31 05:33:14-0400.