# SPEC CPU®2017 Integer Rate Result

## Dell Inc.

PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

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<thead>
<tr>
<th>SPECrate®2017_int_base = 28.5</th>
<th>SPECrate®2017_int_peak = 29.3</th>
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<td>Test Date: Dec-2019</td>
<td>Hardware Availability: Dec-2018</td>
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<tr>
<td>Test Sponsor: Dell Inc.</td>
<td>Software Availability: Jun-2019</td>
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### Hardware

- **CPU Name:** Intel Xeon E-2224G
- **Max MHz:** 4700
- **Nominal:** 3500
- **Enabled:** 4 cores, 1 chip
- **Orderable:** 1 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 256 KB I+D on chip per core
- **L3:** 8 MB I+D on chip per chip
- **Other:** None
- **Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP1
- **Kernel:** 4.12.14-195-default
- **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
- **Compiler:** Version 2.1.6 released Nov-2019
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
Dell Inc.  
PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

Results Table

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</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"

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/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
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)
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:
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
PCI ASPM L1 Link Power Management disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed6e6e46a485a0011
running on linux-g3ob Wed Dec 4 15:02:26 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-2224G CPU @ 3.50GHz
    1 "physical id"s (chips)
    4 "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 : 4
    siblings : 4
    physical 0: cores 0 1 2 3

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

(Continued on next page)
Dell Inc.
PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

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

SPECrates:
- SPECrate®2017_int_base = 28.5
- SPECrate®2017_int_peak = 29.3

Test Date: Dec-2019
Hardware Availability: Dec-2018
Software Availability: Jun-2019

Platform Notes (Continued)

Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
CPU(s): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2224G CPU @ 3.50GHz
Stepping: 10
CPU MHz: 3500.000
BogoMIPS: 7008.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-3

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
 aperfmpref perf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
 sdbg fma cx16 xtrm 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
 pti ssbd ibrs ibp pcep tpr_shadow vmi flexpriority ept vpid fsgsbase tsc_adjust
 bmi1 hle avx2 smep bmi2 3rms invpcid rtm mpx rdseed adx smap clflushopt intel_pt
 xsaveopt xsavec xgetbv1 xsave dtherm ida arat pln pts md_clear flush_l1d

From ./proc/cpuinfo cache data
  cache size : 8192 KB

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
  node 0 size: 64259 MB
  node 0 free: 63460 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
MemTotal: 65801564 kB
HugePages_Total: 0

(Continued on next page)
Dell Inc. PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)  

**SPEC CPU®2017 Integer Rate Result**

**Test Sponsor:** Dell Inc.  
**CPU2017 License:** 55  
**Test Date:** Dec-2019  
**Tested by:** Dell Inc.  
**Hardware Availability:** Dec-2018  
**Software Availability:** Jun-2019

### Platform Notes (Continued)

- **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):** Mitigation: PTE Inversion
- **Microarchitectural Data Sampling:** Mitigation: Clear CPU buffers; SMT disabled
- **CVE-2017-5754 (Meltdown):** Mitigation: PTI
- **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: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

- **run-level 3 Dec 4 15:02 last=5**

**SPEC is set to:** /home/cpu2017  
**Filesysterm** Type Size Used Avail Use% Mounted on  
/dev/sda2 xfs 440G 30G 411G 7% /

**From /sys/devices/virtual/dmi/id**  
- **BIOS:** Dell Inc. 2.1.6 09/27/2018  
- **Vendor:** Dell Inc.  
- **Product:** PowerEdge R340  
- **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 frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

- **Memory:** 2x 00CE000000A02 M391A2K43BB1-CTD 16 GB 2 rank 2666

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

Dell Inc.  
PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

SPECrate®2017_int_base = 28.5  
SPECrate®2017_int_peak = 29.3

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Test Date: Dec-2019

Tested by: Dell Inc.  
Hardware Availability: Dec-2018

Software Availability: Jun-2019

Platform Notes (Continued)

2x 00CE000000A07 M391A2K43BB1-CTD 16 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

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| 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. |
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CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Test Date: Dec-2019  
Hardware Availability: Dec-2018  
Tested by: Dell Inc.  
Software Availability: Jun-2019

Compiler Version Notes (Continued)

C++  | 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 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++  | 523.xalancbmk_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++  | 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 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran  | 548.exchange2_r(base, peak)

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

Fortran benchmarks:
ifort -m64
### SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

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#### CPU2017 License
- 55

Test Sponsor:
- Dell Inc.

Tested by:
- Dell Inc.

#### 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`

#### Peak Compiler Invocation

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

- **502.gcc_r**:
  - `icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

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

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

Dell Inc.
PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)  

| SPECrate®2017_int_base = 28.5 |
| SPECrate®2017_int_peak = 29.3 |

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

Test Date: Dec-2019
Hardware Availability: Dec-2018
Software Availability: Jun-2019

Peak Compiler Invocation (Continued)

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.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.leea_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
-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_2019.4.227/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

(Continued on next page)
Dell Inc.

PowerEdge R340 (Intel Xeon E-2224G, 3.50 GHz)

SPECRate®2017_int_base = 28.5
SPECRate®2017_int_peak = 29.3

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

Test Date: Dec-2019
Hardware Availability: Dec-2018
Software Availability: Jun-2019

Peak Optimization Flags (Continued)

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/jemalloc -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:

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