**SPEC CPU®2017 Integer Rate Result**

**Dell Inc.**

PowerEdge R750xa (Intel Xeon Silver 4310, 2.10 GHz)

| Test Date: | May-2021 |
| Test Sponsor: | Dell Inc. |
| Tested by: | Dell Inc. |

| SPECrate®2017_int_base = 163 | SPECrate®2017_int_peak = 169 |

**Hardware**

- **CPU Name:** Intel Xeon Silver 4310
- **Max MHz:** 3300
- **Nominal:** 2100
- **Enabled:** 24 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **L2:** 1.25 MB I+D on chip per core
- **L3:** 18 MB I+D on chip per chip
- **Other:** None
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)
- **Storage:** 225 GB on tmpfs
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
  4.18.0-240.15.1.el8_3.x86_64
- **Compiler:**
  C/C++: Version 2021.1 of Intel oneAPI DPC++/C++
  Compiler Build 20201113 for Linux;
  Fortran: Version 2021.1 of Intel Fortran Compiler
  Classic Build 20201112 for Linux;
  C/C++: Version 2021.1 of Intel C/C++ Compiler
  Classic Build 20201112 for Linux
- **Parallel:** No
- **Firmware:** Version 1.2.1 released May-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Copies</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Copies</th>
<th>Peak Seconds</th>
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<th>Base Ratio</th>
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<td>557.xz_r</td>
<td>48</td>
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<td>48</td>
<td>561</td>
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<td>550</td>
<td>94.2</td>
<td></td>
<td>561</td>
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**SPECrate®2017_int_base = 163**  
**SPECrate®2017_int_peak = 169**

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 = 
  "/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/ia32:
  /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib
MALLOC_CONF = "retain:true"
```

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1

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)
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

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.

Benchmark run from a 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"

Platform Notes

BIOS Settings:
Sub NUMA Cluster : 2-Way Clustering
Virtualization Technology : Disabled

System Profile : Custom
CPU Power Management : Maximum Performance
C1E : Disabled
C States : Autonomous
Memory Patrol Scrub : Disabled
Energy Efficiency Policy : Performance
CPU Interconnect Bus Link
Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Fri May 14 17:07:24 2021

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 4310 CPU @ 2.10GHz
  2 "physical id"s (chips)
  48 "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 : 12
siblings : 24

(Continued on next page)
**Platform Notes (Continued)**

From `lscpu`:
- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU:** 48
- **On-line CPU(s) list:** 0-47
- **Thread(s) per core:** 2
- **Core(s) per socket:** 12
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
- **Stepping:** 6
- **CPU MHz:** 2701.068
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 18432K
- **NUMA node0 CPU(s):** 0,4,8,12,16,20,24,28,32,36,40,44
- **NUMA node1 CPU(s):** 2,6,10,14,18,22,26,30,34,38,42,46
- **NUMA node2 CPU(s):** 1,5,9,13,17,21,25,29,33,37,41,45
- **NUMA node3 CPU(s):** 3,7,11,15,19,23,27,31,35,39,43,47
- **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 pdaelgb rtstsc pl constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtr pdcm pdcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpckid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced fsagbase tsc_adjust bmi1 hle avx2 smep bmi2 ibrms invpeci cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifm cflushopt clwb intel_pt avx512c sha ni avx512bw avx512vl xsaveopt xsaveopt xgetbv1 xsaves cqm_l1c cqm_occup_l1c cqm_mbm_total cqb_mbm_local split_lock_detect wboinvd dtc ther ida arat pln pts avx512vbmi umip pku ospe avx512_vbmi2 qfni vaes mcm l5d rdpid md_clear pconfig flush_lld arch_capabilities

From `numactl` --hardware WARNING: a numactl 'node' might or might not correspond to a...

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

Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310, 2.10 GHz)

SPECrate®2017_int_base = 163
SPECrate®2017_int_peak = 169

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Platform Notes (Continued)

physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44
node 0 size: 126833 MB
node 0 free: 113110 MB
node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46
node 1 size: 127602 MB
node 1 free: 128232 MB
node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45
node 2 size: 127674 MB
node 2 free: 128640 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47
node 3 size: 127724 MB
node 3 free: 128116 MB
node distances:
node  0   1   2   3
0:  10  11  20  20
1:  11  10  20  20
2:  20  20  10  11
3:  20  20  11  10

From /proc/meminfo
MemTotal:     527680120 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
/sbin/tuned-adm active
Current active profile: throughput-performance

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
Linux localhost.localdomain 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 2021 x86_64 x86_64 x86_64 GNU/Linux

(Continued on next page)
Dell Inc.  
PowerEdge R750xa (Intel Xeon Silver 4310, 2.10 GHz)  

**SPEC CPU®2017 Integer Rate Result**  
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</tbody>
</table>

### Platform Notes (Continued)

Kernel self-reported vulnerability status:

- **CVE-2018-12207 (iTLB Multihit):** Not affected
- **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: usercopy/swaps barriers and __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
- **CVE-2020-0543 (Special Register Buffer Data Sampling):** Not affected
- **CVE-2019-11135 (TSX Asynchronous Abort):** Not affected

run-level 5 May 14 16:51

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>225G</td>
<td>6.9G</td>
<td>219G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

- **Vendor:** Dell Inc.
- **Product:** PowerEdge R750xa
- **Product Family:** PowerEdge
- **Serial:** 1234567

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:**
  - 13x 00AD00B300AD HMAA4GR7A5JR8N-XN 32 GB 2 rank 3200, configured at 2666
  - 3x 00AD063200AD HMAA4GR7A5JR8N-XN 32 GB 2 rank 3200, configured at 2666
  - 16x Not Specified Not Specified

- **BIOS:**
  - **BIOS Vendor:** Dell Inc.
  - **BIOS Version:** 1.2.1
  - **BIOS Date:** 05/06/2021
  - **BIOS Revision:** 1.2

*(End of data from sysinfo program)*
## Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310, 2.10 GHz)

### SPEC CPU®2017 Integer Rate Result

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### Compiler Version Notes

<table>
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<th>Language</th>
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<td>C</td>
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<tr>
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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
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Compiler Version Notes (Continued)

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

C    | 500.perlbench_r(peak) 557.xz_r(peak)

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

C    | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
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--------------------------------------------------------------------------------------------------------

C    | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
     | 525.x264_r(base, peak) 557.xz_r(base)

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

C++   | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
      | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)

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

Fortran | 548.exchange2_r(base, peak)

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### CPU2017 License: 55
- **Test Sponsor:** Dell Inc.
- **Tested by:** Dell Inc.
- **Test Date:** May-2021
- **Hardware Availability:** May-2021
- **Software Availability:** Feb-2021

### Base Compiler Invocation

- **C benchmarks:** icx
- **C++ benchmarks:** icpx
- **Fortran benchmarks:** ifort

### 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:**
  - `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math`
  - `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
  - `-mbranches-within-32B-boundaries`
  - `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
  - `-lqkmalloc`

- **C++ benchmarks:**
  - `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto`
  - `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
  - `-mbranches-within-32B-boundaries`
  - `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
  - `-lqkmalloc`

- **Fortran benchmarks:**
  - `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
  - `-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte`
  - `-auto -mbranches-within-32B-boundaries`

(Continued on next page)
Base Optimization Flags (Continued)

Fortran benchmarks (continued):

- L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
- ljkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):

icx

500.perlbench_r: icc

557.xz_r: icc

C++ benchmarks:

icpx

Fortran benchmarks:

ifort

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: -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

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries

(Continued on next page)
Peak Optimization Flags (Continued)

500.perlbench_r (continued):
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

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:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
## SPEC CPU®2017 Integer Rate Result

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<tr>
<th>Dell Inc.</th>
<th>SPECrate®2017_int_base = 163</th>
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<tbody>
<tr>
<td>PowerEdge R750xa (Intel Xeon Silver 4310, 2.10 GHz)</td>
<td>SPECrate®2017_int_peak = 169</td>
</tr>
</tbody>
</table>

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

| Test Date: | May-2021 |
| Hardware Availability: | May-2021 |
| Software Availability: | Feb-2021 |

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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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