# SPEC CPU®2017 Integer Speed Result

## Dell Inc.

**PowerEdge R650xs (Intel Xeon Silver 4310, 2.10 GHz)**

| SPECspeed®2017_int_base = 10.6 | Test Date: Aug-2021 |
| SPECspeed®2017_int_peak = 10.8 | Hardware Availability: Jul-2021 |

**CPU2017 License:** 55

| Test Sponsor: Dell Inc. | Software Availability: Dec-2020 |
| Tested by: Dell Inc. | |

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>6.69</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>7.72</td>
<td>SPECspeed®2017_int_base (10.6)</td>
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<td>605.mcf_s</td>
<td>9.87</td>
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</tr>
<tr>
<td>620.omnetpp_s</td>
<td>10.2</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>7.80</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>12.7</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>5.60</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>4.58</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>15.8</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>18.7</td>
<td>SPECspeed®2017_int_base (10.6)</td>
</tr>
</tbody>
</table>

### Hardware

**CPU Name:** Intel Xeon Silver 4310

**Max MHz:** 3300

**Nominal:** 2100

**Enabled:** 24 cores, 2 chips

**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 2Rx4 PC4-3200AA-R, running at 2666)

**Storage:** 225 GB on tmpfs

**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.3 (Ootpa)

**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:** Yes

**Firmware:** Version 1.2.1 released May-2021

**File System:** tmpfs

**System State:** Run level 3 (multi-user)

**Base Pointers:** 64-bit

**Peak Pointers:** 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.
Dell Inc.

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SPECspeed®2017_int_base = 10.6
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Results Table

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<thead>
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<th>Ratio</th>
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<td>12.7</td>
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</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 10.6
SPECspeed®2017_int_peak = 10.8

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.1-64"
MALLOCONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
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
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.

(Continued on next page)
General Notes (Continued)

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:
  Logical Processor : Disabled
  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
  PCI ASPM L1 Link
    Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on r650xs.9yn9cd3.inside.dell.com Mon Aug 30 15:49:04 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)
  24 "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 : 12
    physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11
    physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11

From lscpu from util-linux 2.32.1:
  Architecture: x86_64
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CPU2017 License: 55
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Test Date: Aug-2021
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Software Availability: Dec-2020

Platform Notes (Continued)

CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 1590.920
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 18432K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23
Flags: fpu vme de pse tsc msr pae mca cmov pat pse36 clflush dts acp l mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid 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 invpcid_single intel_ppin sbd mba ibrs ibpb stibp ibrs_enhanced fs.gsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cm qdmt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsave xsaveopt xgetbv1 xsaves cmq _llc cmq _occup _llc cmq _mbm _total cmq _mbm _local split _lock _detect wbnoinvd dtherm ida ar at pln pts avx512vmbi umip pkt ospe avx512_vbmi2 gfn1 vaes vpclmulqdq avx512_vnni avx512_bid talg tme avx512 _vpopcntdq la57 rdpid md _clear pconfig flush _lld arch _capabilities

/proc/cpuinfo cache data
  cache size : 18432 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22
  node 0 size: 253558 MB
  node 0 free: 256650 MB
  node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23
  node 1 size: 253712 MB

(Continued on next page)
Dell Inc.  
PowerEdge R650xs (Intel Xeon Silver 4310, 2.10 GHz)  

SPEC®2017 int_base = 10.6  
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Platform Notes (Continued)

node 1 free: 248467 MB
node distances:
node 0 1  
0: 10 20  
1: 20 10

From /proc/meminfo
MemTotal: 527552968 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 r650xs.9yn9cd3.inside.dell.com 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020 x86_64 x86_64 x86_64 GNU/Linux

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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected

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

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PowerEdge R650xs (Intel Xeon Silver 4310, 2.10 GHz)

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SPECspeed®2017_int_peak = 10.8

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

Test Date: Aug-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Platform Notes (Continued)

CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Aug 30 15:48

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 4.4G 221G 2% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R650xs
Product Family: PowerEdge
Serial: 9YN9CD3

Additional information from dmidecode 3.2 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:
16x 00AD063200AD HMA84GR7DJR4N-XN 32 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.2.1
BIOS Date: 05/28/2021
BIOS Revision: 1.2

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
<thead>
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<th>C</th>
<th>600.perlbench_s(peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>---------</td>
<td>------------------------</td>
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<tr>
<td>Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)</td>
<td></td>
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<tr>
<td>64, Version 2021.1 Build 20201112_000000</td>
<td></td>
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<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
<td></td>
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==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)</th>
</tr>
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<tbody>
<tr>
<td>Intel(R) oneAPI DPC+/C++ Compiler for applications running on Intel(R) 64,</td>
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<tr>
<td>Version 2021.1 Build 20201113</td>
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<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
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<td>------------------------</td>
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</tbody>
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(Continued on next page)
## Compiler Version Notes (Continued)

| C | 600.perlbench_s(peak) |
|-----------------------------------------------|
| Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| C | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak) |
|-----------------------------------------------|
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| C++ | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak) |
|-----------------------------------------------|
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| Fortran | 648.exchange2_s(base, peak) |
|-----------------------------------------------|
| Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000 |
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## Base Compiler Invocation

### C benchmarks:
- icx

### C++ benchmarks:
- icpx

### Fortran benchmarks:
- ifort
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<table>
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<tr>
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Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX512
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-DSPEC_OPENMP -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/
-1qkmalloc

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

Peak Compiler Invocation

C benchmarks (except as noted below):
icx

600.perlbench_s: icc

C++ benchmarks:
icpx

(Continued on next page)
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SPECspeed®2017_int_base = 10.6
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Peak Compiler Invocation (Continued)

Fortran benchmarks:
ifort

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -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
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

625.x264_s: -DSPEC_OPENMP -fiopenmp -std=c11 -m64 -Wl,-z,muldefs
-xCORE-AVX512 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes
623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes

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

641.leela_s: basepeak = yes

Fortran benchmarks:
648.exchange2_s: 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
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.xml

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-08-30 16:49:04-0400.
Report generated on 2021-11-10 10:09:29 by CPU2017 PDF formatter v6442.
Originally published on 2021-11-09.