## Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

<table>
<thead>
<tr>
<th>Task</th>
<th>SPEC speed®2017_int_base</th>
<th>SPEC speed®2017_int_peak</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>6.70</td>
<td>7.74</td>
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<tr>
<td>602.gcc_s</td>
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<td>605.mcf_s</td>
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<tr>
<td>620.omnetpp_s</td>
<td>18.5</td>
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<tr>
<td>623.xalanchmk_s</td>
<td>12.7</td>
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<tr>
<td>625.x264_s</td>
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<td></td>
</tr>
<tr>
<td>657.xz_s</td>
<td></td>
<td></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 2Rx8 PC4-3200AA-R, running at 2666)
- **Storage:** 125 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++
  - Fortran: Version 2021.1 of Intel Fortran Compiler
- **Parallel:** Yes
- **Firmware:** Version 1.1.3 released Apr-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.
## SPEC CPU®2017 Integer Speed Result

| Dell Inc. | SPECspeed®2017_int_base = 10.6 |
| PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz) | SPECspeed®2017_int_peak = 10.9 |

| CPU2017 License: 55 | Test Date: May-2021 |
| Test Sponsor: Dell Inc. | Hardware Availability: Apr-2021 |
| Tested by: Dell Inc. | Software Availability: Dec-2020 |

### Results Table

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<tr>
<th>Benchmark</th>
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</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

### 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/cpu2017-1.1.7-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/jem5.0.1-64"
- MALLOC_CONF = "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

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

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

**Dell Inc.**
PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

<table>
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<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
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<tbody>
<tr>
<td>10.6</td>
<td>10.9</td>
</tr>
</tbody>
</table>

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

**General Notes (Continued)**

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  

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G 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

Sysinfo program /mnt/ramdisk/cpu2017-1.1.7-ic2021.1/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on localhost.localdomain Mon May 24 00:11:56 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:  
```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
```

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

Dell Inc.

Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

SPECspeed®2017_int_base = 10.6

SPECspeed®2017_int_peak = 10.9

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

Test Date: May-2021
Hardware Availability: Apr-2021
Software Availability: Dec-2020

Platform Notes (Continued)

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: 1074.259
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 18432K
NUMA node0 CPU(s): 0-11
NUMA node1 CPU(s): 12-23
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 aperfmperf pni pclmulqdq dtses64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrpr pdcm dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abbr_3nowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pssn ssbd mba ibrs ibpb stibp ibrs_enhanced fsxguard tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_rmm lsse sbse rdseed adx smap avx512fma clflushopt clwb intel_pt avx512cd sha_hni avx512bw avx512vl xsaveopt 3xsave xsaveopt xsaves cmq_llc cmq_occrr CDDL cmq_mbm_total cmq_mbm_local split_lock_detect wbinvd dtherm ida arit pln pts avx512vmbi umip pku ospke avx512_vmbi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq 1a73 rdpid md_clear pconfig flush_l1d arch_capabilities

/proclcpuinfo 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 1 2 3 4 5 6 7 8 9 10 11
  node 0 size: 253531 MB
  node 0 free: 256839 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
  node 1 size: 254026 MB
  node 1 free: 248590 MB

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

node distances:

<table>
<thead>
<tr>
<th>node</th>
<th>0</th>
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</tr>
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<tbody>
<tr>
<td>0</td>
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<td>20</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

From `/proc/meminfo`

<table>
<thead>
<tr>
<th>MemTotal: 527814840 kB</th>
</tr>
</thead>
<tbody>
<tr>
<td>HugePages_Total: 0</td>
</tr>
<tr>
<td>Hugepagesize: 2048 kB</td>
</tr>
</tbody>
</table>

/sbin/tuned-adm active

Current active profile: throughput-performance

From `/etc/*release* /etc/*version*`

```plaintext
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rheil"
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:

```plaintext
Linux localhost.localdomain 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)**: 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

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

Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

SPECspeed®2017_int_base = 10.6
SPECspeed®2017_int_peak = 10.9

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<tr>
<th>CPU2017 License: 55</th>
<th>Test Date: May-2021</th>
</tr>
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<tr>
<td>Test Sponsor: Dell Inc.</td>
<td>Hardware Availability: Apr-2021</td>
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<td>Software Availability: Dec-2020</td>
</tr>
</tbody>
</table>

Platform Notes (Continued)

run-level 3 May 24 00:08

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.7-ic2021.1

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 4.4G 121G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge C6520
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:
6x 002C00B3002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666
10x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.3
BIOS Date: 04/27/2021
BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

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.

(Continued on next page)
Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:	ifort
## Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** May-2021  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2020

### Base Portability Flags

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<tr>
<th>Benchmark</th>
<th>Flags</th>
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</table>

### Base Optimization Flags

#### C benchmarks:

- DSPEC_OPENMP -std=c11 -m64 -fopenmp -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/
  -lqkmalloc

#### 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)
**SPEC CPU®2017 Integer Speed Result**

**Dell Inc.**

PowerEdge C6520 (Intel Xeon Silver 4310, 2.10 GHz)

| SPECspeed®2017_int_base = 10.6 |
| SPECspeed®2017_int_peak = 10.9 |

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

**Test Date:** May-2021  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2020

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**Peak Compiler Invocation (Continued)**

Fortran benchmarks:

ifort

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**Peak Portability Flags**

Same as Base Portability Flags

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**Peak Optimization Flags**

**C benchmarks:**

600.perlb benchmark -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

602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -fprofiling -fprofile-use=default.profdata(pass 1)  
-xCORE-AVX512 -flto  
-fOfast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4  
-mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

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