Dell Inc.

PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECspeak®2017_int_base = 11.9
SPECspeak®2017_int_peak = 12.2

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

Threads

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>64</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>64</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>64</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>64</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>64</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>64</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>64</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>64</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>64</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>64</td>
</tr>
</tbody>
</table>

SPECspeak®2017_int_base (11.9) SPECspeak®2017_int_peak (12.2)

Hardware

CPU Name: Intel Xeon Gold 6338N
Max MHz: 3500
Nominal: 2200
Enabled: 64 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: 48 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)
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 1.1.2 released Apr-2021
File System: tmpfs
System State: Run level 5 (graphical multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
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.**

**PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)**

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

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tbody>
<tr>
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<tr>
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<td>134</td>
<td>12.2</td>
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<td>12.0</td>
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<td><strong>12.2</strong></td>
<td>134</td>
<td>12.2</td>
<td>136</td>
<td>12.0</td>
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<tr>
<td>623.xalanchmk_s</td>
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<tr>
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<td><strong>17.2</strong></td>
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<td><strong>4.85</strong></td>
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<td>4.85</td>
<td>352</td>
<td>4.85</td>
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<tr>
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<td>64</td>
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<td>19.2</td>
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<td>19.2</td>
<td>152</td>
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<td>153</td>
<td>19.2</td>
<td>152</td>
<td>19.3</td>
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<tr>
<td>657.xz_s</td>
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<td>260</td>
<td>23.8</td>
<td>258</td>
<td>23.9</td>
<td>259</td>
<td>23.9</td>
<td>260</td>
<td>23.8</td>
</tr>
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**SPECspeed®2017_int_base = 11.9**  
**SPECspeed®2017_int_peak = 12.2**

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/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/je5.0.1-64"
- 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  
- 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)
Dell Inc.

PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)

**SPEC CPU®2017 Integer Speed Result**

**SPEC**

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**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** Apr-2021

**Hardware Availability:** May-2021

**Software Availability:** Feb-2021

---

**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

**Sysinfo program** /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/bin/sysinfo

**Rev:** r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c

running on localhost.localdomain Mon Apr 12 11:48:32 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) Gold 6338N CPU @ 2.20GHz
- 2 "physical id"s (chips)
- 64 "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 : 32
  - siblings : 32
  - physical 0: cores 0 1 2 3 4 5 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  - physical 1: cores 0 1 2 3 4 5 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

(Continued on next page)
Dell Inc.

PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)

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

**SPECspeed®2017_int_base = 11.9**

**SPECspeed®2017_int_peak = 12.2**

---

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

---

From lscpu:

- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU(s):** 64
- **On-line CPU(s) list:** 0-63
- **Thread(s) per core:** 1
- **Core(s) per socket:** 32
- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
- **Stepping:** 6
- **CPU MHz:** 3014.274
- **BogoMIPS:** 4400.00

**Virtualization:** VT-x

**L1d cache:** 48K

**L1i cache:** 32K

**L2 cache:** 1280K

**L3 cache:** 49152K

**NUMA node0 CPU(s):**

0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62

**NUMA node1 CPU(s):**

1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59,61,63

**Flags:**

- fpu
- vme
- de
- pse
- mce
- cmov
- pat
- pse36
- clflush
- dts
- dtst
- mmu
- stp
- mtrr
- pge
- mca
- cmov
- pat
- pse36
- clflush
- dts
- dtst
- mmu
- stp
- mtrr
- pge
- mca
- cmov
- pat
- pse36
- clflush
- dts
- dtst
- mmu
- stp
- mtrr
- pge
- mca

**/proc/cpuinfo cache data**

- **cache size:** 49152 KB

---

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

---

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

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**SPECspeed®2017_int_base = 11.9**  
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<td>Software Availability: Feb-2021</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

available: 2 nodes (0-1)  
node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62  
node 0 size: 245523 MB  
node 0 free: 241547 MB  
node 0 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63  
node 1 size: 246462 MB  
node 1 free: 256606 MB  
node distances:  
node 0 1  
0: 10 20  
1: 20 10  

From /proc/meminfo  
MemTotal: 527808648 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  

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  

(Continued on next page)
Dell Inc.
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<th>SPECspeed®2017_int_peak</th>
</tr>
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<tbody>
<tr>
<td>11.9</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000

**Platform Notes (Continued)**

Bypass disabled via prctl and seccomp
Mitigation: usercopy/swapgs barriers and __user pointer sanitization

CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):

Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

Not affected

run-level 5 Apr 12 11:46

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 R650
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:
7x 00AD00B300AD HMMA4GR7A4JR8N-XN 32 GB 2 rank 3200, configured at 2666
9x 00AD063200AD HMMA4GR7A4JR8N-XN 32 GB 2 rank 3200, configured at 2666
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.2
BIOS Date: 04/09/2021
BIOS Revision: 1.1

(End of data from sysinfo program)

**Compiler Version Notes**

==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>---------</td>
<td>------------------------</td>
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(Continued on next page)
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PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)

SPEC CPU®2017 Integer Speed Result

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Compiler Version Notes (Continued)

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==============================================================================
|  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       | 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)                     |
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| 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.         |
Dell Inc.
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### Base Compiler Invocation

C benchmarks:
- icx

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

### 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/
- -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

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

602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdatal(pass 2) -xCORE-AVX512 -flto
-Ofast(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

(Continued on next page)
Dell Inc. PowerEdge R650 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECspeed®2017_int_base = 11.9
SPECspeed®2017_int_peak = 12.2

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

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

Peak Optimization Flags (Continued)

C++ benchmarks:
620.omnetpp_s: basepeak = yes
623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes
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

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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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