Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4215R, 3.20 GHz)

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

SPECspeed®2017_int_base = 8.98
SPECspeed®2017_int_peak = 9.10

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Thread Count</th>
<th>SPECspeed®2017_int_base (8.98)</th>
<th>SPECspeed®2017_int_peak (9.10)</th>
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<tr>
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<td>16</td>
<td>6.21</td>
<td>8.63</td>
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<tr>
<td>602.gcc_s</td>
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<td>8.62</td>
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<td>605.mcf_s</td>
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<td>5.21</td>
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<td>620.omnetpp_s</td>
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<td>10.3</td>
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<tr>
<td>623.xalancbmk_s</td>
<td>16</td>
<td>5.42</td>
<td>4.70</td>
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<tr>
<td>625.x264_s</td>
<td>16</td>
<td>15.7</td>
<td>18.7</td>
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<tr>
<td>631.deepsjeng_s</td>
<td>16</td>
<td></td>
<td></td>
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<tr>
<td>641.leela_s</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>657.xz_s</td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hardware**

CPU Name: Intel Xeon Silver 4215R
Max MHz: 4000
Nominal: 3200
Enabled: 16 cores, 2 chips
Orderable: 1.2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 11 MB I+D on chip per chip
Other: None
Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2400)
Storage: 1 x 1.92 TB SATA SSD
Other: None

**Software**

OS: Red Hat Enterprise Linux 8.1
Kernel: 4.18.0-147.el8.x86_64
Compiler: C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux;
Fortran: Version 19.0.5.281 of Intel Fortran Compiler for Linux
Parallel: Yes
Firmware: Version 2.5.4 released Jan-2020
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 set to prefer performance at the cost of additional power usage
Dell Inc.
PowerEdge R640 (Intel Xeon Silver 4215R, 3.20 GHz)

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
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</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 8.98
SPECspeed®2017_int_peak = 9.10

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/lib/intel64:/mnt/ramdisk/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K 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
Filesystem page cache synced and cleared with:
 sync; echo 3>/proc/sys/vm/drop_caches
Benchmark run from a 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"
jemalloc, a general purpose malloc implementation

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

Dell Inc.
PowerEdge R640 (Intel Xeon Silver 4215R, 3.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_peak</th>
<th>SPECspeed®2017_int_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.10</td>
<td>8.98</td>
</tr>
</tbody>
</table>

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: May-2020
Hardware Availability: Feb-2020
Tested by: Dell Inc.
Software Availability: Nov-2019

General Notes (Continued)

built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS settings:
Virtualization Technology 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 set to standard
Logical Processor disabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /mnt/ramdisk/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl1e6e46a485a0011
running on rhel-8-1-sut Mon May 11 12:39:14 2020

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 4215R CPU @ 3.20GHz
  2 "physical id"s (chips)
  16 "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 : 8
siblings : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 16

(Continued on next page)
Platform Notes (Continued)

On-line CPU(s) list: 0-15
Thread(s) per core: 1
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4215R CPU @ 3.20GHz
Stepping: 7
CPU MHz: 2601.007
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 6400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15
Flags: fpu vme de pse tsc msr pae 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 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 abtm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_pmcgov ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavevc xsaves cqm_llc cqm_occp LLC cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
cache size : 11264 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
node 0 size: 192050 MB
node 0 free: 191335 MB
node 1 cpus: 1 3 5 7 9 11 13 15
node 1 size: 193533 MB
node 1 free: 177173 MB
node distances:
SPEC CPU®2017 Integer Speed Result

Dell Inc.

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Tested by: Dell Inc.

SPECspeed®2017_int_base = 8.98
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Test Date: May-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Platform Notes (Continued)

node  0  1
 0: 10 21
 1: 21 10

From /proc/meminfo
MemTotal: 394837836 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
Linux rhel-8-1-sut 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019 x86_64	x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown):
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):

run-level 3 May 11 11:43 last=5

SPEC is set to: /mnt/ramdisk/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 200G 7.5G 193G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.5.4 01/13/2020

(Continued on next page)
Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4215R, 3.20 GHz)

SPECspeed®2017_int_base = 8.98
SPECspeed®2017_int_peak = 9.10

Platform Notes (Continued)

Vendor: Dell Inc.
Product: PowerEdge R640
Product Family: PowerEdge
Serial: FPFXCH2

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:
10x 002C069D002C 18A5F2G72PDZ-2G9E1 16 GB 2 rank 2933
4x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933
8x 00AD00B300AD HMA82GR7CJR8N-XN 16 GB 2 rank 3200
2x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 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) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Dell Inc.

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**SPECspeed®2017_int_base = 8.98**

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</tbody>
</table>

---

### Base Compiler Invocation

- C benchmarks: icc
- C++ benchmarks: icpc
- Fortran benchmarks: ifort

---

### Base Portability Flags

- C benchmarks:
  - 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:
  - -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  - -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
  - -L/usr/local/je5.0.1-64/lib -ljemalloc

- C++ benchmarks:
  - -m64 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  - -qopt-mem-layout-trans=4
  - -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin -lqkmalloc

- Fortran benchmarks:
  - -m64 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
  - -nostandard-realloc-lhs
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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Test Date: May-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -O2 -xCORE-AVX512
  -qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div
  -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
  -fno-strict-overflow -L/usr/local/je5.0.1-64/lib
  -ljemalloc

602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -O2 -xCORE-AVX512
  -qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div
  -DSPEC_SUPPRESS_OPENMP -L/usr/local/je5.0.1-64/lib
  -ljemalloc

605.mcf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div
  -qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
  -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc

625.x264_s: basepeak = yes

657.xz_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -O2 -xCORE-AVX512
  -qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div
  -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
  -L/usr/local/je5.0.1-64/lib -ljemalloc

(Continued on next page)
Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4215R, 3.20 GHz)

SPECspeed\textsuperscript{\textregistered}2017\textunderscore int\textunderscore peak = 9.10

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CPU2017 License: & 55 \\
Test Sponsor: & Dell Inc. \\
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\hline
\end{tabular}

Test Date: \quad May-2020

Hardware Availability: \quad Feb-2020

Software Availability: \quad Nov-2019

\textbf{Peak Optimization Flags (Continued)}

C++ benchmarks:

620.omnetpp\_s: \texttt{-m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4 -DSPEC\_SUPPRESS\_OPENMP -L/usr/local/IntelCompiler19/compilers\_and\_libraries\_2019.5.281/linux/compiler/lib/intel64\_lin -lqkmalloc}

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:


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Tested with SPEC CPU\textsuperscript{\textregistered}2017 v1.1.0 on 2020-05-11 13:39:13-0400.
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