SPEC CPU®2017 Integer Speed Result

Dell Inc.

PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)

SPECSpeed®2017_int_base = 9.15
SPECSpeed®2017_int_peak = 9.38

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_int_base (9.15)</th>
<th>SPECspeed®2017_int_peak (9.38)</th>
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<tr>
<td>600.perlbench_s 32</td>
<td>5.44</td>
<td>6.51</td>
</tr>
<tr>
<td>602.gcc_s 32</td>
<td>8.31</td>
<td>8.85</td>
</tr>
<tr>
<td>605.mcf_s 32</td>
<td>7.97</td>
<td>15.7</td>
</tr>
<tr>
<td>620.omnetpp_s 32</td>
<td></td>
<td></td>
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<tr>
<td>623.xalancbmk_s 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>625.x264_s 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>631.deepsjeng_s 32</td>
<td>4.83</td>
<td>4.83</td>
</tr>
<tr>
<td>641.leela_s 32</td>
<td>3.93</td>
<td>3.93</td>
</tr>
<tr>
<td>648.exchange2_s 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>657.xz_s 32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Silver 4216
Max MHz: 3200
Nominal: 2100
Enabled: 32 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: 22 MB I+D on chip per chip
Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC4-3200V-R, running at 2400)
Storage: 1 x 1.92 TB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 8.1
type: kernel 4.18.0-147.el8.x86_64
Compiler: C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux;
Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
Parallel: Yes
Firmware: Version 2.7.7 released May-2020
File System: xfs
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 R440 (Intel Xeon Silver 4216, 2.10 GHz)

SPEC CPU®2017 Integer Speed Result
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SPECspeed®2017_int_base = 9.15
SPECspeed®2017_int_peak = 9.38

Dell Inc.

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

Results Table

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<tr>
<th>Benchmark</th>
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<th>Ratio</th>
<th>Seconds</th>
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<th>Ratio</th>
<th>Seconds</th>
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<td>328</td>
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<td>15.7</td>
<td>302</td>
<td>15.6</td>
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<tr>
<td>620.omnetpp_s</td>
<td>32</td>
<td>208</td>
<td>7.84</td>
<td>204</td>
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<td>205</td>
<td>7.97</td>
<td>32</td>
<td>208</td>
<td>7.84</td>
<td>204</td>
<td>7.98</td>
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<tr>
<td>623.xalanchmk_s</td>
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<td>10.9</td>
<td>129</td>
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<td>130</td>
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<td>10.9</td>
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<tr>
<td>625.x264_s</td>
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<td>12.9</td>
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<td>13.0</td>
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<td>648.exchange2_s</td>
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<td>13.8</td>
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<tr>
<td>657.xz_s</td>
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<td>319</td>
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<td>32</td>
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<td>19.4</td>
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</tbody>
</table>

SPECspeed®2017_int_base = 9.15
SPECspeed®2017_int_peak = 9.38

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

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64/:/home/cpu2017/je5.0.1-64"
MALLOCONF = "retain:true"
OMP_STACKSIZE = "192M"
Dell Inc.
PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)

SPEC CPU®2017 Integer Speed Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECspeed®2017_int_base = 9.15
SPECspeed®2017_int_peak = 9.38

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

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
runcpu command invoked through numactl i.e.:
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

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 /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbf1e6e46a485a0011
running on localhost.localdomain Sun Jun 14 16:22:34 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

(Continued on next page)
Platform Notes (Continued)

model name : Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
  2 "physical id"s (chips)
  32 "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 : 16
siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
Stepping: 6
CPU MHz: 2852.081
CPU max MHz: 3200.0000
CPU min MHz: 800.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
apermperf pni pclmulqdq dtes64monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtr Harding pcid dca sse4_1 sse4_2 x2apic movbe popcnt pcp tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_patin ssbd mba ibrs ibpb stibp 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 xsaves cqm_llc cqm_occucc_ltc cqm_mmm_total
cqm_mmb_local dtherm ida arat pln pts pkup osprke avx512_vnni md_clear flush_l1d

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

Dell Inc.

**PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)**

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>9.15</th>
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</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
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</table>

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Apr-2020

**Hardware Availability:** Apr-2020

**Tested by:** Dell Inc.

**Software Availability:** Apr-2020

---

**Platform Notes (Continued)**

```plaintext
arch_capabilities

/proc/cpuinfo cache data
  cache size : 22528 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 24 26 28 30
  node 0 size: 192074 MB
  node 0 free: 191363 MB
  node 1 cpus:  1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31
  node 1 size: 193506 MB
  node 1 free: 192544 MB
  node distances:
    node 0 1
    0:  10  21
    1:  21  10

From /proc/meminfo
  MemTotal:       394835328 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 localhost.localdomain 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): Not affected
```

(Continued on next page)
**Dell Inc.**

**PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)**

| SPECspeed®2017_int_base = 9.15 |
| SPECspeed®2017_int_peak = 9.38 |

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

---

**Platform Notes (Continued)**

CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp

CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitation

CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

---

run-level 3 Jun 14 16:22 last=5

SPEC is set to: /home/cpu2017

<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>/dev/mapper/rhel-home</td>
<td>xfs</td>
<td>1.7T</td>
<td>23G</td>
<td>1.7T</td>
<td>2%</td>
<td>/home</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

- BIOS: Dell Inc. 2.7.7 05/06/2020
- Vendor: Dell Inc.
- Product: PowerEdge R440
- Product Family: PowerEdge
- Serial: F9TD613

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:

- 12x 002C069D002C 36ASF4G72PZ-3G2E2 32 GB 2 rank 3200
- 4x Not Specified Not Specified

(End of data from sysinfo program)

---

**Compiler Version Notes**

```
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) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

```
C       | 600.perlbench_s(peak)
```

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306

(Continued on next page)
Dell Inc.

PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)

SPEC CPU®2017 Integer Speed Result

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SPECspeed®2017_int_peak = 9.38

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

Test Date: Apr-2020
Hardware Availability: Apr-2020
Software Availability: Apr-2020

Compiler Version Notes ( Continued )

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) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304            |
 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.                                              |
 ------------------------------------------------------------------------------------------------------------------
 | C       | 600.perlbench_s(peak)                                                                                         |
------------------------------------------------------------------------------------------------------------------
 | Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306               |
 | 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) C++ Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304        |
 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.                                              |
 ------------------------------------------------------------------------------------------------------------------
 | Fortran | 648.exchange2_s(base, peak)                                                                                   |
------------------------------------------------------------------------------------------------------------------
 | Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306        |
 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.                                              |
 ------------------------------------------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

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

Dell Inc.
PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)

Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

SPECspeed®2017_int_base = 9.15
SPECspeed®2017_int_peak = 9.38

Base Compiler Invocation (Continued)

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:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64.5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX2
-O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-mbranches-within-32B-boundaries
Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64(*) -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

(*) Indicates a portability flag that was found in a non-portability variable.

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX2 -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 -qnextgen -std=c11 -fuse-ld=gold
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

(Continued on next page)
Dell Inc.
PowerEdge R440 (Intel Xeon Silver 4216, 2.10 GHz)

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

Test Date: Apr-2020
Hardware Availability: Apr-2020
Software Availability: Apr-2020

Peak Optimization Flags (Continued)

605.mcf_s: basepeak = yes

625.x264_s: -m64 -gnextgen -std=c11
-W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -xCORE-AVX2 -flto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-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
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-ic19.1u1-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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