**SPEC CPU®2017 Integer Speed Result**

Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4210R, 2.40 GHz)

<table>
<thead>
<tr>
<th>Software Availability:</th>
<th>Test Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov-2019</td>
<td>Apr-2020</td>
</tr>
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</table>

| SPECspeed®2017_int_base = 7.76 |
| SPECspeed®2017_int_peak = 7.85 |

<table>
<thead>
<tr>
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<th>Tested by:</th>
</tr>
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<td>Dell Inc.</td>
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<td>Feb-2020</td>
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Threads (7.85)

| SPECspeed®2017_int_base (7.76) |
| SPECspeed®2017_int_peak (7.85) |

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Silver 4210R</td>
<td></td>
</tr>
<tr>
<td>OS: Red Hat Enterprise Linux release 8.1</td>
<td></td>
</tr>
<tr>
<td>Max MHz: 3200</td>
<td></td>
</tr>
<tr>
<td>kernel 4.18.0-147.el8.x86_64</td>
<td></td>
</tr>
<tr>
<td>Nominal: 2400</td>
<td></td>
</tr>
<tr>
<td>Compiler: C/C++: Version 19.0.5.281 of Intel C/C++</td>
<td></td>
</tr>
<tr>
<td>Enabled: 20 cores, 2 chips, 2 threads/core</td>
<td></td>
</tr>
<tr>
<td>Compiler for Linux;</td>
<td></td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
<td></td>
</tr>
<tr>
<td>Fortran: Version 19.0.5.281 of Intel Fortran</td>
<td></td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td></td>
</tr>
<tr>
<td>Compiler for Linux;</td>
<td></td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td></td>
</tr>
<tr>
<td>Parallel: Yes</td>
<td></td>
</tr>
<tr>
<td>L3: 13.75 MB I+D on chip per chip</td>
<td></td>
</tr>
<tr>
<td>Firmware: Version 2.7.3 released Mar-2020</td>
<td></td>
</tr>
<tr>
<td>Other: None</td>
<td></td>
</tr>
<tr>
<td>File System: tmpfs</td>
<td></td>
</tr>
<tr>
<td>Memory: 384 GB (12 x 32 GB 2Rx8 PC4-2933V-R, running at 2400)</td>
<td></td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td></td>
</tr>
<tr>
<td>Storage: 1 x 480 GB SATA SSD</td>
<td></td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td></td>
</tr>
<tr>
<td>Other: None</td>
<td></td>
</tr>
<tr>
<td>Peak Pointers: 64-bit</td>
<td></td>
</tr>
<tr>
<td>Power Management: BIOS set to prefer performance at the cost of additional power usage</td>
<td></td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
<td></td>
</tr>
</tbody>
</table>
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>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>600.perlbenc_h_s</td>
<td>40</td>
<td>340</td>
<td>5.22</td>
<td>343</td>
<td>5.17</td>
<td>340</td>
<td>5.21</td>
<td>40</td>
<td>304</td>
<td>5.83</td>
<td>302</td>
<td>5.87</td>
<td>304</td>
<td>5.84</td>
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<tr>
<td>602.gcc_s</td>
<td>40</td>
<td>511</td>
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<td>501</td>
<td>7.94</td>
<td>509</td>
<td>7.82</td>
<td>40</td>
<td>500</td>
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<td>494</td>
<td>8.05</td>
<td>502</td>
<td>7.93</td>
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<tr>
<td>605.mcf_s</td>
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<tr>
<td>620.omnetpp_s</td>
<td>40</td>
<td>312</td>
<td>5.22</td>
<td>315</td>
<td>5.17</td>
<td>315</td>
<td>5.17</td>
<td>40</td>
<td>322</td>
<td>5.06</td>
<td>318</td>
<td>5.12</td>
<td>324</td>
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<tr>
<td>623.xalanchmk_s</td>
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<td>165</td>
<td>8.59</td>
<td>163</td>
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<td>8.67</td>
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<td>625.x264_s</td>
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<td>11.2</td>
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<td>631.deepsjeng_s</td>
<td>40</td>
<td>319</td>
<td>4.49</td>
<td>319</td>
<td>4.49</td>
<td>319</td>
<td>4.49</td>
<td>40</td>
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<td>4.49</td>
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<td>4.49</td>
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<td>4.49</td>
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<tr>
<td>641.leela_s</td>
<td>40</td>
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<td>3.75</td>
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<td>3.76</td>
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<td>3.75</td>
<td>40</td>
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<td>3.75</td>
<td>454</td>
<td>3.76</td>
<td>455</td>
<td>3.75</td>
</tr>
<tr>
<td>648.exchange2_s</td>
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<td>237</td>
<td>12.4</td>
<td>235</td>
<td>12.5</td>
<td>235</td>
<td>12.5</td>
<td>40</td>
<td>237</td>
<td>12.4</td>
<td>235</td>
<td>12.5</td>
<td>235</td>
<td>12.5</td>
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<td>657.xz_s</td>
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<td>18.1</td>
<td><strong>341</strong></td>
<td><strong>18.1</strong></td>
<td>40</td>
<td>338</td>
<td>18.3</td>
<td>338</td>
<td>18.3</td>
<td><strong>338</strong></td>
<td><strong>18.3</strong></td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 7.76
SPECspeed®2017_int_peak = 7.85

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

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 = "/dev/shm/cpu2017/lib/intel64:/dev/shm/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
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.
Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4210R, 2.40 GHz)

**General Notes (Continued)**

- 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
  - DCU Streamer Prefetcher 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 disabled
  - Logical Processor enabled
  - CPU Interconnect Bus Link Power Management enabled
  - PCI ASPM L1 Link Power Management enabled

- Sysinfo program /dev/shm/cpu2017/bin/sysinfo

  Rev: r6365 of 2019-08-21 295195f888a3d7ed6b1e6e46a485a0011

  running on localhost.localdomain Thu Apr 23 11:09:03 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 4210R CPU @ 2.40GHz
  2 "physical id"s (chips)
  40 "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 : 10
  siblings : 20
  physical 0: cores 0 1 2 3 4 8 9 10 11 12
  physical 1: cores 0 1 2 3 4 8 9 10 11 12
  ```

  From lscpu:

(Continued on next page)
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SPECspeed®2017_int_peak = 7.85

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Platform Notes (Continued)

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 2
Core(s) per socket: 10
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
Stepping: 7
CPU MHz: 1358.444
CPU max MHz: 3200.0000
CPU min MHz: 1000.0000
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 14080K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39
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
aarch64 xsave tsx smt tsc_deadline_timer aes xsaveila f16c rdrcr lahf_lm
abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
invercirempe intelpin ssbd mba ibrs ibpb stibp ibrs_endepl tpr_shadow
vmmi flexpriority ept vpid fsgsbase tsc_adjust bihle avx2 smep bmi2 erms invpcid
rtm cqm mxp rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt
avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc
cqm_mmb_total cqm_mbb_local dtherm ida arat pfn pts pkup ospkc avx512_vnni
md_clear flush_l1d
arch_capabilities

/proc/cpuinfo cache data
    cache size : 14080 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 32 34 36 38
    node 0 size: 192073 MB
    node 0 free: 166857 MB

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**SPEC CPU®2017 Integer Speed Result**

**Dell Inc.**

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**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Apr-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Nov-2019

**Platform Notes (Continued)**

```plaintext
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
node 1 size: 193505 MB
node 1 free: 172632 MB
node distances:
  node 0 1
  0: 10 21
  1: 21 10

From /proc/meminfo
  MemTotal: 394832916 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  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
- 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 sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Apr 21 16:15

SPEC is set to: /dev/shm/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>
</table>

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Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4210R, 2.40 GHz)

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Copyright 2017-2020 Standard Performance Evaluation Corporation

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CPU2017 License: 55
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Platform Notes (Continued)

tmpfs  tmpfs  189G  36G  153G  19% /dev/shm

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.7.3 03/25/2020
Vendor: Dell Inc.
Product: PowerEdge C6420
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 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
2x 00AD063200AD HMA84GR7CJR4N-XN 32 GB 2 rank 3200
3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>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)</th>
</tr>
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<tbody>
<tr>
<td>Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2019 Intel Corporation. All rights reserved.</td>
<td></td>
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<tr>
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==============================================================================
<table>
<thead>
<tr>
<th>Fortran</th>
<th>648.exchange2_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815</td>
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**Compiler Version Notes (Continued)**  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

---

**Base Compiler Invocation**

C benchmarks:  
icc

C++ benchmarks:  
icpc

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 -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

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

**Base Optimization Flags (Continued)**

Fortran benchmarks:
- `-m64 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4`  
- `-nostandard-realloc-lhs`

**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`

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**Peak Optimization Flags (Continued)**

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/jemalloc

C++ benchmarks:

620.omnetpp_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-ipo -xCORE-AVX512 -O3 -no-prec-div
-qopt-mem-layout-trans=4 -ipo -O3 -no-prec-div
-DSPEC_SUPPRESS_OPENMP
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin

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-ic19.0u5-official-linux64_rev0.xml