# SPEC CPU®2017 Integer Speed Result

**Dell Inc.**

PowerEdge R640 (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>10.3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_int_base (10.1)</th>
<th>SPECspeed®2017_int_peak (10.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s 56</td>
<td>6.63</td>
<td>7.52</td>
</tr>
<tr>
<td>602.gcc_s 56</td>
<td>10.0</td>
<td>10.3</td>
</tr>
<tr>
<td>605.mcf_s 56</td>
<td>9.15</td>
<td>12.4</td>
</tr>
<tr>
<td>620.omnetpp_s 56</td>
<td>9.21</td>
<td>12.5</td>
</tr>
<tr>
<td>623.xalancbmk_s 56</td>
<td>10.8</td>
<td>14.6</td>
</tr>
<tr>
<td>625.x264_s 56</td>
<td>5.50</td>
<td>5.50</td>
</tr>
<tr>
<td>631.deepsjeng_s 56</td>
<td>4.69</td>
<td>4.69</td>
</tr>
<tr>
<td>641.leela_s 56</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>648.exchange2_s 56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>657.xz_s 56</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Hardware

**CPU Name**: Intel Xeon Gold 6238R  
**Max MHz**: 4000  
**Nominal**: 2200  
**Enabled**: 56 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**: 38.5 MB I+D on chip per chip  
**Other**: None  
**Memory**: 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)  
**Storage**: 1 x 1.92 TB SATA SSD  
**Other**: None  

## Software

**OS**: Red Hat Enterprise Linux 8.1  
**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**: None  

**jemalloc memory allocator V5.0.1**  
**Power Management**: BIOS set to prefer performance at the cost of additional power usage.
**SPEC CPU®2017 Integer Speed Result**

Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6238R, 2.20 GHz)

**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>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>56</td>
<td>267</td>
<td>6.64</td>
<td>268</td>
<td>6.63</td>
<td>56</td>
<td>236</td>
<td>7.52</td>
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<td>7.53</td>
<td></td>
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<tr>
<td>602.gcc_s</td>
<td>56</td>
<td>397</td>
<td>10.0</td>
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<td>10.3</td>
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<td>10.4</td>
<td>387</td>
<td>10.3</td>
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<tr>
<td>605.mcf_s</td>
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<td>620.omnetpp_s</td>
<td>56</td>
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<td>9.15</td>
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<td>9.21</td>
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<td>177</td>
<td>9.21</td>
<td>170</td>
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<tr>
<td>623.xalancbmk_s</td>
<td>56</td>
<td>132</td>
<td>10.8</td>
<td>131</td>
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<td>56</td>
<td>132</td>
<td>10.8</td>
<td>131</td>
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<td></td>
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<tr>
<td>625.x264_s</td>
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<td>14.6</td>
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<td>14.6</td>
<td>56</td>
<td>121</td>
<td>14.6</td>
<td>121</td>
<td>14.6</td>
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</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>56</td>
<td>260</td>
<td>5.52</td>
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<td>5.50</td>
<td>56</td>
<td>260</td>
<td>5.52</td>
<td>261</td>
<td>5.50</td>
<td></td>
</tr>
<tr>
<td>641.leela_s</td>
<td>56</td>
<td>363</td>
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<tr>
<td>648.exchange2_s</td>
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<td>188</td>
<td>15.7</td>
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<tr>
<td>657.xz_s</td>
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<td>261</td>
<td>23.7</td>
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<td>56</td>
<td>260</td>
<td>23.8</td>
<td>260</td>
<td>23.8</td>
<td></td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 10.1
SPECspeed®2017_int_peak = 10.3

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/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

Files system 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)
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PowerEdge R640 (Intel Xeon Gold 6238R, 2.20 GHz)  

SPEC CPU®2017 Integer Speed Result  

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SPECspeed®2017_int_base = 10.1  
SPECspeed®2017_int_peak = 10.3  

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Test Date: Apr-2020  
Tested by: Dell Inc.  
Hardware Availability: Feb-2020  
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:  
Sub NUMA Cluster disabled  
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 295195f888a3d7eddb1e6e46a485a0011  
runtime on rhel-8-1-sut Mon Apr 27 16:49:59 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) Gold 6238R CPU @ 2.20GHz  
   2 "physical id"s (chips)  
   56 "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 : 28  
siblings : 28  
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30  
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30  

From lscpu:  
Architect: x86_64  

(Continued on next page)
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CPU2017 License: 55
Test Sponsor: Dell Inc.
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SPECspeed®2017_int_base = 10.1
SPECspeed®2017_int_peak = 10.3

CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 3352.192
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
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
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
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 pdtelgb rdtscp lm constant tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop tsc cpuid aperfmpref perf pni pclmulqdq dtes64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrr pdcm pcd dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat _l3 cd p_l3

/platform_cpuinfo_cache_data

cache size : 39424 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 40 42 44 46 48 50 52 54

(Continued on next page)
Platform Notes (Continued)

node 0 size: 192071 MB
node 0 free: 190936 MB
node 1 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
node 1 size: 193504 MB
node 1 free: 177611 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal:       394830304 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
platform: Red Hat Enterprise Linux 8.1 (Ootpa)
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 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 27 16:42 last=5
## Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
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<tr>
<td>SPECspeed®2017_int_peak</td>
<td>10.3</td>
</tr>
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</table>

### CPU2017 License:
55

### Test Date:
Apr-2020

### Test Sponsor:
Dell Inc.

### Hardware Availability:
Feb-2020

### Tested by:
Dell Inc.

### Software Availability:
Nov-2019

### Platform Notes (Continued)

SPEC is set to: /mnt/ramdisk/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>tmpfs</td>
<td>tmpfs</td>
<td>225G</td>
<td>7.5G</td>
<td>218G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

BIOS: Dell Inc. 2.5.4 01/13/2020
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 18ASF2G72PDZ-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

<table>
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<tr>
<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>
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</table>

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++

<table>
<thead>
<tr>
<th>620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)</th>
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Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
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Fortran

<table>
<thead>
<tr>
<th>648.exchange2_s(base, peak)</th>
</tr>
</thead>
</table>

(Continued on next page)
COMPILER VERSION NOTES (CONTINUED)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
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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

(Continued on next page)
### Base Optimization Flags (Continued)

C++ benchmarks (continued):
- `-lqkmalloc`

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 -gopenmp -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
```

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

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- **SPECspeed\textsuperscript{\(\circ\)2017\_int\_base} = 10.1**
- **SPECspeed\textsuperscript{\(\circ\)2017\_int\_peak} = 10.3**

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<td>Apr-2020</td>
<td>Nov-2019</td>
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**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

#### Peak Optimization Flags (Continued)

- **605.mcf\_s:**  
  - `-m64`  
  - `-std=c11`  
  - `-Wl,-z,muldefs`  
  - `-prof-gen(pass 1)`  
  - `-prof-use(pass 2)`  
  - `-ipo`  
  - `-xCORE-AVX512`  
  - `-O3`  
  - `-no-prec-div`  
  - `-DSPEC\_SUPPRESS\_OPENMP`  
  - `-qopenmp`  
  - `-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)`  
  - `-ipo`  
  - `-xCORE-AVX512`  
  - `-O3`  
  - `-no-prec-div`  
  - `-DSPEC\_SUPPRESS\_OPENMP`  
  - `-qopenmp`  
  - `-DSPEC\_OPENMP`

- **C++ benchmarks:**

  - **620.omnetpp\_s:**  
    - `-m64`  
    - `-std=c11`  
    - `-Wl,-z,muldefs`  
    - `-prof-gen(pass 1)`  
    - `-prof-use(pass 2)`  
    - `-ipo`  
    - `-xCORE-AVX512`  
    - `-O3`  
    - `-no-prec-div`  
    - `-DSPEC\_SUPPRESS\_OPENMP`

  - **623.xalancbnk\_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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU\textsuperscript{\(\circ\)2017} v1.1.0 on 2020-04-27 17:49:59-0400.  