SPECCPU®2017 Integer Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10
(2.10 GHz, Intel Xeon Gold 5218R)

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>40</td>
<td>7.56</td>
<td>9.47</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>40</td>
<td>9.45</td>
<td>12.3</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>40</td>
<td>8.39</td>
<td>12.3</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>40</td>
<td>8.24</td>
<td>12.2</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>40</td>
<td>12.2</td>
<td>14.4</td>
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<tr>
<td>625.x264_s</td>
<td>40</td>
<td>5.44</td>
<td>14.4</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>40</td>
<td>5.45</td>
<td>16.0</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>40</td>
<td>4.68</td>
<td>16.0</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>40</td>
<td>16.0</td>
<td>21.7</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>40</td>
<td>16.0</td>
<td>21.7</td>
</tr>
</tbody>
</table>

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Hardware

CPU Name: Intel Xeon Gold 5218R
Max MHz: 4000
Nominal: 2100
Enabled: 40 cores, 2 chips
Orderable: 1, 2 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 27.5 MB I+D on chip per chip
Other: None
Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)
Storage: 1 x 400 GB SAS SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux;
Parallel: Yes
Firmware: HPE BIOS Version U32 v2.22 (11/13/2019) released Apr-2020
File System: btrfs
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
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SPECspeed®2017_int_base = 10.0
SPECspeed®2017_int_peak = 10.1

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>
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<tbody>
<tr>
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<td>40</td>
<td>268</td>
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<td>6.61</td>
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<td>6.60</td>
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<td>602.gcc_s</td>
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<td>605.mcf_s</td>
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<td>116</td>
<td>12.2</td>
<td>117</td>
<td>12.1</td>
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<tr>
<td>625.x264_s</td>
<td>40</td>
<td>123</td>
<td>14.4</td>
<td>123</td>
<td>14.4</td>
<td>123</td>
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</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>40</td>
<td>262</td>
<td>5.46</td>
<td>263</td>
<td>5.44</td>
<td>263</td>
<td>5.44</td>
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<tr>
<td>641.leela_s</td>
<td>40</td>
<td>364</td>
<td>4.68</td>
<td>365</td>
<td>4.67</td>
<td>365</td>
<td>4.68</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>40</td>
<td>185</td>
<td>15.9</td>
<td>184</td>
<td>16.0</td>
<td>184</td>
<td>16.0</td>
</tr>
</tbody>
</table>

SPECspeed®2017_int_base = 10.0
SPECspeed®2017_int_peak = 10.1

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"
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

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/cpu2017/lib/intel64:/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.
Platform Notes

BIOS Configuration:
- Hyper-Threading set to Disabled
- Thermal Configuration set to Maximum Cooling
- Memory Patrol Scrubbing set to Disabled
- LLC Prefetch set to Enabled
- LLC Dead Line Allocation set to Disabled
- Enhanced Processor Performance set to Enabled
- Workload Profile set to General Peak Frequency Compute
- Energy/Performance Bias set to Balanced Power
- Workload Profile set to Custom
- Numa Group Size Optimization set to Flat
- Intel UPI Link Power Management set to Enabled

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbb16e4d4a485a0011
running on linux-9e60 Fri Feb 28 02:06:33 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 5218R CPU @ 2.10GHz
- 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 : 20
  - siblings : 20
  - physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- Address sizes: 46 bits physical, 48 bits virtual
- CPU(s): 40
- On-line CPU(s) list: 0-39
- Thread(s) per core: 1
- Core(s) per socket: 20
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 5218R CPU @ 2.10GHz
## Platform Notes (Continued)

- Stepping: 7
- CPU MHz: 2100.000
- BogoMIPS: 4200.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 28160K
- NUMA node0 CPU(s): 0-19
- NUMA node1 CPU(s): 20-39
- 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 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 abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_pinn ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vni miflexpriority 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 xsavec xcharset xsaveprec xsaveoptavx1 xsaveoptavx2 cqm_llc cqm_occphys_l1a cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pkup ospe avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
    cache size : 28160 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 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
    node 0 size: 193126 MB
    node 0 free: 190704 MB
    node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
    node 1 size: 193501 MB
    node 1 free: 193197 MB
    node distances:
        node 0: 0 1
        0: 10 21
        1: 21 10

From /proc/meminfo
    MemTotal: 395907212 kB
    HugePages_Total: 0
    Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
    os-release:

(Continued on next page)
### Platform Notes (Continued)

**NAME**="SLES"
**VERSION**="15-SP1"
**VERSION_ID**="15.1"
**PRETTY_NAME**="SUSE Linux Enterprise Server 15 SP1"
**ID**="sles"
**ID_LIKE**="suse"
**ANSI_COLOR**="0;32"
**CPE_NAME**="cpe:/o:suse:sles:15:sp1"

```
uname -a:
Linux linux-9e6o 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

```
run-level 3 Feb 28 02:04
```

SPEC is set to: /cpu2017

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 369G 135G 235G 37% /
```

From /sys/devices/virtual/dmi/id

- **BIOS**: HPE U32 11/13/2019
- **Vendor**: HPE
- **Product**: ProLiant DL360 Gen10
- **Product Family**: ProLiant
- **Serial**: MXQ94204PS

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**:

- 24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933

(End of data from sysinfo program)
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<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Apr-2020</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Jun-2019</td>
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**Compiler Version Notes**

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<tr>
<th>C benchmarks:</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>
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<td>620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)</td>
</tr>
<tr>
<td>Fortran benchmarks:</td>
<td>648.exchange2_s(base, peak)</td>
</tr>
</tbody>
</table>

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**Base Compiler Invocation**

- C benchmarks: `icc -m64 -std=c11`
- C++ benchmarks: `icpc -m64`
- Fortran benchmarks: `ifort -m64`

**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

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Tested by: HPE
Test Date: Feb-2020
Hardware Availability: Apr-2020
Software Availability: Jun-2019

Base Portability Flags (Continued)

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:
-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:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

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

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Peak Portability Flags

Same as Base Portability Flags
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Test Sponsor: HPE
Tested by: HPE

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

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -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: -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: -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: -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

657.xz_s: -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 -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:

620.omnetpp_s: -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_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

623.xalancbmk_s: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

631.deepsjeng_s: Same as 623.xalancbmk_s

641.leela_s: Same as 623.xalancbmk_s

Fortran benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4

(Continued on next page)
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SPECspeed®2017_int_peak = 10.1

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Peak Optimization Flags ( Continued)
Fortran benchmarks (continued):
-nostandard-realloc-lhs

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.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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