## SPEC CPU®2017 Integer Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL360 Gen10  
(2.70 GHz, Intel Xeon Gold 6226)

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

### Test Details

- **Test Date:** Jul-2019  
- **Hardware Availability:** Apr-2019  
- **Software Availability:** Feb-2019

### Hardware

- **CPU Name:** Intel Xeon Gold 6226  
  - **Max MHz:** 3700  
  - **Nominal:** 2700  
  - **Enabled:** 24 cores, 2 chips, 2 threads/core  
  - **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:** 19.25 MB I+D on chip per chip  
  - **Other:** None  
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage:** 1 x 400 GB SAS SSD, RAID 0  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64)  
  - **Kernel:** 4.12.14-23-default  
- **Compiler:** C/C++: Version 19.0.2.187 of Intel C/C++  
  - **Compiler Build:** 20190117 for Linux;  
  - **Fortran:** Version 19.0.2.187 of Intel Fortran  
  - **Compiler Build:** 20190117 for Linux  
- **Parallel:** Yes  
- **Firmware:** HPE BIOS Version U32 05/21/2019 released Apr-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** jemalloc memory allocator V5.0.1  
- **Power Management:** --

### Results

<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>48</td>
<td>6.47</td>
<td>Not Run</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>48</td>
<td>8.93</td>
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<tr>
<td>605.mcf_s</td>
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<td>11.7</td>
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<td>620.omnetpp_s</td>
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<td>623.xalancbmk_s</td>
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</tr>
<tr>
<td>625.x264_s</td>
<td>48</td>
<td>13.5</td>
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<td>631.deepsjeng_s</td>
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<tr>
<td>641.leela_s</td>
<td>48</td>
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<tr>
<td>648.exchange2_s</td>
<td>48</td>
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<tr>
<td>657.xz_s</td>
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</table>

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**SPECspeed®2017_int_base = 9.23**  
**SPECspeed®2017_int_peak = Not Run**
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
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<td>306</td>
<td>20.2</td>
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</tbody>
</table>

SPECspeed®2017_int_base = 9.23
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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

General Notes

Environment variables set by runcpu before the start of the run:
    KMP_AFFINITY = "granularity=fine,compact"
    LD_LIBRARY_PATH = "/home/cpu2017_u2/lib/ia32:/home/cpu2017_u2/lib/intel64:
    /home/cpu2017_u2/je5.0.1-32:/home/cpu2017_u2/je5.0.1-64"
    OMP_STACKSIZE = "192M"

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.
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Platform Notes

BIOS Configuration:
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
Minimum Processor Idle Power Core C-State set to C1E State
Energy/Performance Bias set to Balanced Power
Workload Profile set to Custom
Numa Group Size Optimization set to Flat
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-pe3i Wed Jul 31 17:00:52 2019

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 6226 CPU @ 2.70GHz
  2 "physical id"s (chips)
  48 "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 : 12
siblings : 24
physical 0: cores 1 2 3 4 5 6 8 9 10 11 12 13
physical 1: cores 0 2 3 4 5 6 8 9 10 11 13 14

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2700.000
BogoMIPS: 5400.00

(Continued on next page)
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Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 19712K
NUMA node0 CPU(s): 0-11,24-35
NUMA node1 CPU(s): 12-23,36-47
Flags: fpu vme de pse tsc msr pae mce 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
aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdkg 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_pmin限り tpr_shadow vmx 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 xsavec xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
ibpb ibrs stibp dtherm ida arat pin pts pku ospke avx512_vnni arch_capabilities ssbd

From proc/cpuinfo cache data
  cache size : 19712 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 24 25 26 27 28 29 30 31 32 33 34 35
    node 0 size: 193118 MB
    node 0 free: 192408 MB
    node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 36 37 38 39 40 41 42 43 44 45 46 47
    node 1 size: 193501 MB
    node 1 free: 193325 MB
    node distances:
      node 0 1
      0: 10 21
      1: 21 10

From /proc/meminfo
  MemTotal: 395898488 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15"
    VERSION_ID="15"
    PRETTY_NAME="SUSE Linux Enterprise Server 15"

(Continued on next page)
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</table>

**Platform Notes (Continued)**

```
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"
```

```bash
uname -a:
  Linux linux-pe3i 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
x86_64 x86_64 x86_64 GNU/Linux
```

**Kernel self-reported vulnerability status:**

- CVE-2017-5754 (Meltdown): Not affected
- CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

**run-level 3 Jul 31 16:58**

**SPEC is set to:** /home/cpu2017_u2

<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/sda3</td>
<td>xfs</td>
<td>476G</td>
<td>75G</td>
<td>402G</td>
<td>16%</td>
<td>/home</td>
</tr>
</tbody>
</table>

**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.

- BIOS HPE U32 05/21/2019
- Memory: 24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)

### Compiler Version Notes

```
C
  600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base)
  625.x264_s(base) 657.xz_s(base)
```

```
C++
  620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
  641.leela_s(base)
```

(Continued on next page)
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### Compiler Version Notes (Continued)

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Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.2.187 Build 20190117  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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**Fortran**  
648.exchange2_s(base)

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.2.187 Build 20190117  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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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`
- `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`
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Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/home/cpu2017_u2/je5.0.1-64/ -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_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc

Fortran benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-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
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-03.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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