## SPEC CPU®2017 Integer Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL560 Gen10  
(3.60 GHz, Intel Xeon Gold 6244)

### SPECspeed®2017_int_base = 10.8

**SPECspeed®2017_int_peak = Not Run**

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

### Hardware

- **CPU Name:** Intel Xeon Gold 6244  
- **Max MHz:** 4400  
- **Nominal:** 3600  
- **Enabled:** 32 cores, 4 chips  
- **Orderable:** 1, 2, 4 chip(s)  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 1 MB I+D on chip per core  
- **L3:** 24.75 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-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 U34 02/02/2019 released Apr-2019  
- **File System:** btrfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** jemalloc memory allocator V5.0.1  
- **Power Management:** --

### 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>32</td>
<td>7.58</td>
<td>9.67</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>32</td>
<td>13.3</td>
<td></td>
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<tr>
<td>605.mcf_s</td>
<td>32</td>
<td>8.37</td>
<td></td>
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<tr>
<td>620.omnetpp_s</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>32</td>
<td>13.7</td>
<td></td>
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<tr>
<td>625.x264_s</td>
<td>32</td>
<td>15.3</td>
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</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>32</td>
<td>5.95</td>
<td></td>
</tr>
<tr>
<td>641.leela_s</td>
<td>32</td>
<td>5.36</td>
<td></td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>32</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>657.xz_s</td>
<td>32</td>
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</tbody>
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SPECspeed®2017_int_base = 10.8
SPECspeed®2017_int_peak = Not Run

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

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>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>32</td>
<td>233</td>
<td>7.60</td>
<td>234</td>
<td>7.58</td>
<td>234</td>
<td>7.58</td>
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<tr>
<td>gcc_s</td>
<td>32</td>
<td>423</td>
<td>9.41</td>
<td>407</td>
<td>9.77</td>
<td>412</td>
<td>9.67</td>
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<tr>
<td>mcf_s</td>
<td>32</td>
<td>354</td>
<td>13.3</td>
<td>351</td>
<td>13.4</td>
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<td>omnetpp_s</td>
<td>32</td>
<td>190</td>
<td>8.59</td>
<td>195</td>
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<td>196</td>
<td>8.31</td>
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<tr>
<td>xalancbmk_s</td>
<td>32</td>
<td>105</td>
<td>13.5</td>
<td>104</td>
<td>13.7</td>
<td>104</td>
<td>13.7</td>
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<tr>
<td>x264_s</td>
<td>32</td>
<td>115</td>
<td>15.3</td>
<td>115</td>
<td>15.3</td>
<td>115</td>
<td>15.3</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>32</td>
<td>241</td>
<td>5.95</td>
<td>241</td>
<td>5.95</td>
<td>241</td>
<td>5.96</td>
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<tr>
<td>leela_s</td>
<td>32</td>
<td>318</td>
<td>5.36</td>
<td>318</td>
<td>5.36</td>
<td>318</td>
<td>5.36</td>
</tr>
<tr>
<td>exchange2_s</td>
<td>32</td>
<td>186</td>
<td>15.8</td>
<td>186</td>
<td>15.8</td>
<td>185</td>
<td>15.9</td>
</tr>
<tr>
<td>xz_s</td>
<td>32</td>
<td>253</td>
<td>24.4</td>
<td>254</td>
<td>24.3</td>
<td>251</td>
<td>24.7</td>
</tr>
</tbody>
</table>

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

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.
jemalloc, a general purpose malloc implementation built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Submitted by: "Bucek, James" <james.bucek@hpe.com>
Submitted: Tue Sep 17 00:02:18 EDT 2019

(Continued on next page)
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Test Sponsor: HPE  
Tested by: HPE  

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

General Notes (Continued)
Submission: cpu2017-20190902-17353.sub

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  
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  
Advanced Memory Protection set to Advanced ECC  

Sysinfo program /home/cpu2017_u2/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
running on linux-vqdi Fri Apr 12 03:51:41 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 6244 CPU @ 3.60GHz  
4 "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 : 8  
siblings : 8  
physical 0: cores 4 9 16 18 19 24 25 27  
physical 1: cores 2 4 9 16 17 19 20 27  
physical 2: cores 2 3 4 17 20 24 25 27  
physical 3: cores 2 4 17 18 19 24 25 27

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: 8

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

Platform Notes (Continued)

Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
Stepping: 7
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-7
NUMA node1 CPU(s): 8-15
NUMA node2 CPU(s): 16-23
NUMA node3 CPU(s): 24-31
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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmerge tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdbg fxsr sse2 ssse3 sse4_1 sse4_2 x2apic movbe popcnt
vmx flexpriority ept pae pge mca cmov pse tsc,tsc_known_freq pni pclmulqdq dtes64
monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pclid dca sse4_1 sse4_2
x2apic movbe popcnt

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.

Available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7
node 0 size: 193090 MB
node 0 free: 192740 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 193534 MB
node 1 free: 193380 MB
node 2 cpus: 16 17 18 19 20 21 22 23
node 2 size: 193534 MB
node 2 free: 193259 MB
node 3 cpus: 24 25 26 27 28 29 30 31
node 3 size: 193533 MB
node 3 free: 193292 MB

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Platform Notes (Continued)

node 3 free: 193361 MB
node distances:
node 0 1 2 3
0: 10 21 21 21
1: 21 10 21 21
2: 21 21 10 21
3: 21 21 21 10

From /proc/meminfo
MemTotal: 792261584 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
NAME="SLES"
VERSION="15"
VERSION_ID="15"
PRETTY_NAME="SUSE Linux Enterprise Server 15"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
Linux linux-vqdi 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 Apr 12 03:50

SPEC is set to: /home/cpu2017_u2

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 371G 315G 56G 86% /home

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 U34 02/02/2019
Memory:

(Continued on next page)
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</tbody>
</table>

### Platform Notes (Continued)

24x UNKNOWN NOT AVAILABLE  
24x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)

### Compiler Version Notes

<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(base)</th>
</tr>
</thead>
</table>

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.2.187 Build 20190117  
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<table>
<thead>
<tr>
<th>C++</th>
<th>620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base) 641.leela_s(base)</th>
</tr>
</thead>
</table>

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.

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

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.2.187 Build 20190117  
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### Base Compiler Invocation

C benchmarks:  
`icc -m64 -std=c11`

C++ benchmarks:  
`icpc -m64`

Fortran benchmarks:  
`ifort -m64`
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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:
-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-ic19.0u1-flags-linux64.html
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-ic19.0u1-flags-linux64.xml
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.

Tested with SPEC CPU®2017 v1.0.5 on 2019-04-11 18:21:41-0400.
Report generated on 2019-09-17 16:09:57 by CPU2017 PDF formatter v6255.
Originally published on 2019-09-17.