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

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

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

| SPECspeed2017_int_base = 9.57 |
| SPECspeed2017_int_peak = Not Run |

Threads

<table>
<thead>
<tr>
<th>benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_int_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>32</td>
<td>6.82</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>32</td>
<td>9.31</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>32</td>
<td>12.4</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>32</td>
<td>7.45</td>
</tr>
<tr>
<td>623.xalanchmk_s</td>
<td>32</td>
<td>12.2</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>32</td>
<td>11.6</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>32</td>
<td>5.45</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>32</td>
<td>4.75</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>32</td>
<td>14.0</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>32</td>
<td>21.3</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 5218N
- **Max MHz.:** 3700
- **Nominal:** 2300
- **Enabled:** 32 cores, 2 chips
- **Orderable:** 1, 2 chip(s)
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **Cache L2:** 1 MB I+D on chip per core
- **Cache L3:** 22 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2666)
- **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 02/02/2019 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
**SPEC CPU2017 Integer Speed Result**

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**SPECspeed2017_int_base = 9.57**
**SPECspeed2017_int_peak = Not Run**

<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>600.perlbench_s</td>
<td>32</td>
<td>262</td>
<td>6.77</td>
<td><strong>260</strong></td>
<td><strong>6.82</strong></td>
<td>260</td>
<td>6.83</td>
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<td>32</td>
<td>428</td>
<td>9.29</td>
<td>421</td>
<td>9.46</td>
<td><strong>428</strong></td>
<td><strong>9.31</strong></td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>32</td>
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<td><strong>12.4</strong></td>
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<td>12.3</td>
<td>378</td>
<td>12.5</td>
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<tr>
<td>620.omnetpp_s</td>
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<td><strong>7.45</strong></td>
<td>217</td>
<td>7.52</td>
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<tr>
<td>623.xalancbmk_s</td>
<td>32</td>
<td>116</td>
<td>12.2</td>
<td><strong>116</strong></td>
<td><strong>12.2</strong></td>
<td>115</td>
<td>12.3</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>32</td>
<td>152</td>
<td>11.6</td>
<td><strong>152</strong></td>
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<td>32</td>
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<td>5.45</td>
<td>263</td>
<td>5.44</td>
<td><strong>263</strong></td>
<td><strong>5.45</strong></td>
</tr>
<tr>
<td>641.leela_s</td>
<td>32</td>
<td>360</td>
<td>4.74</td>
<td>359</td>
<td>4.75</td>
<td><strong>360</strong></td>
<td><strong>4.75</strong></td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>32</td>
<td>211</td>
<td>14.0</td>
<td><strong>210</strong></td>
<td><strong>14.0</strong></td>
<td>209</td>
<td>14.0</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>32</td>
<td>290</td>
<td>21.3</td>
<td>289</td>
<td>21.4</td>
<td><strong>290</strong></td>
<td><strong>21.3</strong></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
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CPU2017 License: 3
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Test Date: Apr-2019
Hardware Availability: Apr-2019
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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
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-nub3 Fri Apr 26 03:06:11 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 5218N CPU @ 2.30GHz
    2 "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 : 16
    siblings : 16
    physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
    physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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: 16
    Socket(s): 2
    NUMA node(s): 2
    Vendor ID: GenuineIntel
    CPU family: 6
    Model: 85
    Model name: Intel(R) Xeon(R) Gold 5218N CPU @ 2.30GHz
    Stepping: 6
    CPU MHz: 2300.000

(Continued on next page)
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Platform Notes (Continued)

BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
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
aperfmrperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdmb 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_13 cdp_13 invpcid_single intel_ppin mba tpr_shadow vnmi flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  invpcid rtm cqm mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsave 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

/proc/cpuinfo cache data
  cache size : 22528 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
  node 0 size: 193119 MB
  node 0 free: 192630 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  node 1 size: 193503 MB
  node 1 free: 193292 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 395902060 kB
  HugePages_Total: 0
  Hugepagesize: 4096 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15"
    VERSION_ID="15"

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## SPEC CPU2017 Integer Speed Result

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### Platform Notes (Continued)

- **PRETTY_NAME**="SUSE Linux Enterprise Server 15"
- **ID**="sles"
- **ID_LIKE**="suse"
- **ANSI_COLOR**="0;32"
- **CPE_NAME**="cpe:/o:suse:sles:15"

```bash
uname -a:
    Linux linux-nub3 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 26 03:04**

**SPEC is set to:** /home/cpu2017_u2
- **Filesystem**     **Type**  **Size**  **Used**  **Avail**  **Use%**  **Mounted on**
- /dev/sda1           xfs    373G   99G   274G   27% /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 U32 02/02/2019  
- Memory: 24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933, configured at 2666

**Compiler Version Notes**

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

```
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.
```

```
CXXC 620.omnetpp_s(base) 623.xalancbk_s(base) 631.deepsjeng_s(base)
```

(Continued on next page)
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SPECspeed2017_int_base = 9.57
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Compiler Version Notes (Continued)

641.leela_s(base)
-----------------------------------------------------------------------------------------------
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.
-----------------------------------------------------------------------------------------------

-----------------------------------------------
FC 648.exchange2_s(base)
-----------------------------------------------
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.
-----------------------------------------------

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.xalancmk_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-Platform-Flags-Intel-V1.2-SKX-revJ.html](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.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-SKX-revJ.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.xml)