Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant ML30 Gen10  
(3.80 GHz, Intel Xeon E-2276G)  

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

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<tr>
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**Threads**

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<tr>
<td>Threads</td>
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</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon E-2276G  
- **Max MHz:** 4900  
- **Nominal:** 3800  
- **Enabled:** 6 cores, 1 chip  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 256 KB I+D on chip per core  
- **L3:** 12 MB I+D on chip per chip  
- **Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-2666V-U)  
- **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 19.0.4.227 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 U44 09/05/2019 released Nov-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

<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>
<td>600.perlbench_s</td>
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<td>11.7</td>
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<td>620.omnetpp_s</td>
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<td>625.x264_s</td>
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<td>16.7</td>
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<td>631.deepsjeng_s</td>
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<td>5.32</td>
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<td>5.32</td>
<td>322</td>
<td>5.30</td>
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<tr>
<td>641.leela_s</td>
<td>6</td>
<td>152</td>
<td>19.4</td>
<td>152</td>
<td>19.3</td>
<td>152</td>
<td>19.4</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>6</td>
<td>542</td>
<td>11.4</td>
<td>542</td>
<td>11.4</td>
<td>542</td>
<td>11.4</td>
</tr>
</tbody>
</table>

### 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,scatter"
  LD_LIBRARY_PATH = "/home/cpu2017_u4/lib/ia32:/home/cpu2017_u4/lib/intel64:
  /home/cpu2017_u4/je5.0.1-32:/home/cpu2017_u4/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

- Yes: 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:
Hyper-Threading set to Disabled
Thermal Configuration set to Maximum Cooling
LLC Prefetch set to Enabled
Workload Profile set to General Peak Frequency Compute
Sysinfo program /home/cpu2017_u4/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on ml30-sles15 Tue Sep 24 13:00:10 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) E-2276G CPU @ 3.80GHz
  1 "physical id"s (chips)
  6 "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 : 6
  siblings : 6
  physical 0: cores 0 1 2 3 4 5

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 6
On-line CPU(s) list: 0-5
Thread(s) per core: 1
Core(s) per socket: 6
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2276G CPU @ 3.80GHz
Stepping: 10
CPU MHz: 3800.000
BogoMIPS: 7584.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 12288K
NUMA node0 CPU(s): 0-5
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

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Test Date: Sep-2019
Hardware Availability: Nov-2019
Software Availability: May-2019

Platform Notes (Continued)

pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb invpcid_single
pti tpr_shadow vmmi flexpriority ept vpid fsqnbbase tsc_adjust bmi1 hle avx2 smep
bm2 erms invpcid rtm mpz rdsedd adx smap clflushopt intel_pt xsaveopt xsavec
xgetbv1 xsaves ibpb ibrs stibp dtherm ida arat pln pts ssbd

/platform/cpusinfo cache data
  cache size : 12288 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5
  node 0 size: 64265 MB
  node 0 free: 63781 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 65808100 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"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
  Linux ml30-sles15 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): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
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Platform Notes (Continued)

IBPB, IBRS_FW
run-level 3 Sep 24 12:58
SPEC is set to: /home/cpu2017_u4
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 344G 50G 294G 15% /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 U44 09/05/2019
Memory:
4x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666, configured at 2667

(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)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
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C++
620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
641.leela_s(base)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran
648.exchange2_s(base)

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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 |

**Base Optimization Flags**

C benchmarks:  
`-Wl,-z,muldefs -xCORE-AVX2 -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-AVX2 -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-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4`  
`-nostandard-realloc-lhs`
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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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