**SPEC® CPU2017 Floating Point Speed Result**

**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL360 Gen10

(3.80 GHz, Intel Xeon Gold 5222)

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**SPECspeed2017_fp_base = 61.5**

**SPECspeed2017_fp_peak = Not Run**

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**Hardware**

- **CPU Name:** Intel Xeon Gold 5222
- **Max MHz.:** 3900
- **Nominal:** 3800
- **Enabled:** 8 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:** 16.5 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:** 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:** None
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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>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
<td>206</td>
<td>287</td>
<td>205</td>
<td>287</td>
<td>205</td>
<td>287</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>293</td>
<td>56.8</td>
<td>293</td>
<td>57.0</td>
<td>293</td>
<td>57.0</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>16</td>
<td>159</td>
<td>33.0</td>
<td>158</td>
<td>33.2</td>
<td>159</td>
<td>33.0</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>16</td>
<td>194</td>
<td>68.3</td>
<td>195</td>
<td>67.8</td>
<td>196</td>
<td>67.4</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>16</td>
<td>225</td>
<td>39.4</td>
<td>226</td>
<td>39.3</td>
<td>228</td>
<td>38.9</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>248</td>
<td>47.9</td>
<td>248</td>
<td>47.8</td>
<td>249</td>
<td>47.8</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>388</td>
<td>37.2</td>
<td>388</td>
<td>37.2</td>
<td>388</td>
<td>37.2</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
<td>219</td>
<td>80.0</td>
<td>219</td>
<td>79.7</td>
<td>219</td>
<td>79.9</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>147</td>
<td>62.2</td>
<td>147</td>
<td>62.2</td>
<td>146</td>
<td>62.3</td>
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<td>654.roms_s</td>
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<td>260</td>
<td>60.5</td>
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</tbody>
</table>

SPECspeed2017_fp_base = 61.5
SPECspeed2017_fp_peak = Not Run

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=core,compact"
LD_LIBRARY_PATH = "/home/cpu2017_u2/lib/ia32:/home/cpu2017_u2/lib/intel64"
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.

Platform Notes

BIOS Configuration:
    Thermal Configuration set to Maximum Cooling
    Memory Patrol Scrubbing set to Disabled

(Continued on next page)
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Platform Notes (Continued)

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 /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd8f2999c33d61f64985e45859ea9
running on linux-pe3i Fri May 24 19:52:21 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 5222 CPU @ 3.80GHz
   2 "physical id"s (chips)
   16 "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 : 4
   siblings : 8
   physical 0: cores 2 5 9 13
   physical 1: cores 1 2 5 13

From lscpu:
   Architecture:          x86_64
   CPU op-mode(s):        32-bit, 64-bit
   Byte Order:            Little Endian
   CPU(s):                16
   On-line CPU(s) list:   0-15
   Thread(s) per core:    2
   Core(s) per socket:    4
   Socket(s):             2
   NUMA node(s):          2
   Vendor ID:             GenuineIntel
   CPU family:            6
   Model:                 85
   Model name:            Intel(R) Xeon(R) Gold 5222 CPU @ 3.80GHz
   Stepping:              7
   CPU MHz:               3800.000
   BogoMIPS:              7600.00
   Virtualization:        VT-x
   L1d cache:             32K
   L1i cache:             32K

(Continued on next page)
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L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0-3,8-11
NUMA node1 CPU(s): 4-7,12-15
Flags: fpu vme de pse tsc msr pae mca 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
       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_puin mba tpr_shadow vmx flexpriority ept
       vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rdt_a
       avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
       xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
       ibpb ibrs stibp dtherm ida arat pln pts pku ospke avx512_vnni arch_capabilities ssbd

/proc/cpuinfo cache data
  cache size : 16896 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 8 9 10 11
  node 0 size: 193121 MB
  node 0 free: 192682 MB
  node 1 cpus: 4 5 6 7 12 13 14 15
  node 1 size: 193504 MB
  node 1 free: 193210 MB
  node distances:
    node  0  1
    0:  10  21
    1:  21  10

From /proc/meminfo
  MemTotal: 395905028 kB
  HugePages_Total: 0
  Hugepagesize: 4096 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"

(Continued on next page)
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SPECspeed2017_fp_base = 61.5
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: May-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)

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 May 24 19:49

SPEC is set to: /home/cpu2017_u2
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/sda3 xfs 476G 29G 448G 6% /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 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
  CC  619.lbm_s(base) 638.imagick_s(base) 644.nab_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  607.cactuBSSN_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.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Test Sponsor: HPE  
Tested by: HPE

**Compiler Version Notes (Continued)**

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**Base Compiler Invocation**

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

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

**Base Portability Flags**

```
603.bwaves_s: -DSPEC_LP64
```

(Continued on next page)
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### Base Portability Flags (Continued)

- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- assume byterecl
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

**Fortran benchmarks:**
- -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -nostandard-realloc-lhs

**Benchmarks using both Fortran and C:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -nostandard-realloc-lhs

**Benchmarks using Fortran, C, and C++:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -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-revA.html](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revA.html)
- [http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.html](http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.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-revA.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revA.xml)
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