SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL560 Gen10
(2.80 GHz, Intel Xeon Gold 6242)

SPECSpeed®2017_fp_base = 176
SPECSpeed®2017_fp_peak = Not Run

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (176)</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s 64</td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s 64</td>
<td></td>
</tr>
<tr>
<td>619.lbm_s 64</td>
<td></td>
</tr>
<tr>
<td>621.wrf_s 64</td>
<td></td>
</tr>
<tr>
<td>627.cam4_s 64</td>
<td></td>
</tr>
<tr>
<td>628.pop2_s 64</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s 64</td>
<td></td>
</tr>
<tr>
<td>644.nab_s 64</td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s 64</td>
<td></td>
</tr>
<tr>
<td>654.roms_s 64</td>
<td></td>
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</table>

Hardware
CPU Name: Intel Xeon Gold 6242
Max MHz: 3900
Nominal: 2800
Enabled: 64 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: 22 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: None
Power Management: --
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Results Table

<table>
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<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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<tr>
<td>603.bwaves_s</td>
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<td>69.4</td>
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<td>607.cactuBSSN_s</td>
<td>64</td>
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<td>190</td>
<td>88.4</td>
<td>189</td>
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<td>621.wrf_s</td>
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<td>627.cam4_s</td>
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<td>139</td>
<td>63.3</td>
<td>140</td>
<td>63.3</td>
<td>140</td>
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<tr>
<td>628.pop2_s</td>
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<td>638.imagick_s</td>
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<td>72.1</td>
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<td>644.nab_s</td>
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<td>47.2</td>
<td>370</td>
<td>47.2</td>
<td>370</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>82.7</td>
<td>110</td>
<td>81.4</td>
<td>112</td>
<td>83.2</td>
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<tr>
<td>654.roms_s</td>
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<td>231</td>
<td>67.8</td>
<td>232</td>
<td>66.7</td>
<td>236</td>
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</tbody>
</table>

**SPECspeed®2017_fp_base = 176**
**SPECspeed®2017_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.

Submitted by: "Bucek, James" <james.bucek@hpe.com>
Submitted: Tue Sep 17 00:02:18 EDT 2019
Submission: cpu2017-20190902-17379.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
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 Tue Apr 30 19:28:26 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 6242 CPU @ 2.80GHz
  4 "physical id"s (chips)
  64 "processors"
core, 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
  physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 3: 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): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6242 CPU @ 2.80GHz

(Continued on next page)
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**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

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

**Platform Notes (Continued)**

- Stepping: 7
- CPU MHz: 2800.000
- BogoMIPS: 5600.00
- 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
- NUMA node2 CPU(s): 32-47
- NUMA node3 CPU(s): 48-63
- Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
  pat pse36 clflush dtes acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nop1 xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpre 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_pml mba tpr_shadow vmni fflexpriority ept
  vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid rtm cmq mpq rdt_a
  avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
  xsaveopt xsavec xgetbv1 xsaves cmq_llc cmq_occup_llc cmq_mbb_total cmq_mbb_local
  ibpb ibrs stibp dtherm ida arat pln pts pku ospe 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: 4 nodes (0-3)
  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: 193532 MB
  node 1 free: 193373 MB
  node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
  node 2 size: 193532 MB
  node 2 free: 193374 MB
  node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
  node 3 size: 193502 MB
  node 3 free: 193249 MB
  node distances:
    node 0 1 2 3
      0: 10 21 21 21
      1: 21 10 21 21
      2: 21 21 10 21

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<td>Software Availability: Feb-2019</td>
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</tbody>
</table>

Platform Notes (Continued)

3: 21 21 21 10

From /proc/meminfo
MemTotal: 792256064 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 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 30 19:27

SPEC is set to: /home/cpu2017_u2

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 371G 342G 29G 93% /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:
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>Language</th>
<th>Benchmarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>C++, C, Fortran</td>
<td>607.cactuBSSN_s(base)</td>
</tr>
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<td>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, Version 19.0.2.187 Build 20190117 Copyright (C) 1985-2019 Intel Corporation. All rights reserved. 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.</td>
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<td>Fortran</td>
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### Base Compiler Invocation

```
cc -m64 -std=c11
```
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Base Compiler Invocation (Continued)

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
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

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### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- `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-ic19.0u1-flags-linux64.html)
- [http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.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-ic19.0u1-flags-linux64.xml)
- [http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.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.

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