# SPEC® CPU2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL580 Gen10  
(2.10 GHz, Intel Xeon Gold 6238)

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU Name:</strong> Intel Xeon Gold 6238</td>
<td><strong>OS:</strong> SUSE Linux Enterprise Server 15 (x86_64)</td>
</tr>
<tr>
<td><strong>Max MHz.:</strong> 3700</td>
<td><strong>Kernel:</strong> 4.12.14-23-default</td>
</tr>
<tr>
<td><strong>Nominal:</strong> 2100</td>
<td><strong>Compiler:</strong> C/C++: Version 19.0.2.187 of Intel C/C++</td>
</tr>
<tr>
<td><strong>Enabled:</strong> 88 cores, 4 chips</td>
<td><strong>Compiler Build:</strong> 20190117 for Linux; Fortran: Version 19.0.2.187 of Intel Fortran</td>
</tr>
<tr>
<td><strong>Orderable:</strong> 1, 2, 3, 4 chip(s)</td>
<td><strong>Firmware:</strong> HPE BIOS Version U34 05/21/2019 released Apr-2019</td>
</tr>
<tr>
<td><strong>Cache L1:</strong> 32 KB I + 32 KB D on chip per core</td>
<td><strong>File System:</strong> xfs</td>
</tr>
<tr>
<td><strong>L2:</strong> 1 MB I+D on chip per core</td>
<td><strong>System State:</strong> Run level 3 (multi-user)</td>
</tr>
<tr>
<td><strong>L3:</strong> 30.25 MB I+D on chip per chip</td>
<td><strong>Base Pointers:</strong> 64-bit</td>
</tr>
<tr>
<td><strong>Other:</strong> None</td>
<td><strong>Peak Pointers:</strong> Not Applicable</td>
</tr>
<tr>
<td><strong>Memory:</strong> 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R)</td>
<td><strong>Other:</strong> None</td>
</tr>
<tr>
<td><strong>Storage:</strong> 1 x 400 GB SAS SSD, RAID 0</td>
<td></td>
</tr>
</tbody>
</table>

**Test Sponsor:** HPE  
**Hardware Availability:** Apr-2019  
**Test Date:** Jun-2019  
**Software Availability:** Feb-2019

**CPU2017 License:** 3
**Tested by:** HPE  
**Software:**

<table>
<thead>
<tr>
<th>Test Date</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2019</td>
<td>186</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

## SPECspeed2017_fp_base = 186
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>88</td>
<td>70.7</td>
<td>834</td>
<td>71.0</td>
<td>831</td>
<td>71.3</td>
<td>827</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>88</td>
<td>83.3</td>
<td>200</td>
<td>82.9</td>
<td>201</td>
<td>82.7</td>
<td>202</td>
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<tr>
<td>619.lbm_s</td>
<td>88</td>
<td>38.9</td>
<td>135</td>
<td>39.8</td>
<td>132</td>
<td>39.8</td>
<td>132</td>
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</tr>
<tr>
<td>621.wrf_s</td>
<td>88</td>
<td>98.3</td>
<td>135</td>
<td>97.6</td>
<td>136</td>
<td>97.1</td>
<td>136</td>
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</tr>
<tr>
<td>627.cam4_s</td>
<td>88</td>
<td>59.9</td>
<td>148</td>
<td>59.8</td>
<td>148</td>
<td>59.8</td>
<td>148</td>
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<tr>
<td>628.pop2_s</td>
<td>88</td>
<td>227</td>
<td>52.4</td>
<td>226</td>
<td>52.5</td>
<td>225</td>
<td>52.7</td>
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<tr>
<td>638.imagick_s</td>
<td>88</td>
<td>66.6</td>
<td>216</td>
<td>66.7</td>
<td>216</td>
<td>66.6</td>
<td>217</td>
<td></td>
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<tr>
<td>644.nab_s</td>
<td>88</td>
<td>46.3</td>
<td>378</td>
<td>46.4</td>
<td>377</td>
<td>46.3</td>
<td>378</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>88</td>
<td>86.5</td>
<td>105</td>
<td>89.7</td>
<td>102</td>
<td>86.1</td>
<td>106</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>88</td>
<td>64.6</td>
<td>244</td>
<td>67.0</td>
<td>235</td>
<td>63.5</td>
<td>248</td>
<td></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=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:
- Hyper-Threading set to Disabled
- Thermal Configuration set to Maximum Cooling

(Continued on next page)
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SPECspeed2017_fp_base = 186
SPECspeed2017_fp_peak = Not Run

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

Test Date: Jun-2019
Hardware Availability: Apr-2019
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Platform Notes (Continued)

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
Intel UPI Link Power Management set to Enabled
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on linux-sypg Thu Aug 16 21:14:07 2018

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 6238 CPU @ 2.10GHz
  4 "physical id"s (chips)
  88 "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 : 22
siblings : 22
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 88
On-line CPU(s) list: 0-87
Thread(s) per core: 1
Core(s) per socket: 22
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
Stepping: 7
CPU MHz: 2100.000
BogoMIPS: 4200.00

(Continued on next page)
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Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 30976K
NUMA node0 CPU(s): 0-21
NUMA node1 CPU(s): 22-43
NUMA node2 CPU(s): 44-65
NUMA node3 CPU(s): 66-87

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_13 cdp_l3 invpcid_single intel_pmm mba tpr_shadow vnmi flexpriority ept
  vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  invpcid rtm cqm
  mpx rdseed 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 dtherm ida arat pin pts ksu ospke avx512_vnni arch_capabilities ssbd

/proc/cpuinfo cache data
  cache size : 30976 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 16 17 18 19 20 21
  node 0 size: 193116 MB
  node 0 free: 192723 MB
  node 1 cpus: 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
  node 1 size: 193502 MB
  node 1 free: 192965 MB
  node 2 cpus: 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
  node 2 size: 193531 MB
  node 2 free: 193352 MB
  node 3 cpus: 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87
  node 3 size: 193530 MB
  node 3 free: 193356 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

(Continued on next page)
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<table>
<thead>
<tr>
<th>SPECspeed2017_fp_peak =</th>
<th>Not Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_base   =</td>
<td>186</td>
</tr>
</tbody>
</table>

CPU2017 License: 3
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Platform Notes (Continued)

MemTotal: 792249988 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-sypg 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 Aug 16 21:12

SPEC is set to: /home/cpu2017_u2
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda1 xfs 894G 80G 815G 9% /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 05/21/2019
  Memory:
    24x UNKNOWN NOT AVAILABLE
    24x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2666

(End of data from sysinfo program)
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SPEC cpu2017 fp_peak = Not Run

CPU2017 License: 3
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Test Date: Jun-2019
Hardware Availability: Apr-2019
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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,
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.
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FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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-----------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

(Continued on next page)
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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

(Continued on next page)
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**CPU2017 License:** 3  
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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.

Tested with SPEC CPU2017 v1.0.5 on 2018-08-16 21:14:07-0400.  