## SPEC CPU®2017 Floating Point Speed Result

### Hewlett Packard Enterprise

(Test Sponsor: HPE)

**ProLiant DL580 Gen10**

(1.80 GHz, Intel Xeon Gold 6222V)

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

---

### SPECspeed®2017_fp_base = 163

**SPECspeed®2017_fp_peak = Not Run**

---

### Hardware

- **CPU Name:** Intel Xeon Gold 6222V  
- **Max MHz:** 3600  
- **Nominal:** 1800  
- **Enabled:** 80 cores, 4 chips  
- **Orderable:** 1, 2, 3, 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:** 27.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 768 GB (24 x 32 GB 2Rx8 PC4-2666V-R, running at 2400)  
- **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 05/21/2019 released Apr-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** --

---

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>80</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>80</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>80</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>80</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>80</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>80</td>
</tr>
<tr>
<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
<td>80</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>80</td>
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<tr>
<td>654.roms_s</td>
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</tbody>
</table>

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**Test Date:** Jun-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
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<th>Ratio</th>
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</tr>
</tbody>
</table>

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### 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)
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL580 Gen10
(1.80 GHz, Intel Xeon Gold 6222V)

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

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = Not Run

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

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-sypg Fri Sep 14 01:59:06 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 6222V CPU @ 1.80GHz
   4 "physical id"s (chips)
   80 "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 : 20
   siblings : 20
   physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
   physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
   physical 2: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
   physical 3: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:
   Architecture: x86_64
   CPU op-mode(s): 32-bit, 64-bit
   Byte Order: Little Endian
   CPU(s): 80
   On-line CPU(s) list: 0-79
   Thread(s) per core: 1
   Core(s) per socket: 20
   Socket(s): 4
   NUMA node(s): 4
   Vendor ID: GenuineIntel
   CPU family: 6
   Model: 85
   Model name: Intel(R) Xeon(R) Gold 6222V CPU @ 1.80GHz
   Stepping: 7
   CPU MHz: 1800.000
   BogoMIPS: 3600.00

(Continued on next page)
Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 28160K
NUMA node0 CPU(s): 0-19
NUMA node1 CPU(s): 20-39
NUMA node2 CPU(s): 40-59
NUMA node3 CPU(s): 60-79
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_ppin mba tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bts hle avx2 smep bmi2  invvpidd rtm cqm mpx rd_t a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavec qmmf lmu cqmx_occq_lcm qcm_builtin qlc qcm_mbb_total qcm_mbb_local ibpb ibrs dtherm ida arat pin pts ksu ospke avx512_vnni arch_capabilities ssbd

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
node 0 size: 193117 MB
node 0 free: 192891 MB
node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
node 1 size: 193503 MB
node 1 free: 192842 MB
node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
node 2 size: 193532 MB
node 2 free: 193371 MB
node 3 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
node 3 size: 193530 MB
node 3 free: 193318 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
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SPECSpeed®2017_fp_base = 163
SPECSpeed®2017_fp_peak = Not Run

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<th>CPU2017 License: 3</th>
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<tr>
<td>Test Sponsor: HPE</td>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Feb-2019</td>
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</tbody>
</table>

Platform Notes (Continued)

MemTotal: 792251492 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 Sep 14 01:57

SPEC is set to: /home/cpu2017_u2
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda1 xfs 894G 87G 808G 10% /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, configured at 2400

(End of data from sysinfo program)
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL580 Gen10  
(1.80 GHz, Intel Xeon Gold 6222V)  

<table>
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Test Sponsor: HPE  
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Compiler Version Notes

<table>
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<tr>
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<th>C</th>
<th>C++, C, Fortran</th>
<th>Fortran</th>
<th>Fortran, C</th>
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<tbody>
<tr>
<td>Base Compiler Invocation</td>
<td>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</td>
<td>607.cactuBSSN_s(base)</td>
<td>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</td>
<td>621.wrf_s(base) 627.cam4_s(base) 628.pop2_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>
<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>
<td>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>
<td>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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</tbody>
</table>

Base Compiler Invocation

C benchmarks:  
icc -m64 -std=c11
SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

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

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**Base Compiler Invocation (Continued)**

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

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

Benchmarks using Fortran, C, and C++:
```bash
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:
```bash
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:
```bash
-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:
```bash
-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++:
```bash
-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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SPECspeed®2017_fp_peak = Not Run

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

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-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-Platform-Flags-Intel-V1.2-CLX-revB.xml