Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10
(3.40 GHz, Intel Xeon E-2226G)

<table>
<thead>
<tr>
<th>SPECspeed\textsuperscript{\textregistered}2017_fp_base</th>
<th>31.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed\textsuperscript{\textregistered}2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

---

### Hardware

- **CPU Name**: Intel Xeon E-2226G
- **Max MHz**: 4700
- **Nominal**: 3400
- **Enabled**: 6 cores, 1 chip
- **Orderable**: 1 chip(s)
- **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 SATA SSD, RAID 0
- **Other**: None
- **Power Management**: --

### Software

- **OS**: SUSE Linux Enterprise Server 15 (x86_64) SP1 4.12.14-195-default
- **Compiler**: C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux;
  Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
- **Firmware**: HPE BIOS Version U43 09/05/2019 released Sep-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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**SPEC CPU\textsuperscript{\textregistered}2017 Floating Point Speed Result**

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**Test Sponsor**: HPE

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**Data**

<table>
<thead>
<tr>
<th>Thread</th>
<th>SPECspeed\textsuperscript{\textregistered}2017_fp_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>607.cactuBSSN_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>619.lbm_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>621.wrf_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>627.cam4_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>628.pop2_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>638.imagick_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>644.nab_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>649.fotonik3d_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
<tr>
<td>654.roms_s 6</td>
<td>\textsuperscript{\textregistered}</td>
</tr>
</tbody>
</table>

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**Test Sponsor**: HPE

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**Test Date**: Sep-2019

**Hardware Availability**: Nov-2019

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**Tested by**: HPE

---

**Software Availability**: Oct-2019

---

**Tested by**: HPE

---

**Software Availability**: Oct-2019

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**Test Sponsor**: HPE

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**Test Date**: Sep-2019

**Hardware Availability**: Nov-2019

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**Tested by**: HPE

---

**Software Availability**: Oct-2019
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10
(3.40 GHz, Intel Xeon E-2226G)

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

SPECspeed®2017_fp_base = 31.9
SPECspeed®2017_fp_peak = Not Run

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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<tr>
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<td>319</td>
<td>52.2</td>
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<td>619.lbm_s</td>
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<td>36.2</td>
<td>328</td>
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<td>638.imagick_s</td>
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<td>16.5</td>
<td>958</td>
<td>16.4</td>
<td>954</td>
<td>16.5</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 31.9
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=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/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

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.
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10
(3.40 GHz, Intel Xeon E-2226G)

SPECspeed®2017_fp_base = 31.9
SPECspeed®2017_fp_peak = Not Run

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

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

Platform Notes

BIOS Configuration:

Thermal Configuration set to Maximum Cooling
LLC Prefetch set to Enabled
Workload Profile set to General Peak Frequency Compute
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd8f2999c3361f64985e45859ea9
running on linux-vb4y Sat Sep 28 08:41:06 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-2226G CPU @ 3.40GHz
  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
Address sizes: 39 bits physical, 48 bits virtual
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-2226G CPU @ 3.40GHz
Stepping: 10
CPU MHz: 3400.000
BogoMIPS: 6816.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 12288K
NUMA node0 CPU(s): 0-5

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

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SPECspeed®2017_fp_base = 31.9
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CPU2017 License: 3
Test Sponsor: HPE
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Test Date: Sep-2019
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Platform Notes (Continued)

Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
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 3dnowprefetch cpuid_fault epb invpcid_single
pti ssbd ibrs ibpb stibp tpr_shadow vmi flexpriority ept vpid fsgsbase tsc_adjust
bm1 hle avx2 smep bmi2 emms invpcid rtm mpx rdseed adx smap clflushopt intel_pt
xsaveopt xsavec xgetbv1 xsaveaves dtherm ida arat pln pts md_clear flush_l1d

/proc/cpuinfo 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: 64022 MB
 node 0 free: 59902 MB
 node distances:
 node 0
 0: 10

From /proc/meminfo
 MemTotal: 65558680 kB
 HugePages_Total: 0
 Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
 os-release:
  NAME="SLES"
  VERSION="15-SP1"
  VERSION_ID="15.1"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
 Linux linux-vb4y 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
 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

(Continued on next page)
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Platform Notes (Continued)

CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Sep 28 06:20

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 270G 64G 206G 24% /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 U43 09/05/2019
Memory: 4x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------------

(Continued on next page)
Hewlett Packard Enterprise
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Compiler Version Notes (Continued)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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
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

SPECsplead®2017_fp_base = 31.9
SPECsplead®2017_fp_peak = Not Run
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10
(3.40 GHz, Intel Xeon E-2226G)

**SPECspeed®2017_fp_base =** 31.9
**SPECspeed®2017_fp_peak = Not Run**

**Base Optimization Flags**

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX2 -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-AVX2 -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-AVX2 -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-revB.html
http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.2019-04-03.00.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
http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.2019-04-03.00.xml

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