### SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL580 Gen10  
(2.70 GHz, Intel Xeon Platinum 8280)

**SPECspeed®2017_fp_base = 216**  
**SPECspeed®2017_fp_peak = Not Run**

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (216)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>112</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>112</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>112</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>112</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>112</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>112</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>112</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>112</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>112</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>112</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Platinum 8280  
- **Max MHz:** 4000  
- **Nominal:** 2700  
- **Enabled:** 112 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:** 38.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)  
- **Storage:** 1 x 600 GB SATA SSD, RAID 0  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64)  
- **Kernel:** 4.12.14-23-default  
- **Compiler:** C/C++: Version 19.0.0.117 of Intel C/C++ Compiler Build 20180804 for Linux; Fortran: Version 19.0.0.117 of Intel Fortran Compiler Build 20180804 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>
<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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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>112</td>
<td>74.7</td>
<td>790</td>
<td>74.9</td>
<td>788</td>
<td>75.0</td>
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<td>112</td>
<td>21.2</td>
<td>234</td>
<td>71.0</td>
<td>235</td>
<td>71.4</td>
<td>233</td>
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<td>619.lbm_s</td>
<td>112</td>
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<td>185</td>
<td>48.4</td>
<td>183</td>
<td>48.2</td>
<td>184</td>
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<tr>
<td>628.pop2_s</td>
<td>112</td>
<td>224</td>
<td>53.0</td>
<td>221</td>
<td>53.6</td>
<td>222</td>
<td>53.4</td>
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<tr>
<td>638.imagick_s</td>
<td>112</td>
<td>50.6</td>
<td>285</td>
<td>51.1</td>
<td>282</td>
<td>50.7</td>
<td>285</td>
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<tr>
<td>644.nab_s</td>
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<td>33.4</td>
<td>522</td>
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<td>523</td>
<td>33.6</td>
<td>520</td>
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<td>649.fotonik3d_s</td>
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<td>80.0</td>
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<td>78.9</td>
<td>116</td>
<td>80.8</td>
<td>113</td>
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<tr>
<td>654.roms_s</td>
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<td>49.8</td>
<td>316</td>
<td>49.4</td>
<td>319</td>
<td>49.0</td>
<td>321</td>
</tr>
</tbody>
</table>

**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"

**General Notes**

Environment variables set by runcpu before the start of the run:

- KMP AFFINITY = "granularity=core,compact"
- LD_LIBRARY_PATH = "/home/cpu2017_ic19/lib/ia32:/home/cpu2017_ic19/lib/intel64:/home/cpu2017_ic19/lib/je5.0.1-32:/home/cpu2017_ic19/je5.0.1-64"
- 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.

**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

(Continued on next page)
Platform Notes (Continued)

Enhanced Processor Performance set to Enabled
Workload Profile set to General Peak Frequency Compute
Energy/Performance Bias set to Maximum Performance
Workload Profile set to Custom
Uncore Frequency Scaling set to Auto
Numa Group Size Optimization set to Flat
Advanced Memory Protection set to AdvancedECC
Sysinfo program /home/cpu2017_ic19/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-lj2l Wed Feb 27 15:13:19 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) Platinum 8280 CPU @ 2.70GHz
  4 "physical id"s (chips)
  112 "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 : 28
siblings : 28
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
  28 29 30
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
  28 29 30
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
  28 29 30
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
  28 29 30

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
Stepping: 7
Hewlett Packard Enterprise
ProLiant DL580 Gen10
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SPECspeed®2017_fp_base = 216
SPECspeed®2017_fp_peak = Not Run

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

Test Date: Feb-2019
Hardware Availability: Apr-2019
Software Availability: Sep-2018

CPU MHz: 2700.000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-27
NUMA node1 CPU(s): 28-55
NUMA node2 CPU(s): 56-83
NUMA node3 CPU(s): 84-111

Flags: fpu vme de pse tsc msr pae mce 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 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_ppnin mba tpr_shadow vmbi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsavesopt xsaveopt xsave xgetbv1 xsavec 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

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 22 23 24 25 26 27
node 0 size: 193086 MB
node 0 free: 192366 MB
node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
node 1 size: 193530 MB
node 1 free: 193361 MB
node 2 cpus: 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83
node 2 size: 193530 MB
node 2 free: 193361 MB
node 3 cpus: 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
node 3 size: 193529 MB
node 3 free: 193346 MB
node distances:
node   0   1   2   3
0:  10  21  21  21
(Continued on next page)
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Platform Notes (Continued)

1:  21  10  21  21
2:  21  21  10  21
3:  21  21  21  10

From /proc/meminfo
MemTotal:       792245476 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-lj2l 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 Feb 27 15:10

SPEC is set to: /home/cpu2017_ic19
  Filesystem   Type  Size  Used Avail Use% Mounted on
  /dev/sdb3    xfs  141G  115G  26G  82%  /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)
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CPU2017 License: 3  
Test Sponsor: HPE  
Tested by: HPE

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**Compiler Version Notes**

<table>
<thead>
<tr>
<th>Language</th>
<th>Benchmark(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>```</td>
</tr>
</tbody>
</table>
|          | Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.0.117 Build 20180804  
|          | Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
|          | ``` | 607.cactuBSSN_s(base) ``` |
|          | C++, C, Fortran |
|          | ``` | 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 19.0.0.117 Build 20180804  
|          | Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
|          | ``` | 607.cactuBSSN_s(base) ``` |
|          | Fortran |
|          | ``` | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base) ``` |
|          | Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.0.117 Build 20180804  
|          | Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
|          | ``` | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base) ``` |
|          | Fortran, C |
|          | ``` | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base) ``` |
|          | Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.0.117 Build 20180804  
|          | Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |

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**Base Compiler Invocation**

C benchmarks:  
```  
icc -m64 -std=c11  
```
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

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=3 -qopenmp -DSPEC_OPENMP
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
-nostandard-realloc-lhs -align array32byte

(Continued on next page)
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Feb-2019
Hardware Availability: Apr-2019
Software Availability: Sep-2018

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -gopt-prefetch
-ffinite-math-only -gopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-gopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
-nostandard-realloc-lhs -align array32byte

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-ic19.0u1-flags-linux64.2019-04-03.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-ic19.0u1-flags-linux64.2019-04-03.xml

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