### Hardware

**CPU Name:** Intel Xeon Platinum 8260  
**Max MHz:** 3900  
**Nominal:** 2400  
**Enabled:** 96 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:** 35.75 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 05/21/2019 released Jun-2019  
**File System:** btrfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** Not Applicable  
**Other:** None  
**Power Management:** --
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL580 Gen10
(2.40 GHz, Intel Xeon Platinum 8260)

SPECspeed®2017_fp_base = 203
SPECspeed®2017_fp_peak = Not Run

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

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>96</td>
<td>68.8</td>
<td>857</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>77.2</td>
<td>216</td>
<td>77.2</td>
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<tr>
<td>619.lbm_s</td>
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<td>96.6</td>
<td>137</td>
<td>96.3</td>
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<td>627.cam4_s</td>
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<td>172</td>
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<td>628.pop2_s</td>
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<td>54.3</td>
<td>225</td>
<td>52.7</td>
<td>226</td>
<td>52.6</td>
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<td>638.imagick_s</td>
<td>96</td>
<td>60.8</td>
<td>237</td>
<td>58.1</td>
<td>248</td>
<td>58.2</td>
<td>248</td>
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</tr>
<tr>
<td>644.nab_s</td>
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<td>39.8</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>84.5</td>
<td>108</td>
<td>82.8</td>
<td>110</td>
<td>82.4</td>
<td>111</td>
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<tr>
<td>654.roms_s</td>
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<td>56.5</td>
<td>279</td>
<td>58.9</td>
<td>267</td>
<td>57.1</td>
<td>276</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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_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)
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
Advanced Memory Protection set to Advanced ECC
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bced8f2999c33d61f64985e45859ea9
running on dl580-sles15 Thu Jul  4 08:10:07 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 8260 CPU @ 2.40GHz
        4 "physical id"s (chips)
        96 "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 : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8260 CPU @ 2.40GHz
Stepping: 6
CPU MHz: 2400.000
BogoMIPS: 4800.00

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

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant DL580 Gen10
(2.40 GHz, Intel Xeon Platinum 8260)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>HPE</td>
</tr>
<tr>
<td>Tested by:</td>
<td>HPE</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 203**
**SPECspeed®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

<table>
<thead>
<tr>
<th>Virtualization:</th>
<th>VT-x</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>1024K</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>36608K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-23</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>24-47</td>
</tr>
<tr>
<td>NUMA node2 CPU(s):</td>
<td>48-71</td>
</tr>
<tr>
<td>NUMA node3 CPU(s):</td>
<td>72-95</td>
</tr>
</tbody>
</table>

Flags:

```
fpu vmx 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 pdelgb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmrperf 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_13 cdp_l3 invpcid_single intel_ppin mba tpr_shadow vmx f1pdi fsbgbase tsc_adjust bm11 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsavees cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
iobp ibrs dinst tdp dtherm tscid ia arat pin pts ksu ospke avx512_vnni arch_capabilities ssbd
```

/proc/cpuinfo cache data

```
cache size : 36608 KB
```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

<table>
<thead>
<tr>
<th>available: 4 nodes (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
</tr>
<tr>
<td>node 0 size: 193117 MB</td>
</tr>
<tr>
<td>node 0 free: 192604 MB</td>
</tr>
<tr>
<td>node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47</td>
</tr>
<tr>
<td>node 1 size: 193531 MB</td>
</tr>
<tr>
<td>node 1 free: 193353 MB</td>
</tr>
<tr>
<td>node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71</td>
</tr>
<tr>
<td>node 2 size: 193502 MB</td>
</tr>
<tr>
<td>node 2 free: 193206 MB</td>
</tr>
<tr>
<td>node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95</td>
</tr>
<tr>
<td>node 3 size: 193529 MB</td>
</tr>
<tr>
<td>node 3 free: 193302 MB</td>
</tr>
<tr>
<td>node distances:</td>
</tr>
<tr>
<td>node 0 1 2 3</td>
</tr>
<tr>
<td>0: 10 21 21 21</td>
</tr>
<tr>
<td>1: 21 10 21 21</td>
</tr>
<tr>
<td>2: 21 21 10 21</td>
</tr>
<tr>
<td>3: 21 21 21 10</td>
</tr>
</tbody>
</table>

From /proc/meminfo

(Continued on next page)
Platform Notes (Continued)

MemTotal: 792248880 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 dl580-sles15 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 Jul 4 08:09

SPEC is set to: /home/cpu2017_u2
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda2 btrfs 371G 90G 281G 25% /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 2933

(End of data from sysinfo program)
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
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SPECspeed®2017_fp_base = 203
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: Feb-2019

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 19.0.2.187 Build 20190117 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
==============================================================================

Compiler Version Notes

==============================================================================
| C++, C, Fortran | 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. |
==============================================================================

Compiler Version Notes

==============================================================================
| 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 19.0.2.187 Build 20190117 |
| Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
==============================================================================

Compiler Version Notes

==============================================================================
| 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 19.0.2.187 Build 20190117 |
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==============================================================================

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

(Continued on next page)
Hewlett Packard Enterprise
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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
-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=4 -qopenmp
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
-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
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
-nostandard-realloc-lhs

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

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| Software Availability: | Feb-2019 |

### Base Optimization Flags (Continued)

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  
- -qopt-prefetch-issue-excl-hint  
- -ansi-alias  
- -complex-limited-range  
- -nostandard-realloc-lhs

The flags files that were used to format this result can be browsed at:
- [http://www.spec.org/cpu2017/flags/HPE-ic19.0ul-flags-linux64.2019-12-10.html](http://www.spec.org/cpu2017/flags/HPE-ic19.0ul-flags-linux64.2019-12-10.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-ic19.0ul-flags-linux64.2019-12-10.xml](http://www.spec.org/cpu2017/flags/HPE-ic19.0ul-flags-linux64.2019-12-10.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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