Hewlett Packard Enterprise  
ProLiant ML350 Gen10  
(2.70 GHz, Intel Xeon Platinum 8280)

CPU2017 License: 3  
Test Sponsor: HPE  
Tested by: HPE  
Test Date: May-2019  
Hardware Availability: Apr-2019  
Software Availability: Feb-2019

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
<td>56</td>
<td>0</td>
<td>188</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>56</td>
<td>0</td>
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<tr>
<td>619.lbm_s</td>
<td>56</td>
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<tr>
<td>621.wrf_s</td>
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</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 155  
SPECspeed2017_fp_peak = Not Run

Hardware

CPU Name: Intel Xeon Platinum 8280  
Max MHz.: 4000  
Nominal: 2700  
Enabled: 56 cores, 2 chips  
Orderable: 1, 2 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: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)  
Storage: 1 x 400 GB SAS SSD, RAID 0  
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64)  
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 U41 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
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>86.4</td>
<td>105</td>
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<td>98.6</td>
<td>160</td>
<td>99.1</td>
<td>159</td>
<td>101</td>
<td>156</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 155
SPECspeed2017_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_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
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on ml350-sles15 Thu May 16 12:41:44 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
2 "physical id"s (chips)
56 "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
```

From lscpu:

```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2700.000
BogoMIPS: 5400.00
Virtualization: VT-x
```

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

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Platform Notes (Continued)

L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-27
NUMA node1 CPU(s): 28-55
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 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_13 invvpcl_single intel_pmm tpr_shadow vmx flexpriority ept
vpid fsgsbase tsc_adjust bmler hle avx2 smep bmi2 erms invpd rtm cqm mxp rdtsa
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves xsavec xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mbms_total cqm_mbms_local
ibpb ibrs stibp dtherm ida arat pin pts ksu ospe avx512_vnni arch_capabilities ssbd

/proc/cpuinfo cache data
  cache size : 39424 KB

From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
  available: 2 nodes (0-1)
  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: 193116 MB
  node 0 free: 192625 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: 193500 MB
  node 1 free: 193155 MB
  node distances:
    node  0  1
    0:  10  21
    1:  21  10

From /proc/meminfo
  MemTotal: 395896424 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"

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

Platform Notes (Continued)

ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
    Linux ml350-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 May 16 12:37

SPEC is set to: /home/cpu2017_u2
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/sdc2 btrfs 371G 233G 137G 64% /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 U41 02/02/2019
    Memory:
        24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

switch: 619.ibm_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.

(Continued on next page)
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<td>Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.2.187 Build 20190117</td>
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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
```
**SPEC CPU2017 Floating Point Speed Result**

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**SPECspeed2017_fp_base = 155**

**SPECspeed2017_fp_peak = Not Run**

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### 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 -gopt-prefetch  
-ffinite-math-only -gopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP  
-gopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range

**Fortran benchmarks:**

-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -gopt-prefetch  
-ffinite-math-only -gopt-mem-layout-trans=4 -gopenmp  
-gopt-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 -gopt-prefetch  
-ffinite-math-only -gopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP  
-gopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range  
-nostandard-realloc-lhs

**Benchmarks using Fortran, C, and C++:**

-xCORE-AVX512 -ipo -O3 -no-prec-div -gopt-prefetch  
-ffinite-math-only -gopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP  
-gopt-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-Platform-Flags-Intel-V1.2-CLX-revA.html](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.html](http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.html)
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**Test Date:** May-2019  
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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-Platform-Flags-Intel-V1.2-CLX-revA.xml)
- [http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.xml](http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.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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