SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 660 Gen10
(3.60 GHz, Intel Xeon Gold 6244)

SPECspeed®2017_fp_base = 158
SPECspeed®2017_fp_peak = Not Run

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

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

Threads

| Test | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 | 440 | 480 | 520 | 560 | 600 | 640 | 680 | 720 | 760 | 800 | 840 |
|------|---|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s | 32 | 840 |
| 607.cactuBSSN_s | 32 | 145 |
| 619.lbm_s | 32 | 139 |
| 621.wrf_s | 32 | 134 |
| 627.cam4_s | 32 | 110 |
| 628.pop2_s | 32 | 60.5 |
| 638.imagick_s | 32 | 125 |
| 644.nab_s | 32 | 255 |
| 649.fotonik3d_s | 32 | 110 |
| 654.roms_s | 32 | 196 |

--- SPECspeed®2017_fp_base (158)

Hardware

CPU Name: Intel Xeon Gold 6244
Max MHz: 4400
Nominal: 3600
Enabled: 32 cores, 4 chips
Orderable: 2, 4 chip(s)
Cache L1: 32 KB I+ 32 KB D on chip per core
Cache L2: 1 MB I+D on chip per core
Cache L3: 24.75 MB I+D on chip per chip
Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 480 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 19.0.2.187 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 I43 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: --
### 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>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>71.6</td>
<td>825</td>
<td>71.4</td>
<td>826</td>
<td>71.1</td>
<td>830</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
<td>119</td>
<td>140</td>
<td>118</td>
<td>141</td>
<td>119</td>
<td>141</td>
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<tr>
<td>619.lbm_s</td>
<td>32</td>
<td>37.6</td>
<td>139</td>
<td>37.8</td>
<td>139</td>
<td>37.3</td>
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<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>99.1</td>
<td>133</td>
<td>97.7</td>
<td>135</td>
<td>98.6</td>
<td>134</td>
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<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>80.9</td>
<td>110</td>
<td>80.6</td>
<td>110</td>
<td>80.6</td>
<td>110</td>
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<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>193</td>
<td>61.4</td>
<td>200</td>
<td>59.5</td>
<td>196</td>
<td>60.5</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32</td>
<td>120</td>
<td>120</td>
<td>112</td>
<td>129</td>
<td>115</td>
<td>125</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
<td>68.4</td>
<td>255</td>
<td>68.4</td>
<td>255</td>
<td>68.4</td>
<td>255</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>81.7</td>
<td>112</td>
<td>83.1</td>
<td>110</td>
<td>82.8</td>
<td>110</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
<td>81.7</td>
<td>193</td>
<td>80.0</td>
<td>197</td>
<td>80.4</td>
<td>196</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 158**

**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=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)
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**SPECs**

**SPECs**

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CPU2017 License: 3
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**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
Intel UPI Link Power Management set to Enabled
Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on sy660-gen10 Thu Apr 25 14:01:03 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) Gold 6244 CPU @ 3.60GHz
  - 4 "physical id"s (chips)
  - 32 "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 : 8
  - siblings : 8
  - physical 0: cores 2 4 8 9 18 19 20 25
  - physical 1: cores 4 9 16 18 19 24 25 27
  - physical 2: cores 2 3 4 8 9 11 18 25
  - physical 3: cores 2 4 17 18 19 24 25 27

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 32
- On-line CPU(s) list: 0-31
- Thread(s) per core: 1
- Core(s) per socket: 8
- Socket(s): 4
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
- Stepping: 7
- CPU MHz: 3600.000
- BogoMIPS: 7200.00

(Continued on next page)
Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node 0 CPU(s): 0-7
NUMA node 1 CPU(s): 8-15
NUMA node 2 CPU(s): 16-23
NUMA node 3 CPU(s): 24-31
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 pdemsg rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperf perfmon pbe pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpx cat_13 cdp_13 invpcid_single intel_ppi mba tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmic hle avx2 smep bmi2 erms invpcid rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occur_llc cqm_mbb total cqm_mbb data

/cache data

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
node 0 size: 193047 MB
node 0 free: 192827 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 193534 MB
node 1 free: 193256 MB
node 2 cpus: 16 17 18 19 20 21 22 23
node 2 size: 193505 MB
node 2 free: 193346 MB
node 3 cpus: 24 25 26 27 28 29 30 31
node 3 size: 193325 MB
node 3 free: 192959 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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**Tested by:** HPE  
**Test Date:** Apr-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

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**Platform Notes (Continued)**

MemTotal: 791974864 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 sy660-gen10 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 Apr 25 14:00

SPEC is set to: /home/cpu2017_u2  
```
Filesystem   Type      Size  Used Avail Use% Mounted on
/dev/sdb2    btrfs     445G  110G  335G  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 I43 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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**Compiler Version Notes**

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<td></td>
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**Base Compiler Invocation**

C benchmarks:  
`icc -m64 -std=c11`

(Continued on next page)
**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
-qopt-prefetch-issue-excl-hint -ansi-alias -complex-limited-range
```

Fortran benchmarks:

```bash
-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:

```bash
-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
```
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-Platform-Flags-Intel-V1.2-CLX-revA.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-revA.xml
http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.2019-04-03.00.xml