## SPEC® CPU2017 Floating Point Speed Result

### Huawei 5288 V5 (Intel Xeon Silver 4109T)

| Test Sponsor: | Huawei |
| Test Date:    | Aug-2018 |
| Hardware Availability: | Jul-2017 |
| Software Availability: | Jan-2018 |

### SPECspeed2017_fp_base = 59.3

### SPECspeed2017_fp_peak = 60.6

#### Hardware

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Silver 4109T</td>
</tr>
<tr>
<td>Max MHz.</td>
<td>3000</td>
</tr>
<tr>
<td>Nominal</td>
<td>2000</td>
</tr>
<tr>
<td>Enabled</td>
<td>16 cores, 2 chips</td>
</tr>
<tr>
<td>Orderable</td>
<td>1,2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3</td>
<td>11 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>768 GB (24 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 1200 GB SAS, 10000 RPM</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Software

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
</tr>
<tr>
<td>Compiler: C/C++</td>
<td>Version 18.0.0.128 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler for Linux:</td>
<td></td>
</tr>
<tr>
<td>Compiler for Fortran:</td>
<td>Version 18.0.0.128 of Intel Fortran</td>
</tr>
<tr>
<td>Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Version 0.81 Released Jul-2018</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
</tbody>
</table>
SPEC CPU2017 Floating Point Speed Result

Huawei
Huawei 5288 V5 (Intel Xeon Silver 4109T)

SPECspeed2017_fp_base = 59.3
SPECspeed2017_fp_peak = 60.6

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>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
<td>187</td>
<td>315</td>
<td>186</td>
<td>317</td>
<td>185</td>
<td>318</td>
<td>16</td>
<td>185</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>232</td>
<td>71.7</td>
<td>231</td>
<td>72.1</td>
<td>233</td>
<td>71.6</td>
<td>16</td>
<td>228</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>16</td>
<td>166</td>
<td>31.5</td>
<td>161</td>
<td>32.6</td>
<td>161</td>
<td>32.6</td>
<td>16</td>
<td>166</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>16</td>
<td>302</td>
<td>43.8</td>
<td>299</td>
<td>44.2</td>
<td>304</td>
<td>43.4</td>
<td>16</td>
<td>282</td>
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<tr>
<td>627.cam4_s</td>
<td>16</td>
<td>267</td>
<td>33.2</td>
<td>267</td>
<td>33.2</td>
<td>268</td>
<td>33.1</td>
<td>16</td>
<td>267</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>267</td>
<td>44.5</td>
<td>266</td>
<td>44.6</td>
<td>267</td>
<td>44.4</td>
<td>16</td>
<td>253</td>
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<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>358</td>
<td>40.2</td>
<td>364</td>
<td>39.6</td>
<td>359</td>
<td>40.2</td>
<td>16</td>
<td>359</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
<td>250</td>
<td>70.0</td>
<td>249</td>
<td>70.1</td>
<td>249</td>
<td>70.1</td>
<td>16</td>
<td>249</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>147</td>
<td>61.8</td>
<td>145</td>
<td>62.7</td>
<td>146</td>
<td>62.4</td>
<td>16</td>
<td>147</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>16</td>
<td>246</td>
<td>63.9</td>
<td>245</td>
<td>64.3</td>
<td>246</td>
<td>63.9</td>
<td>16</td>
<td>228</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"

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4
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
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:
Power Policy Set to Load Balance
Hyper-Threading Set to Disable

(Continued on next page)
Huawei 5288 V5 (Intel Xeon Silver 4109T)

**SPECspeed2017_fp_base** = 59.3

**SPECspeed2017_fp_peak** = 60.6

---

**Platform Notes (Continued)**

XPT Prefetch Set to Enabled
Sysinfo program /spec2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b0c91c0f
running on localhost.localdomain Fri Aug 31 09:05:02 2018

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) Silver 4109T CPU @ 2.00GHz
  2 "physical id"s (chips)
  16 "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 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 1
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4109T CPU @ 2.00GHz
Stepping: 4
CPU MHz: 2001.000
CPU max MHz: 2001.0000
CPU min MHz: 800.0000
BogoMIPS: 4000.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0-7
NUMA node1 CPU(s): 8-15
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov

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### SPEC CPU2017 Floating Point Speed Result

<table>
<thead>
<tr>
<th>Platform Notes (Continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperfmperf eagerfpu pni pclmulqdq dtes64 msr pmachreg ds_cpl vmx smx est tm2 ssse3 fma cx16 xtopr pdm cpid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_l3 cdp_l3 invpcid_single intel_pt spec_ctrl ibpb_support tpr_shadow vnumi flexpriority ept vpid fsxsh革新 tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cmq mpz rt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xsaveopt xsaveopt cqm llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts</td>
</tr>
<tr>
<td>/proc/cpuinfo cache data</td>
</tr>
<tr>
<td>cache size : 11264 KB</td>
</tr>
<tr>
<td>From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.</td>
</tr>
<tr>
<td>available: 2 nodes (0-1)</td>
</tr>
<tr>
<td>node 0 cpus: 0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>node 0 size: 391349 MB</td>
</tr>
<tr>
<td>node 0 free: 375756 MB</td>
</tr>
<tr>
<td>node 1 cpus: 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>node 1 size: 393216 MB</td>
</tr>
<tr>
<td>node 1 free: 376636 MB</td>
</tr>
<tr>
<td>node distances:</td>
</tr>
<tr>
<td>node 0 1</td>
</tr>
<tr>
<td>0: 10 21</td>
</tr>
<tr>
<td>1: 21 10</td>
</tr>
<tr>
<td>From /proc/meminfo</td>
</tr>
<tr>
<td>MemTotal: 790512260 kB</td>
</tr>
<tr>
<td>HugePages_Total: 0</td>
</tr>
<tr>
<td>Hugepagesize: 2048 kB</td>
</tr>
<tr>
<td>From /etc/<em>release</em> /etc/<em>version</em></td>
</tr>
<tr>
<td>os-release:</td>
</tr>
<tr>
<td>NAME=&quot;Red Hat Enterprise Linux Server&quot;</td>
</tr>
<tr>
<td>VERSION=&quot;7.4 (Maipo)&quot;</td>
</tr>
<tr>
<td>ID=&quot;rhel&quot;</td>
</tr>
<tr>
<td>ID_LIKE=&quot;fedora&quot;</td>
</tr>
<tr>
<td>VARIANT=&quot;Server&quot;</td>
</tr>
<tr>
<td>VARIANT_ID=&quot;server&quot;</td>
</tr>
<tr>
<td>VERSION_ID=&quot;7.4&quot;</td>
</tr>
<tr>
<td>PRETTY_NAME=&quot;Red Hat Enterprise Linux Server 7.4 (Maipo)&quot;</td>
</tr>
<tr>
<td>redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
</tr>
<tr>
<td>system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
</tr>
<tr>
<td>system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server</td>
</tr>
</tbody>
</table>

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Huawei 5288 V5 (Intel Xeon Silver 4109T)

<table>
<thead>
<tr>
<th>SPECspeed2017.fp_base</th>
<th>SPECspeed2017.fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>59.3</td>
<td>60.6</td>
</tr>
</tbody>
</table>

CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

Platform Notes (Continued)

Linux localhost.localdomain 3.10.0-693.11.6.el7.x86_64 #1 SMP Thu Dec 28 14:23:39 EST 2017 x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Aug 29 18:57

SPEC is set to: /spec2017

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda2</td>
<td>xfs</td>
<td>781G</td>
<td>130G</td>
<td>652G</td>
<td>17%</td>
<td>/</td>
</tr>
</tbody>
</table>

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 INSYDE Corp. 0.81 07/02/2018
Memory:
24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC 619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC 619.lbm_s(peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

FC 607.cactuBSSN_s(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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

**Huawei**

**Huawei 5288 V5 (Intel Xeon Silver 4109T)**

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>59.3</th>
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<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>60.6</td>
</tr>
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</table>

**CPU2017 License:** 3175  
**Test Sponsor:** Huawei  
**Test Date:** Aug-2018  
**Hardware Availability:** Jul-2017  
**Tested by:** Huawei  
**Software Availability:** Jan-2018

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**Compiler Version Notes (Continued)**

<table>
<thead>
<tr>
<th>FC</th>
<th>607.cactuBSSN_s(peak)</th>
</tr>
</thead>
</table>
| icpc (ICC) | 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
| icc (ICC) | 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
| ifort (IFORT) | 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |

<table>
<thead>
<tr>
<th>FC</th>
<th>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</th>
</tr>
</thead>
</table>
| ifort (IFORT) | 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |

<table>
<thead>
<tr>
<th>FC</th>
<th>603.bwaves_s(peak) 649.fotonik3d_s(peak) 654.roms_s(peak)</th>
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</table>
| ifort (IFORT) | 18.0.0 20170811  
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<table>
<thead>
<tr>
<th>CC</th>
<th>621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)</th>
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</thead>
</table>
| ifort (IFORT) | 18.0.0 20170811  
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<table>
<thead>
<tr>
<th>CC</th>
<th>621.wrf_s(peak) 628.pop2_s(peak)</th>
</tr>
</thead>
</table>
| ifort (IFORT) | 18.0.0 20170811  
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### Huawei

<table>
<thead>
<tr>
<th>Huawei 5288 V5 (Intel Xeon Silver 4109T)</th>
<th>SPECspeed2017_fp_base = 59.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak = 60.6</td>
<td></td>
</tr>
</tbody>
</table>

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**Test Sponsor:** Huawei  
**Tested by:** Huawei

**Test Date:** Aug-2018  
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### Base Compiler Invocation

**C benchmarks:**
- icc

**Fortran benchmarks:**
- ifort

**Benchmarks using both Fortran and C:**
- ifort icc

**Benchmarks using Fortran, C, and C++:**
- icpc icc ifort

### 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-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

**Fortran benchmarks:**
- -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
- -nostandard-realloc-lhs -align array32byte

**Benchmarks using both Fortran and C:**
- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
- -nostandard-realloc-lhs -align array32byte

(Continued on next page)
Huawei

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### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2
-ipo
-03
-no-prec-div
-qopt-prefetch
-ffinite-math-only
-qopt-mem-layout-trans=3
-qopenmp
-DSPEC_OPENMP
-nostandard-realloc-lhs
-align array32byte

### Base Other Flags

C benchmarks:
-m64
-std=c11

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64
-std=c11

Benchmarks using Fortran, C, and C++:
-m64
-std=c11

### Peak Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort
icc

Benchmarks using Fortran, C, and C++:
icpc
icc
ifort

### Peak Portability Flags

Same as Base Portability Flags
Huawei 5288 V5 (Intel Xeon Silver 4109T)

**SPECspeed2017_fp_base** = 59.3

**SPECspeed2017_fp_peak** = 60.6

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<td>3175</td>
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<th>Software Availability</th>
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</thead>
<tbody>
<tr>
<td>Huawei</td>
<td>Jan-2018</td>
</tr>
</tbody>
</table>

### Peak Optimization Flags

**C benchmarks**:

619.lbm_s: basepeak = yes

638.imagick_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

644.nab_s: Same as 638.imagick_s

**Fortran benchmarks**:

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp -nostandard-realloc-lhs -align array32byte

649.fotonik3d_s: basepeak = yes

654.roms_s: Same as 603.bwaves_s

**Benchmarks using both Fortran and C**:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

627.cam4_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

628.pop2_s: Same as 621.wrf_s

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

-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

### Peak Other Flags

**C benchmarks**:

-m64 -std=c11

(Continued on next page)
Huawei

Huawei 5288 V5 (Intel Xeon Silver 4109T)  

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>SPECspeed2017_fp_base</td>
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</tbody>
</table>

CPU2017 License: 3175  
Test Sponsor: Huawei  
Tested by: Huawei  
Test Date: Aug-2018  
Hardware Availability: Jul-2017  
Software Availability: Jan-2018

Peak Other Flags (Continued)

Fortran benchmarks:
- m64

Benchmarks using both Fortran and C:
- m64 -std=c11

Benchmarks using Fortran, C, and C++:
- m64 -std=c11

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml
http://www.spec.org/cpu2017/flags/Huawei-Platform-Settings-SKL-V1.9-revC.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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