## Huawei 2288 V5 (Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_base = 61.0</td>
<td>CPU Name: Intel Xeon Silver 4110</td>
</tr>
<tr>
<td>SPECspeed2017_fp_peak = 62.3</td>
<td>Max MHz.: 3000</td>
</tr>
<tr>
<td></td>
<td>Nominal: 2100</td>
</tr>
<tr>
<td></td>
<td>Enabled: 16 cores, 2 chips</td>
</tr>
<tr>
<td></td>
<td>Orderable: 1,2 chips</td>
</tr>
<tr>
<td></td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td></td>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td></td>
<td>L3: 11 MB I+D on chip per chip</td>
</tr>
<tr>
<td></td>
<td>Other: None</td>
</tr>
<tr>
<td></td>
<td>Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)</td>
</tr>
<tr>
<td></td>
<td>Storage: 1 x 2000 GB SATA, 7200 RPM</td>
</tr>
<tr>
<td></td>
<td>Other: None</td>
</tr>
<tr>
<td></td>
<td>OS: Red Hat Enterprise Linux Server release 7.4 (Maipo)</td>
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<tr>
<td></td>
<td>Compiler: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux</td>
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<tr>
<td></td>
<td>Parallel: Yes</td>
</tr>
<tr>
<td></td>
<td>Firmware: Version 0.52 Released Jul-2018</td>
</tr>
<tr>
<td></td>
<td>File System: xfs</td>
</tr>
<tr>
<td></td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td></td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td></td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td></td>
<td>Other: None</td>
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</table>

| SPECspeed2017_fp_base | 61.0 |
| SPECspeed2017_fp_peak | 62.3 |

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base (61.0)</th>
<th>SPECspeed2017_fp_peak (62.3)</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
<td>75.1</td>
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<td>607.cactuBSSN_s</td>
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<td>619.ibm_s</td>
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<tr>
<td>621.wrf_s</td>
<td>16</td>
<td>44.5</td>
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<tr>
<td>627.cam4_s</td>
<td>16</td>
<td>34.4</td>
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<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>45.9</td>
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<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>41.8</td>
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<tr>
<td>644.nab_s</td>
<td>16</td>
<td>73.1</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>63.0</td>
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<tr>
<td>654.roms_s</td>
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<td>65.3</td>
</tr>
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</table>
SPEC CPU2017 Floating Point Speed Result

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Huawei 2288 V5 (Intel Xeon Silver 4110)

SPECspeed2017_fp_base = 61.0
SPECspeed2017_fp_peak = 62.3

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></td>
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<td>Base</td>
<td></td>
<td>Peak</td>
<td></td>
<td></td>
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<td>180</td>
<td>327</td>
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<td>45.9</td>
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<td>627.cam4_s</td>
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<td>34.4</td>
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<td>628.pop2_s</td>
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<td>45.9</td>
<td>259</td>
<td>45.9</td>
</tr>
<tr>
<td>638.imagick_s</td>
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<td>345</td>
<td>41.8</td>
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<td>41.8</td>
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<td>644.nab_s</td>
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<td>73.1</td>
<td>239</td>
<td>73.1</td>
<td>239</td>
<td>73.1</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>145</td>
<td>63.1</td>
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<td>145</td>
<td>63.0</td>
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<tr>
<td>654.roms_s</td>
<td>16</td>
<td>241</td>
<td>65.3</td>
<td>241</td>
<td>65.4</td>
<td>242</td>
<td>65.1</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 Custom
Hyper-Threading Set to Disable

(Continued on next page)
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Huawei 2288 V5 (Intel Xeon Silver 4110)

SPEC CPU2017 Floating Point Speed Result

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SPECspeed2017_fp_base = 61.0
SPECspeed2017_fp_peak = 62.3

Platform Notes (Continued)

ADDDC Sparing Set to Disabled
Sysinfo program /spec2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on localhost.localdomain Thu Aug 16 21:36:01 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 4110 CPU @ 2.10GHz
  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 4110 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2101.000
CPU max MHz: 2101.0000
CPU min MHz: 800.0000
BogoMIPS: 4200.00
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

(Continued on next page)
Platform Notes (Continued)

```
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperf perf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma
cx16 xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_13 cd0_d3 invpcid_single
intel_pt spec_ctrl ibpb_support tpr_shadow vnmi flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcmldq rtm cmqm mpx rdt_a avx512f avx512dq
rdsesead map clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
xsaveopt clam unload llc cmqm_occup_llc cmqm_mbm_total cmqm_mbm_local dtherm ida arat pln pts
```

/proc/cpuinfo cache data
  cache size : 11264 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
  node 0 size: 194741 MB
  node 0 free: 189682 MB
  node 1 cpus: 8 9 10 11 12 13 14 15
  node 1 size: 196608 MB
  node 1 free: 191422 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 394174888 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux Server"
    VERSION="7.4 (Maipo)"
    ID="rhel"
    ID_LIKE="fedora"
    VARIANT="Server"
    VARIANT_ID="server"
    VERSION_ID="7.4"
    PRETTY_NAME="Red Hat Enterprise Linux Server 7.4 (Maipo)"
  redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
  system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server

uname -a:

(Continued on next page)
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| CPU2017 License: | 3175 |
| Test Sponsor: | Huawei |
| Tested by: | Huawei |
| Test Date: | Aug-2018 |
| Hardware Availability: | Sep-2018 |
| Software Availability: | Jan-2018 |

**SPEC CPU2017 Floating Point Speed Result**

| SPECspeed2017_fp_base = 61.0 |
| SPECspeed2017_fp_peak = 62.3 |

**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 16 15:14

SPEC is set to: /spec2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 2.0T 64G 2.0T 4% /

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 SM BIOS" standard.

BIOS INSYDE Corp. 0.52 07/18/2018
Memory:
4x NO DIMM NO DIMM
12x 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.
==============================================================================
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)
Huawei

Huawei 2288 V5 (Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>Specspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.0</td>
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<table>
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<tr>
<th>CPU2017 License: 3175</th>
<th>Test Date: Aug-2018</th>
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<tbody>
<tr>
<td>Test Sponsor: Huawei</td>
<td>Hardware Availability: Sep-2018</td>
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<tr>
<td>Tested by: Huawei</td>
<td>Software Availability: Jan-2018</td>
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**Compiler Version Notes (Continued)**

```
FC   607.cactuBSSN_s(peak)

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.
```

```
FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
```

```
FC   603.bwaves_s(peak) 649.fotonik3d_s(peak) 654.roms_s(peak)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
```

```
CC  621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

ifort (IFORT) 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.
```

```
CC   621.wrf_s(peak) 628.pop2_s(peak)

ifort (IFORT) 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.
```
## SPEC CPU2017 Floating Point Speed Result

**Huawei**

Huawei 2288 V5 (Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
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<tbody>
<tr>
<td>61.0</td>
<td>62.3</td>
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**CPU2017 License:** 3175  
**Test Sponsor:** Huawei  
**Tested by:** Huawei  

**Test Date:** Aug-2018  
**Hardware Availability:** Sep-2018  
**Software Availability:** Jan-2018

### 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

Huawei 2288 V5 (Intel Xeon Silver 4110)

| SPECspeed2017_fp_base = 61.0 |
| SPECspeed2017_fp_peak = 62.3 |

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

**Base Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -openmp -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
### SPEC CPU2017 Floating Point Speed Result

**Huawei**

**Huawei 2288 V5 (Intel Xeon Silver 4110)**

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

#### Peak Optimization Flags

**C benchmarks:**

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

**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
Huawei

Huawei 2288 V5 (Intel Xeon Silver 4110)  

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

Test Date: Aug-2018  
Hardware Availability: Sep-2018  
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.

Tested with SPEC CPU2017 v1.0.2 on 2018-08-16 09:36:01-0400.
Report generated on 2018-10-31 18:35:56 by CPU2017 PDF formatter v6067.
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