### Huawei

**CPU2017 License:** 3175  
**Test Sponsor:** Huawei  
**Tested by:** Huawei  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Dec-2018

#### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>bwaves_s</td>
<td>132</td>
<td>133</td>
</tr>
<tr>
<td>cactuBSSN_s</td>
<td>133</td>
<td>133</td>
</tr>
<tr>
<td>lbm_s</td>
<td>131</td>
<td>133</td>
</tr>
<tr>
<td>wrf_s</td>
<td>118</td>
<td>122</td>
</tr>
<tr>
<td>cam4_s</td>
<td>116</td>
<td>118</td>
</tr>
<tr>
<td>pop2_s</td>
<td>62.8</td>
<td>63.6</td>
</tr>
<tr>
<td>imagick_s</td>
<td>137</td>
<td>137</td>
</tr>
<tr>
<td>nab_s</td>
<td>207</td>
<td>207</td>
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<tr>
<td>fotoni3d_s</td>
<td>91.0</td>
<td>97.0</td>
</tr>
<tr>
<td>roms_s</td>
<td>135</td>
<td>137</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Gold 6230  
- **Max MHz.:** 3900  
- **Nominal:** 2100  
- **Enabled:** 40 cores, 2 chips  
- **Orderable:** 1,2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 1 MB I+D on chip per core  
- **Cache L3:** 27.5 MB I+D on chip per chip  
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)  
- **Storage:** 1 x 1200 GB SAS, 10000 RPM

#### Software

- **OS:** SUSE Linux Enterprise Server 12 SP4 (x86_64)  
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++  
- **Compiler Build:** 20181018 for Linux  
- **Fortran:** Version 19.0.1.144 of Intel Fortran  
- **Compiler Build:** 20181018 for Linux  
- **Parallel:** Yes  
- **Firmware:** Version 6.36 Released Feb-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** None
Huawei

Huawei 2288H V5 (Intel Xeon Gold 6230)

SPECspeed2017_fp_base = 132
SPECspeed2017_fp_peak = 133

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>
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<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
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<tr>
<td>607.cactuBSSN_s</td>
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</tr>
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<tr>
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<td>90.7</td>
<td>100</td>
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<td>116</td>
<td>136</td>
<td>115</td>
<td>137</td>
<td>115</td>
<td>137</td>
</tr>
</tbody>
</table>

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"
LD_LIBRARY_PATH = ":/spec2017/lib/ia32:/spec2017/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
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)
# SPEC CPU2017 Floating Point Speed Result

## Huawei

### Huawei 2288H V5 (Intel Xeon Gold 6230)

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Tested by</th>
<th>CPU2017 License</th>
<th>Test Date</th>
<th>Hardware Availability</th>
<th>Software Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huawei</td>
<td>Huawei</td>
<td>3175</td>
<td>Mar-2019</td>
<td>Apr-2019</td>
<td>Dec-2018</td>
</tr>
</tbody>
</table>

**SPECspeed2017_fp_base = 132**

**SPECspeed2017_fp_peak = 133**

---

**Platform Notes (Continued)**

XPT Prefetch Set to Enabled

Sysinfo program /spec2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on sles12sp4 Thu Mar 21 07:10:26 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

<table>
<thead>
<tr>
<th>model name</th>
<th>Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 &quot;physical id&quot;s</td>
<td>(chips)</td>
</tr>
<tr>
<td>40 &quot;processors&quot;</td>
<td></td>
</tr>
<tr>
<td>cores, siblings</td>
<td>(Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)</td>
</tr>
<tr>
<td>cpu cores</td>
<td>20</td>
</tr>
<tr>
<td>siblings</td>
<td>20</td>
</tr>
<tr>
<td>physical 0: cores</td>
<td>0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28</td>
</tr>
<tr>
<td>physical 1: cores</td>
<td>0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28</td>
</tr>
</tbody>
</table>

From lscpu:

<table>
<thead>
<tr>
<th>Architecture</th>
<th>x86_64</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU op-mode(s)</td>
<td>32-bit, 64-bit</td>
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<tr>
<td>Byte Order</td>
<td>Little Endian</td>
</tr>
<tr>
<td>CPU(s)</td>
<td>40</td>
</tr>
<tr>
<td>On-line CPU(s) list</td>
<td>0-39</td>
</tr>
<tr>
<td>Thread(s) per core</td>
<td>1</td>
</tr>
<tr>
<td>Core(s) per socket</td>
<td>20</td>
</tr>
<tr>
<td>Socket(s)</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node(s)</td>
<td>2</td>
</tr>
<tr>
<td>Vendor ID</td>
<td>GenuineIntel</td>
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<tr>
<td>CPU family</td>
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<tr>
<td>Model</td>
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<tr>
<td>Model name</td>
<td>Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz</td>
</tr>
<tr>
<td>Stepping</td>
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</tr>
<tr>
<td>CPU MHz</td>
<td>2100.000</td>
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<tr>
<td>CPU max MHz</td>
<td>3900.000</td>
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<td>CPU min MHz</td>
<td>800.000</td>
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<td>BogoMIPS</td>
<td>4200.00</td>
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<td>Virtualization</td>
<td>VT-x</td>
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<td>L1d cache</td>
<td>32K</td>
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<td>L1i cache</td>
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<td>L2 cache</td>
<td>1024K</td>
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<td>L3 cache</td>
<td>28160K</td>
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<tr>
<td>NUMA node0 CPU(s)</td>
<td>0-19</td>
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<tr>
<td>NUMA node1 CPU(s)</td>
<td>20-39</td>
</tr>
<tr>
<td>Flags</td>
<td>fpu vme de pse tsc msr mce apic sep mtrr pge mca cmov</td>
</tr>
</tbody>
</table>

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

Huawei

Huawei 2288H V5 (Intel Xeon Gold 6230)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
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<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>133</td>
</tr>
</tbody>
</table>

CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei
Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

Platform Notes (Continued)

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 cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrmid pmcd 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_l3 cdp_l3
invpcid_single ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid
fsgsbased tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f
avx512dq rdseed adx clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaver opt xsaveopt xsave xgetbv1 xsavec cqm_llc cqm_occurenc_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 28160 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
dr 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
    node 0 size: 191932 MB
    node 0 free: 191353 MB
    node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
    node 1 size: 193250 MB
    node 1 free: 191940 MB
    node distances:
      node 0 1
      0:  10  21
      1:  21  10

From /proc/meminfo
MemTotal: 394427764 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
  SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12
  PATCHLEVEL = 4
  # This file is deprecated and will be removed in a future service pack or release.
  # Please check /etc/os-release for details about this release.
os-release:
  NAME="SLES"
  VERSION="12-SP4"
  VERSION_ID="12.4"
  PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
  ID="sles"
  ANSI_COLOR="0;32"

(Continued on next page)
Huawei 2288H V5 (Intel Xeon Gold 6230)

SPECspeed2017_fp_base = 132
SPECspeed2017_fp_peak = 133

CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei
Test Date: Mar-2019
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Platform Notes (Continued)

CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
    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 Mar 21 02:42

SPEC is set to: /spec2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 700G 15G 686G 3% /

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. 6.36 02/15/2019
Memory:
    24x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
FC  607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,

(Continued on next page)
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CPU2017 License: 3175
Test Sponsor: Huawei
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Test Date: Mar-2019

Compiler Version Notes (Continued)

```
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

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

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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```

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

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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CC  621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

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

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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SPEC CPU2017 Floating Point Speed Result

Huawei
Huawei 2288H V5 (Intel Xeon Gold 6230)

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CPU2017 License: 3175
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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

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 -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

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-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
-nostandard-realloc-lhs

(Continued on next page)
Huawei 2288H V5 (Intel Xeon Gold 6230)

SPECspeed2017_fp_base = 132
SPECspeed2017_fp_peak = 133

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
-nostandard-realloc-lhs

Peak 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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

(Continued on next page)
Huawei
Huawei 2288H V5 (Intel Xeon Gold 6230)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_peak = 133</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_base = 132</td>
</tr>
</tbody>
</table>

Peak Optimization Flags (Continued)

654.roms_s (continued):
-qopenmp -nstandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nstandard-realloc-lhs

627.cam4_s: basepeak = yes

628.pop2_s: Same as 621.wrf_s

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
-nstandard-realloc-lhs

The flags files that were used to format this result can be browsed at

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