## SPEC® CPU2017 Floating Point Speed Result

**Huawei**

**Huawei CH225 V5 (Intel Xeon Silver 4116)**

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>3175</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Huawei</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Huawei</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Sep-2018</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2017</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Mar-2018</td>
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<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>78.5</td>
<td>79.6</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td></td>
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<tr>
<td>619.lbm_s</td>
<td></td>
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<tr>
<td>621.wrf_s</td>
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<tr>
<td>627.cam4_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td></td>
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</tr>
</tbody>
</table>

### Hardware
- **CPU Name:** Intel Xeon Silver 4116
- **Max MHz.:** 3000
- **Nominal:** 2100
- **Enabled:** 24 cores, 2 chips
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 1 MB I+D on chip per core
- **L3:** 16.5 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)
- **Storage:** 1 x 1200 GB SAS, 10000 RPM
- **Other:** None

### Software
- **OS:** Red Hat Enterprise Linux Server release 7.4 (Maipo) 3.10.0-693.11.6.el7.x86_64
- **Compiler:** C/C++: Version 18.0.2.199 of Intel C/C++ Compiler for Linux;
  Fortran: Version 18.0.2.199 of Intel Fortran Compiler for Linux
- **Parallel:** Yes
- **Firmware:** Version 0.80 Released Jun-2018
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
Huawei
Huawei CH225 V5 (Intel Xeon Silver 4116)

SPECspeed2017_fp_base = 78.5
SPECspeed2017_fp_peak = 79.6

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
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<th>Base Seconds</th>
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<td>619.lbm_s</td>
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<td>147</td>
<td>35.6</td>
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<td>621.wrf_s</td>
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<td>57.3</td>
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<td>627.cam4_s</td>
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<tr>
<td>628.pop2_s</td>
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<td>51.1</td>
<td>231</td>
<td>51.4</td>
<td>233</td>
<td>51.0</td>
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<td>224</td>
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<td>638.imagick_s</td>
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<td>60.2</td>
<td>239</td>
<td>60.3</td>
<td>239</td>
<td>60.2</td>
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<td>119</td>
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<td>120</td>
<td>24</td>
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<td>649.fotonik3d_s</td>
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<td>70.2</td>
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<td>81.3</td>
<td>24</td>
<td>199</td>
<td>79.0</td>
<td>194</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 78.5
SPECspeed2017_fp_peak = 79.6

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 i7-6700K 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.
jemalloc, a general purpose malloc implementation built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
Huawei CH225 V5 (Intel Xeon Silver 4116)

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<td>Software Availability: Mar-2018</td>
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Platform Notes

BIOS configuration:
Power Policy Set to Load Balance
Hyper-Threading Set to Disable
XPT Prefetch Set to Enabled
Sysinfo program /spec2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on localhost.localdomain Wed Sep 19 05:25:30 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 4116 CPU @ 2.10GHz
  2 "physical id"s (chips)
  24 "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 : 12
  siblings : 12
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
  physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4116 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: 16896K

(Continued on next page)
Huawei

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

Platform Notes (Continued)

NUMA node0 CPU(s): 0-11
NUMA node1 CPU(s): 12-23
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
aperfmpref eagerfpu pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 fma cx16 xtrnas
pdcms ptds 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 vmxi flexpriority ept vpid fsqsgbase tsc_adjust
bm1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx
smap cfiushedopt clwb avx512cd avx512bw avx512vl xsaves opt xsaveopt xsave xgetbv1 cqm_llc
cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts

/proc/cpuinfo cache data
  cache size: 16896 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
  node 0 size: 391349 MB
  node 0 free: 377836 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
  node 1 size: 393216 MB
  node 1 free: 378866 MB
  node distances:
    node 0: 10 21
    node 1: 21 10

From /proc/meminfo
  MemTotal: 790510872 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)
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Test Sponsor: Huawei  
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Test Date: Sep-2018  
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Software Availability: Mar-2018

**Platform Notes (Continued)**

```
 system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server

uname -a:
    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 Sep 18 23:07

SPEC is set to: /spec2017

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      xfs   720G   91G  629G  13% /
```

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. 0.80 06/27/2018
- Memory:
  - 24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

### Compiler Version Notes

```
==============================================================================
<table>
<thead>
<tr>
<th>CC   619.lbm_s(base)</th>
<th>638.imagick_s(base, peak)</th>
<th>644.nab_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc (ICC) 18.0.2</td>
<td>20180210</td>
<td></td>
</tr>
<tr>
<td>Copyright (C)</td>
<td>1985-2018 Intel Corporation. All rights reserved.</td>
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==============================================================================
<table>
<thead>
<tr>
<th>CC   619.lbm_s(peak)</th>
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==============================================================================
<table>
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<tr>
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<tr>
<td>icc (ICC) 18.0.2</td>
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<tr>
<td>Copyright (C) 1985-2018 Intel Corporation. All rights reserved.</td>
</tr>
<tr>
<td>ifort (IFORT)</td>
</tr>
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</table>
```

(Continued on next page)
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Compiler Version Notes (Continued)

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base, peak)
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(peak) 628.pop2_s(peak)
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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

(Continued on next page)
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Base Compiler Invocation (Continued)

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

Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>619.lbm_s</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>621.wrf_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td></td>
<td>-assume byterecl</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>-DSPEC_LP64</td>
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<td>654.roms_s</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

Base Optimization Flags

C benchmarks:
-W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
-W1,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Benchmarks using both Fortran and C:
-W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
-W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -L/usr/local/je5.0.1-64/lib -ljemalloc
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### Peak Compiler Invocation

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

**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
```

### Peak Portability Flags

Same as Base Portability Flags

### 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: basepeak = yes

**Fortran benchmarks:**

603.bwaves.s: basepeak = yes

649.fotonik3d.s: basepeak = yes

654.roms.s: basepeak = yes

**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

(Continued on next page)
Huawei CH225 V5 (Intel Xeon Silver 4116)

SPECspeed2017_fp_peak = 79.6
SPECspeed2017_fp_base = 78.5

Peak Optimization Flags (Continued)

627.cam4_s: -xCORE-AVX2 -ipo -03 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

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/Intel-ic18.0-official-linux64.2017-12-21.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 2018-09-19 05:25:29-0400.
Originally published on 2018-10-16.