Huawei 2288H V5 (Intel Xeon Platinum 8276M)

<table>
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<th>SPECspeed2017_fp_peak</th>
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<tr>
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<td>56</td>
<td>177</td>
</tr>
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<td>607.cactuBSSN_s</td>
<td>56</td>
<td>104</td>
</tr>
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<td>118</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>56</td>
<td>118</td>
</tr>
<tr>
<td>627.imagick_s</td>
<td>56</td>
<td>153</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>56</td>
<td>282</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>56</td>
<td>91.1</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>56</td>
<td>160</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** Intel Xeon Platinum 8276M
- **Max MHz.:** 4000
- **Nominal:** 2200
- **Enabled:** 56 cores, 2 chips
- **Orderable:** 1, 2 cores
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 1 MB I+D on chip per core
- **L3:** 38.5 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
- **Other:** None

## 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 6.52 Released Mar-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 Platinum 8276M)

SPECspeed2017 fp_base = 147
SPECspeed2017 fp_peak = 148

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds Base</th>
<th>Ratio</th>
<th>Seconds Peak</th>
<th>Ratio</th>
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<th>Ratio</th>
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</tr>
</tbody>
</table>

SPECspeed2017 fp_base = 147
SPECspeed2017 fp_peak = 148

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"
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)
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Huawei 2288H V5 (Intel Xeon Platinum 8276M)

SPECspeed2017_fp_base = 147
SPECspeed2017_fp_peak = 148

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

Platform Notes (Continued)

XPT Prefetch Set to Enabled
Sysinfo program /spec2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on sles12sp4 Tue Apr 16 20:57:32 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) Platinum 8276M CPU @ 2.20GHz
  2 "physical id"s (chips)
  56 "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: 28
siblings: 28
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8276M CPU @ 2.20GHz
Stepping: 7
CPU MHz: 2200.000
CPU max MHz: 4000.000
CPU min MHz: 1000.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-27

(Continued on next page)
Huawei

Huawei 2288H V5 (Intel Xeon Platinum 8276M)

SPEC CPU2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECspeed2017_fp_base = 147
SPECspeed2017_fp_peak = 148

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

Platform Notes (Continued)

NUMA node1 CPU(s): 28-55
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 rdtsscp
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
xtrr pdcm 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 vni flexpriority ept vpid
fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdт_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsaves cgм_llc cgм_occup_llc cgм_mbm_total cgм_mbm_local
dtherm ida arat pln pts pkv ospke avx512_vnni flush_l1d arch_capabilities

/proccpuinfo cache data
  cache size : 39424 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 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
  node 0 size: 191931 MB
  node 0 free: 191322 MB
  node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
   53 54 55
  node 1 size: 193249 MB
  node 1 free: 191910 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 394425772 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"

(Continued on next page)
Huawei

Huawei 2288H V5 (Intel Xeon Platinum 8276M)

SPECspeed2017_fp_base = 147
SPECspeed2017_fp_peak = 148

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

Platform Notes (Continued)

PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
ID="sles"
ANSI_COLOR="0;32"
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 Apr 16 16:17

SPEC is set to: /spec2017
/dev/sda3      xfs   700G   14G  687G   2% /

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. 6.52 03/16/2019
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,
## SPEC CPU2017 Floating Point Speed Result

**Huawei**  
Huawei 2288H V5 (Intel Xeon Platinum 8276M)

### SPECspeed2017_fp_base = 147

### SPECspeed2017_fp_peak = 148

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<th>3175</th>
<th>Test Date:</th>
<th>Apr-2019</th>
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<td>Huawei</td>
<td>Hardware Availability:</td>
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<td>Tested by:</td>
<td>Huawei</td>
<td>Software Availability:</td>
<td>Dec-2018</td>
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</table>

### 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) 64,  
Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC  603.bwaves_s(peak) 649.fotonik3d_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.

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

==============================================================================
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  
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Huawei

Huawei 2288H V5 (Intel Xeon Platinum 8276M)

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</table>

**Base 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
```

**Base Portability Flags**

```bash
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
```

Fortran benchmarks:

```bash
-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:

```bash
-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)
### SPEC CPU2017 Floating Point Speed Result

**Huawei**

**Huawei 2288H V5 (Intel Xeon Platinum 8276M)**

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

#### 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 -n ostandard-realloc-lhs

649.fotonik3d_s: basepeak = yes

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 2288H V5 (Intel Xeon Platinum 8276M)

**SPECspeed2017_fp_base = 147**

**SPECspeed2017_fp_peak = 148**

**Peak Optimization Flags (Continued)**

654.roms_s (continued):
-`-qopenmp -nostandard-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 -nostandard-realloc-lhs`

627.cam4_s: `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -openmp -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/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.