Huawei

Huawei 2288H V5 (Intel Xeon Platinum 8160)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>216</td>
</tr>
</tbody>
</table>

**CPU2017 License**: 3175  
**Test Sponsor**: Huawei  
**Hardware Availability**: Jul-2017

**Tested by**: Huawei  
**Software Availability**: Sep-2017

**Test Date**: Dec-2017

---

### Hardware

- **CPU Name**: Intel Xeon Platinum 8160  
- **Max MHZ.**: 3700  
- **Nominal**: 2100  
- **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**: 33 MB I+D on chip per chip  
- **Memory**: 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage**: 1 x 1200 GB SAS, 10000 RPM

### Software

- **OS**: Red Hat Enterprise Linux Server release 7.3 (Maipo)  
- **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

- **Parallel**: No  
- **Firmware**: Version 0.31 Released Sep-2017  
- **File System**: xfs

- **System State**: Run level 3 (multi-user)

- **Base Pointers**: 64-bit
- **Peak Pointers**: 64-bit
- **Other**: None
SPEC CPU2017 Floating Point Rate Result

Huawei 2288H V5 (Intel Xeon Platinum 8160)

SPECrate2017_fp_base = 211
SPECrate2017_fp_peak = 216

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<th>Ratio</th>
<th>Seconds</th>
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<td>503.bwaves_r</td>
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<td>494</td>
<td>1950</td>
<td>494</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>588</td>
<td>207</td>
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<tr>
<td>508.namd_r</td>
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<td>171</td>
<td>532</td>
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<td>120</td>
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<td>119</td>
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<td>521.wrf_r</td>
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<td>526.blender_r</td>
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<td>549.fotonik3d_r</td>
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<td>94.9</td>
<td>1600</td>
<td>95.3</td>
<td>1608</td>
<td>94.9</td>
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SPECrate2017_fp_base = 211
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.

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:

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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
(Continued on next page)
General Notes (Continued)

is mitigated in the system as tested and documented.
No: 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.
No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes

BIOS configuration:
Power Policy Set to Performance
SNC Set to Enabled
IMC Interleaving Set to 1-way Interleave
XPT Prefetch Set to Enabled
Sysinfo program /spec2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bccc091c0f
running on localhost.localdomain Wed Dec 27 09:31:28 2017

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 8160 CPU @ 2.10GHz
  2 "physical id"s (chips)
  96 "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 : 24
  siblings : 48
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
  physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

(Continued on next page)
Huawei

Huawei 2288H V5 (Intel Xeon Platinum 8160)

SPEC CPU2017 Floating Point Rate Result

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Huawei 2288H V5 (Intel Xeon Platinum 8160)

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CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei
Test Date: Dec-2017
Hardware Availability: Jul-2017
Software Availability: Sep-2017

Platform Notes (Continued)

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8160 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2100.000
BogoMIPS: 4204.23
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 33792K
NUMA node0 CPU(s): 0-2,6-8,12-14,18-20,48-50,54-56,60-62,66-68
NUMA node1 CPU(s): 3-5,9-11,15-17,21-23,51-53,57-59,63-65,69-71
NUMA node2 CPU(s): 24-26,30-32,36-38,42-44,72-74,78-80,84-86,90-92
NUMA node3 CPU(s): 27-29,33-35,39-41,45-47,75-77,81-83,87-89,93-95

/proc/cpuinfo cache data
  cache size: 33792 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0 1 2 6 7 8 12 13 14 18 19 20 48 49 50 54 55 56 60 61 62 66 67 68
  node 0 size: 96405 MB
  node 0 free: 93255 MB
  node 1 cpus: 3 4 5 9 10 11 15 16 17 21 22 23 51 52 53 57 58 59 63 64 65 69 70 71
  node 1 size: 98304 MB
  node 1 free: 95442 MB
  node 2 cpus: 24 25 26 30 31 32 36 37 38 42 43 44 72 73 74 78 79 80 84 85 86 90 91 92
  node 2 size: 98304 MB
  node 2 free: 94666 MB
  node 3 cpus: 27 28 29 33 34 35 39 40 41 45 46 47 75 76 77 81 82 83 87 88 89 93 94 95
  node 3 size: 98304 MB
  node 3 free: 95400 MB
  node distances:
  node 0 1 2 3

(Continued on next page)
Huawei
Huawei 2288H V5 (Intel Xeon Platinum 8160)

| SPECrate2017_fp_base | 211 |
| SPECrate2017_fp_peak | 216 |

CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Dec-2017
CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Dec-2017

<table>
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<th>Platform Notes (Continued)</th>
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<tbody>
<tr>
<td>0: 10 11 21 21</td>
</tr>
<tr>
<td>1: 11 10 21 21</td>
</tr>
<tr>
<td>2: 21 21 10 11</td>
</tr>
<tr>
<td>3: 21 21 11 10</td>
</tr>
</tbody>
</table>

From /proc/meminfo
MemTotal: 394144696 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.3 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="7.3"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.3 (Maipo)"
ANSI_COLOR="0;31"
CPE_NAME="cpe:/o:redhat:enterprise_linux:7.3:GA:server"
redhat-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)

uname -a:
Linux localhost.localdomain 3.10.0-514.el7.x86_64 #1 SMP Wed Oct 19 11:24:13 EDT 2016
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Dec 26 00:45

SPEC is set to: /spec2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 859G 48G 812G 6% /

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. 0.31 09/29/2017

Memory:
24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666

(End of data from sysinfo program)
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CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Dec-2017
Tested by: Huawei
Hardware Availability: Jul-2017
Software Availability: Sep-2017

Compiler Version Notes

==============================================================================
CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CC  519.lbm_r(peak) 544.nab_r(peak)
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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base)
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icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CXXC 508.namd_r(peak) 510.parest_r(peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CC  511.povray_r(base) 526.blender_r(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.
==============================================================================
CC  511.povray_r(peak) 526.blender_r(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.
==============================================================================

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CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Dec-2017
Hardware Availability: Jul-2017
Tested by: Huawei
Software Availability: Sep-2017

Compiler Version Notes (Continued)

FC 507.cactuBSSN_r(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.

FC 507.cactuBSSN_r(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 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)

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

FC 554.roms_r(peak)

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

CC 521.wrf_r(base) 527.cam4_r(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 521.wrf_r(peak) 527.cam4_r(peak)

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SPEC CPU2017 Floating Point Rate Result

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Hardware Availability: Jul-2017
Software Availability: Sep-2017

Compiler Version Notes (Continued)

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.

Base Compiler Invocation

C benchmarks:
iccc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519 lavoro_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64
Huawei
Huawei 2288H V5 (Intel Xeon Platinum 8160)

SPEC CPU2017 Floating Point Rate Result

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Test Sponsor: Huawei
Tested by: Huawei

Test Date: Dec-2017
Hardware Availability: Jul-2017
Software Availability: Sep-2017

Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

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

Benchmarks using both C and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

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

Base Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

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

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

Benchmarks using Fortran, C, and C++:
-m64 -std=c11
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CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3

544.nab_r: Same as 519.lbm_r

C++ benchmarks:

-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Fortran benchmarks:

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

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</table>

### Peak Optimization Flags (Continued)

503.bwaves_r: basepeak = yes

549.fotonik3d_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

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

Benchmarks using both Fortran and C:
- prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
- prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3

Benchmarks using Fortran, C, and C++:
507.cactuBSSN_r: basepeak = yes

### Peak Other Flags

C benchmarks:
- m64 -std=c11

C++ benchmarks:
- m64

Fortran benchmarks:
- m64

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

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

Benchmarks using Fortran, C, and C++:
- m64 -std=c11
## SPEC CPU2017 Floating Point Rate Result

### Huawei

**Huawei 2288H V5 (Intel Xeon Platinum 8160)**

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| Tested by:         | Huawei         |
| Test Date:         | Dec-2017       |
| Hardware Availability: | Jul-2017    |
| Software Availability: | Sep-2017    |

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](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/Intel-ic18.0-official-linux64.xml)

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