**SPEC® CPU2017 Floating Point Rate Result**

**Huawei**

**Huawei 2288H V5 (Intel Xeon Gold 6144)**

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
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<td>503.bwaves_r</td>
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<td>507.cactuBSSN_r</td>
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</table>

**CPU2017 License:** 3175

**Test Sponsor:** Huawei

**Hardware**

- **CPU Name:** Intel Xeon Gold 6144
- **Max MHz.:** 4200
- **Nominal:** 3500
- **Enabled:** 16 cores, 2 chips, 2 threads/core
- **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:** 24.75 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
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux Server release 7.4 (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 0.62 Released Mar-2018
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

**Test Date:** Jul-2018

**Hardware Availability:** Jul-2017

**Software Availability:** Jan-2018

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SPEC CPU2017 Floating Point Rate Result

Huawei
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SPECrate2017_fp_base = 132
SPECrate2017_fp_peak = 135

Results Table

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</tr>
</tbody>
</table>

SPECrate2017_fp_base = 132
SPECrate2017_fp_peak = 135

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:
LD_LIBRARY_PATH = ""/spec2017/lib/ia32:/spec2017/lib/intel64:/spec2017/je5.0.1-32:/spec2017/je5.0.1-64"

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>
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

(Continued on next page)
Huawei

Huawei 2288H V5 (Intel Xeon Gold 6144)

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CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Jul-2018
Tested by: Huawei
Software Availability: Jan-2018

General Notes (Continued)

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 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 96c45e4568ad54c135fd618bcc091c0f
running on localhost.localdomain Fri Jul 6 21:29:35 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) Gold 6144 CPU @ 3.50GHz
      2 "physical id"s (chips)
      32 "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 : 16
        physical 0: cores 0 1 2 3 10 11 24 27
        physical 1: cores 0 4 5 6 16 19 20 22

From lscpu:
   Architecture:      x86_64
   CPU op-mode(s):    32-bit, 64-bit
   Byte Order:        Little Endian
   CPU(s):            32
   On-line CPU(s) list: 0-31
   Thread(s) per core: 2
   Core(s) per socket: 8
   Socket(s):         2
   NUMA node(s):      4
   Vendor ID:         GenuineIntel
   CPU family:        6
   Model:             85
   Model name:        Intel(R) Xeon(R) Gold 6144 CPU @ 3.50GHz
   Stepping:          4

(Continued on next page)
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CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

- **CPU MHz:** 3500.000
- **BogoMIPS:** 7000.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 25344K
- **NUMA node0 CPU(s):** 0-2,6,16-18,22
- **NUMA node1 CPU(s):** 3-5,7,19-21,23
- **NUMA node2 CPU(s):** 8,9,12,13,24,25,28,29
- **NUMA node3 CPU(s):** 10,11,14,15,26,27,30,31
- **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
- **aperfmperf eagerfpu pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 fma cx16 xtpr
- **pcd pdcm pcid 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 vnmi flexpriority ept vpid fsgsbase tsc_adjust
- **bmi1 hle avx2 smep bmi2 ets invpcid rtm cm3 mpx rdt_a avx512f avx512dq rdseed adx
- **smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cqm_llc
- **cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts

```
/proc/cpuinfo cache data
  cache size : 25344 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 16 17 18 22
    node 0 size: 96437 MB
    node 0 free: 93560 MB
    node 1 cpus: 3 4 5 7 19 20 21 23
    node 1 size: 98304 MB
    node 1 free: 95649 MB
    node 2 cpus: 8 9 12 13 24 25 28 29
    node 2 size: 98304 MB
    node 2 free: 95679 MB
    node 3 cpus: 10 11 14 15 26 27 30 31
    node 3 size: 98304 MB
    node 3 free: 95474 MB
    node distances:
      node 0 1 2 3
       0: 10 11 21 21
       1: 11 10 21 21
       2: 21 21 10 11
       3: 21 21 11 10
```
(Continued on next page)
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SPECrate2017_fp_base = 132
SPECrate2017_fp_peak = 135

CPU2017 License: 3175
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Test Date: Jul-2018
Tested by: Huawei
Hardware Availability: Jul-2017
Software Availability: Jan-2018

Platform Notes (Continued)

From /proc/meminfo
   MemTotal:       394174484 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:
   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 Jul 5 16:56

SPEC is set to: /spec2017
   Filesystem            Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-root xfs   1.8T   34G  1.8T   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. 0.62 03/26/2018
   Memory:
   24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666

(End of data from sysinfo program)

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.

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Huawei 2288H V5 (Intel Xeon Gold 6144) SPECrate2017_fp_base = 132
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Compiler Version Notes (Continued)

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Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base)
==============================================================================
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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CXXC 508.namd_r(peak) 510.parest_r(peak)
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icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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CC  511.povray_r(base) 526.blender_r(base)
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icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
iccc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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FC  507.cactuBSSN_r(base)
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iccc (ICC) 18.0.0 20170811
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Compiler Version Notes (Continued)

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

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FC 507.cactusBSSN_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.

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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.

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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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### Base 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

### 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.lbm_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

### 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

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
-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
Huawei 2288H V5 (Intel Xeon Gold 6144)

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Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
afort

Benchmarks using both Fortran and C:
afort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc iccafort

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

353.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:

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Tested by: Huawei

Test Date: Jul-2018
Hardware Availability: Jul-2017
Software Availability: Jan-2018

Peak Optimization Flags (Continued)

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

549.fotonik3d_r: basepeak = yes

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++:
-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

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

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Huawei

Huawei 2288H V5 (Intel Xeon Gold 6144)

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Peak Other Flags (Continued)

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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