SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

Huawei

Huawei 5288 V5 (Intel Xeon Gold 6140)

SPECrate2017_fp_base =   184

SPECrate2017_fp_peak =   188
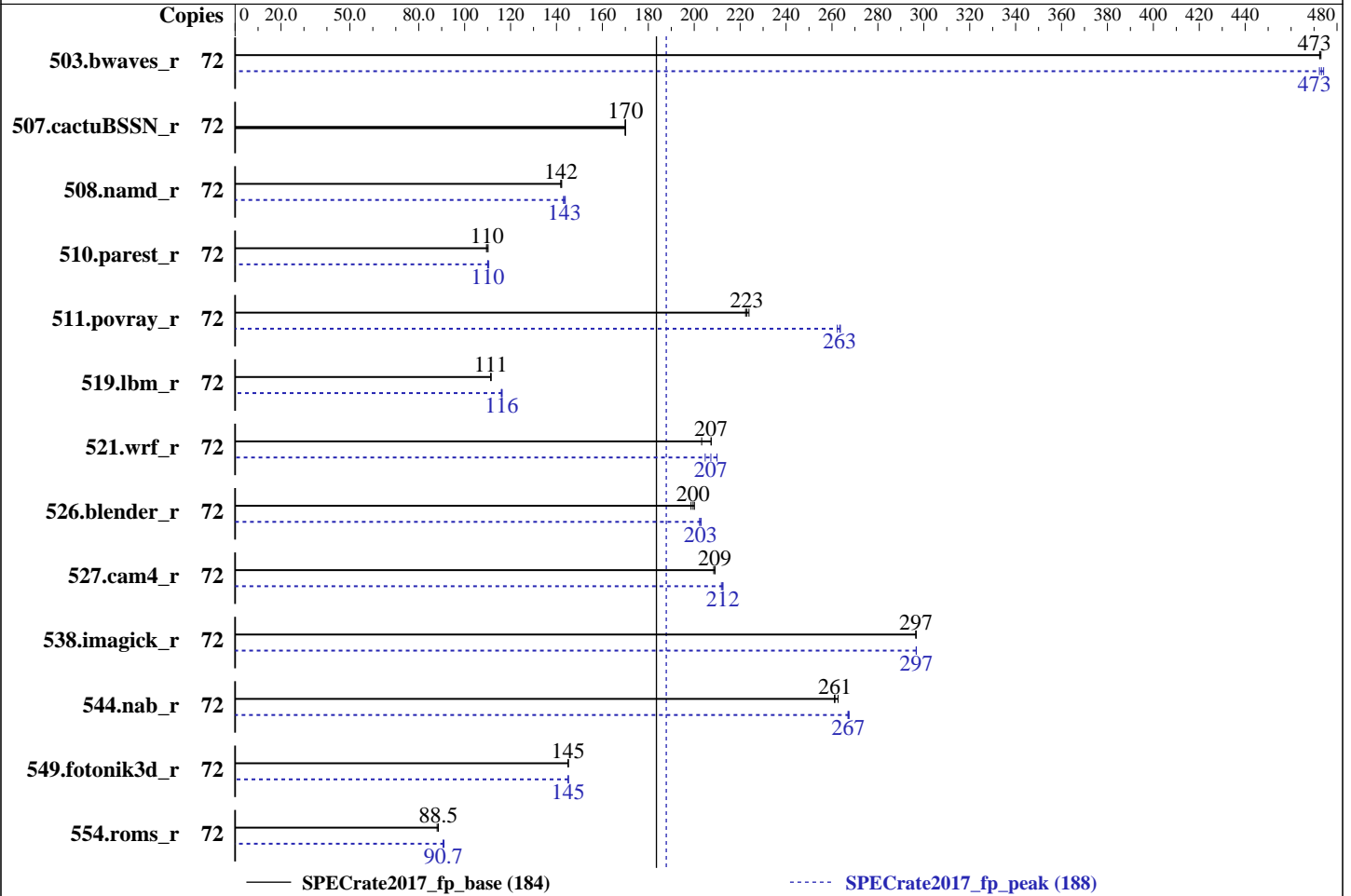
CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

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

Copies		
503.bwaves_r	72	473 / 473
507.cactuBSSN_r	72	170
508.namd_r	72	142 / 143
510.parest_r	72	110 / 110
511.povray_r	72	223 / 263
519.lbm_r	72	111 / 116
521.wrf_r	72	207 / 207
526.blender_r	72	200 / 203
527.cam4_r	72	209 / 212
538.imagick_r	72	297 / 297
544.nab_r	72	261 / 267
549.fotonik3d_r	72	145 / 145
554.roms_r	72	88.5 / 90.7

—— SPECrate2017_fp_base (184)   ······ SPECrate2017_fp_peak (188)

Hardware

CPU Name: Intel Xeon Gold 6140
 Max MHz.:   3700
 Nominal: 2300
Enabled: 36 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
 Other: None
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)
 3.10.0-693.11.6.el7.x86_64
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 Apr-2018
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	72	**1528**	**473**	1528	472	1526	473	72	1523	474	1529	472	**1526**	**473**
507.cactuBSSN_r	72	536	170	**536**	**170**	537	170	72	536	170	**536**	**170**	537	170
508.namd_r	72	**482**	**142**	481	142	482	142	72	478	143	476	144	**477**	**143**
510.parest_r	72	1709	110	**1715**	**110**	1720	110	72	**1712**	**110**	1704	111	1712	110
511.povray_r	72	751	224	756	222	**754**	**223**	72	641	262	638	264	**638**	**263**
519.lbm_r	72	682	111	681	112	**681**	**111**	72	**653**	**116**	654	116	652	116
521.wrf_r	72	778	207	**778**	**207**	794	203	72	**778**	**207**	768	210	788	205
526.blender_r	72	552	199	**550**	**200**	548	200	72	542	202	540	203	**541**	**203**
527.cam4_r	72	602	209	**603**	**209**	604	208	72	594	212	**593**	**212**	593	212
538.imagick_r	72	**604**	**297**	604	297	604	297	72	604	297	603	297	**603**	**297**
544.nab_r	72	**464**	**261**	464	261	461	263	72	453	267	454	267	**454**	**267**
549.fotonik3d_r	72	1935	145	1933	145	**1933**	**145**	72	1934	145	**1933**	**145**	1933	145
554.roms_r	72	1300	88.0	**1292**	**88.5**	1292	88.5	72	1263	90.6	1257	91.0	**1262**	**90.7**
SPECrate2017_fp_base =		**184**												
SPECrate2017_fp_peak =		**188**												

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)

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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 Mon May 14 21:14:09 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 6140 CPU @ 2.30GHz
      2  "physical id"s (chips)
      72 "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 : 18
      siblings  : 36
      physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:
     Architecture:          x86_64
     CPU op-mode(s):        32-bit, 64-bit
     Byte Order:            Little Endian
     CPU(s):                72
     On-line CPU(s) list:   0-71
     Thread(s) per core:    2
     Core(s) per socket:    18
     Socket(s):             2
     NUMA node(s):          4
     Vendor ID:             GenuineIntel
     CPU family:            6
     Model:                 85
     Model name:            Intel(R) Xeon(R) Gold 6140 CPU @ 2.30GHz
     Stepping:              4
```

(Continued on next page)

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Platform Notes (Continued)

```
            CPU MHz:                2300.000
            BogoMIPS:               4600.00
            Virtualization:         VT-x
            L1d cache:              32K
            L1i cache:              32K
            L2 cache:               1024K
            L3 cache:               25344K
            NUMA node0 CPU(s):      0-2,5,6,9,10,14,15,36-38,41,42,45,46,50,51
            NUMA node1 CPU(s):      3,4,7,8,11-13,16,17,39,40,43,44,47-49,52,53
            NUMA node2 CPU(s):      18-20,23,24,27,28,32,33,54-56,59,60,63,64,68,69
            NUMA node3 CPU(s):      21,22,25,26,29-31,34,35,57,58,61,62,65-67,70,71
            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
        aperfmperf eagerfpu pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 fma cx16 xtpr
        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 erms invpcid rtm cqm 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 5 6 9 10 14 15 36 37 38 41 42 45 46 50 51
      node 0 size: 96437 MB
      node 0 free: 93662 MB
      node 1 cpus: 3 4 7 8 11 12 13 16 17 39 40 43 44 47 48 49 52 53
      node 1 size: 98304 MB
      node 1 free: 95882 MB
      node 2 cpus: 18 19 20 23 24 27 28 32 33 54 55 56 59 60 63 64 68 69
      node 2 size: 98304 MB
      node 2 free: 95917 MB
      node 3 cpus: 21 22 25 26 29 30 31 34 35 57 58 61 62 65 66 67 70 71
      node 3 size: 98304 MB
      node 3 free: 95354 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
```

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Tested by:	Huawei	**Software Availability:**	Jan-2018

Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:        394174812 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 May 14 20:28

SPEC is set to: /spec2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda2       xfs   781G   30G  752G   4% /

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 04/03/2018
   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.
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------

==========================================================================
CC   519.lbm_r(peak) 544.nab_r(peak)
--------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
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.
--------------------------------------------------------------------------

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

==========================================================================
 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
```

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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.
------------------------------------------------------------------------------


==============================================================================
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)
------------------------------------------------------------------------------
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------------------------------------------------------------------------------


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CC   521.wrf_r(peak) 527.cam4_r(peak)
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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
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```

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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`

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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)

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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: `Same as 503.bwaves_r`

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`

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Test Sponsor: Huawei

Tested by: Huawei

Test Date: May-2018

Hardware Availability: Jul-2017

Software Availability: Jan-2018

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/Huawei-Platform-Settings-SKL-V1.9-revC.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`

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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