



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Huawei

SPECrate2017\_fp\_base = 45.8

### Huawei 2288 V5 (Intel Xeon Bronze 3104)

SPECrate2017\_fp\_peak = 46.8

CPU2017 License: 3175

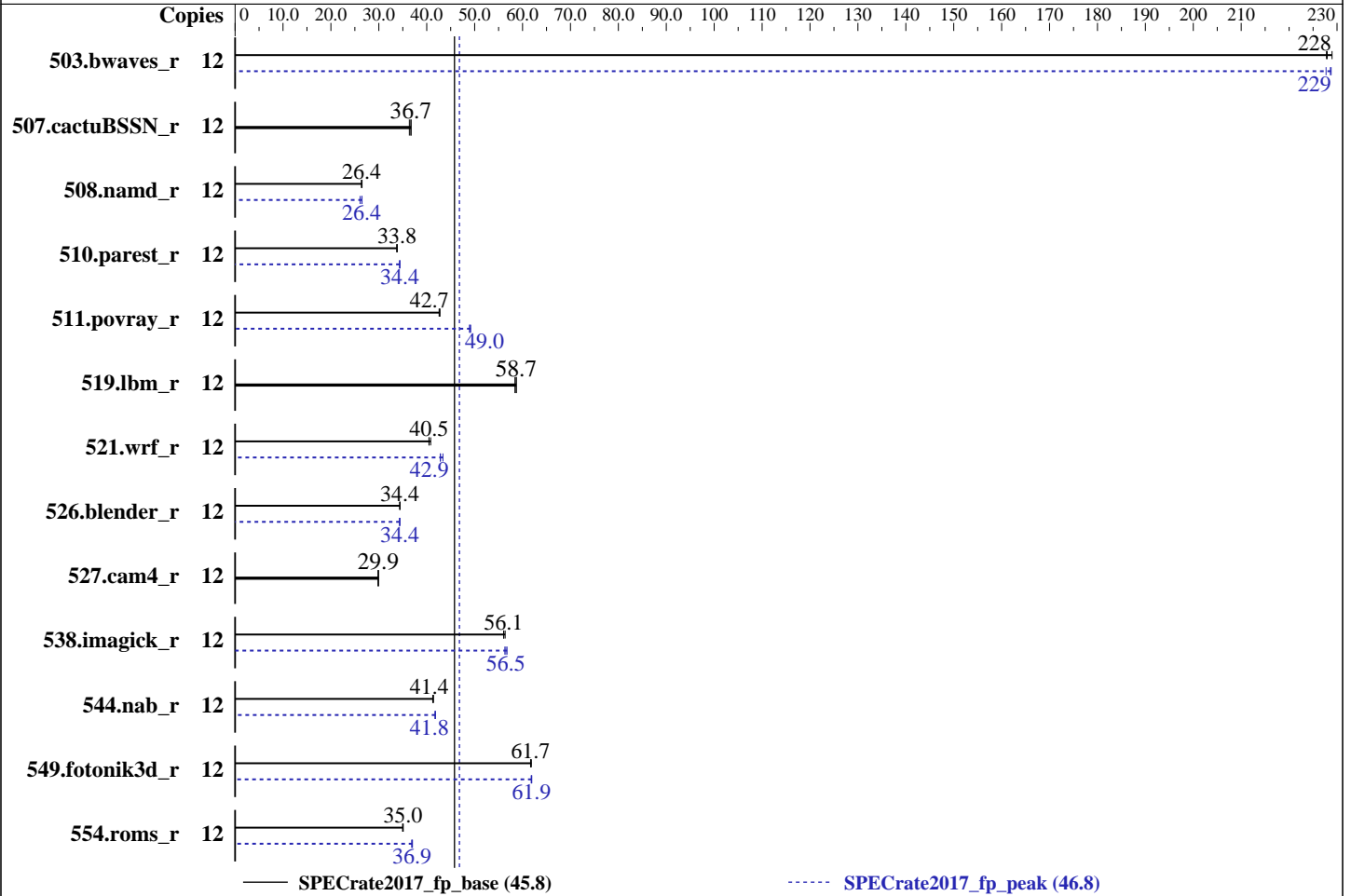
Test Sponsor: Huawei

Tested by: Huawei

Test Date: Jul-2018

Hardware Availability: Sep-2018

Software Availability: Jan-2018



### Hardware

CPU Name: Intel Xeon Bronze 3104  
 Max MHz.: 1700  
 Nominal: 1700  
 Enabled: 12 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: 8.25 MB I+D on chip per chip  
 Other: None  
 Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R, running at 2133)  
 Storage: 1 x 2000 GB SATA, 7200 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 0.52 Released Jul-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	12	<b>528</b>	<b>228</b>	526	229	528	228	12	528	228	<b>526</b>	<b>229</b>	526	229
507.cactuBSSN_r	12	414	36.7	418	36.4	<b>414</b>	<b>36.7</b>	12	414	36.7	418	36.4	<b>414</b>	<b>36.7</b>
508.namd_r	12	<b>432</b>	<b>26.4</b>	432	26.4	430	26.5	12	<b>431</b>	<b>26.4</b>	430	26.5	437	26.1
510.parest_r	12	930	33.7	927	33.9	<b>929</b>	<b>33.8</b>	12	913	34.4	<b>913</b>	<b>34.4</b>	914	34.3
511.povray_r	12	658	42.6	655	42.8	<b>657</b>	<b>42.7</b>	12	570	49.2	<b>572</b>	<b>49.0</b>	572	49.0
519.lbm_r	12	<b>216</b>	<b>58.7</b>	216	58.7	217	58.4	12	<b>216</b>	<b>58.7</b>	216	58.7	217	58.4
521.wrf_r	12	664	40.5	658	40.8	<b>664</b>	<b>40.5</b>	12	620	43.4	<b>627</b>	<b>42.9</b>	628	42.8
526.blender_r	12	531	34.4	<b>531</b>	<b>34.4</b>	531	34.4	12	532	34.3	<b>532</b>	<b>34.4</b>	531	34.4
527.cam4_r	12	703	29.8	<b>702</b>	<b>29.9</b>	701	29.9	12	703	29.8	<b>702</b>	<b>29.9</b>	701	29.9
538.imagick_r	12	532	56.1	529	56.4	<b>532</b>	<b>56.1</b>	12	530	56.3	526	56.8	<b>528</b>	<b>56.5</b>
544.nab_r	12	488	41.4	<b>488</b>	<b>41.4</b>	490	41.3	12	<b>484</b>	<b>41.8</b>	483	41.8	484	41.7
549.fotonik3d_r	12	756	61.8	<b>758</b>	<b>61.7</b>	758	61.7	12	<b>756</b>	<b>61.9</b>	755	61.9	757	61.8
554.roms_r	12	546	35.0	543	35.1	<b>544</b>	<b>35.0</b>	12	<b>516</b>	<b>36.9</b>	517	36.9	515	37.0

SPECrate2017\_fp\_base = 45.8

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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:  
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.

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**CPU2017 License:** 3175  
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**Tested by:** Huawei

**Test Date:** Jul-2018  
**Hardware Availability:** Sep-2018  
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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  
Sysinfo program /spec2017/bin/sysinfo  
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f  
running on localhost.localdomain Mon Jul 23 17:43:01 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) Bronze 3104 CPU @ 1.70GHz  
2 "physical id"s (chips)  
12 "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 : 6  
siblings : 6  
physical 0: cores 0 1 2 3 4 5  
physical 1: cores 0 1 2 3 4 5

From lscpu:  
Architecture: x86\_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 12  
On-line CPU(s) list: 0-11  
Thread(s) per core: 1  
Core(s) per socket: 6  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Bronze 3104 CPU @ 1.70GHz  
Stepping: 4  
CPU MHz: 1700.000  
BogoMIPS: 3400.00  
Virtualization: VT-x

(Continued on next page)



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### Platform Notes (Continued)

L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 8448K  
NUMA node0 CPU(s): 0-5  
NUMA node1 CPU(s): 6-11

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 arat pln pts

```
/proc/cpuinfo cache data
cache size : 8448 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
node 0 size: 194741 MB
node 0 free: 189515 MB
node 1 cpus: 6 7 8 9 10 11
node 1 size: 196608 MB
node 1 free: 191482 MB
node distances:
node 0 1
0: 10 21
1: 21 10
```

```
From /proc/meminfo
MemTotal: 394174888 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"
```

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### Platform Notes (Continued)

```
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 23 08:27
```

```
SPEC is set to: /spec2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3        xfs   734G   79G  655G  11% /
```

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. 0.52 07/18/2018
Memory:
4x NO DIMM NO DIMM
12x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2133
```

(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.
-----
```

```
=====
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)
-----
```

(Continued on next page)



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### Compiler Version Notes (Continued)

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.

=====  
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  
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Tested by: Huawei

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Hardware Availability: Sep-2018  
Software Availability: Jan-2018

## Compiler Version Notes (Continued)

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)

ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
icc (ICC) 18.0.0 20170811  
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## Base Compiler Invocation

C benchmarks:  
icc

C++ benchmarks:  
icpc

Fortran benchmarks:  
ifort

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## Base Compiler Invocation (Continued)

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  
-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
```

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## Base Optimization Flags (Continued)

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`

## Peak Compiler Invocation

C benchmarks:

`icc`

C++ benchmarks:

`icpc`

Fortran benchmarks:

`ifort`

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## Peak Compiler Invocation (Continued)

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: basepeak = yes
```

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

```
544.nab_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
```

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:

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

```
549.fotonik3d_r: Same as 503.bwaves_r
```

(Continued on next page)



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## Peak Optimization Flags (Continued)

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:

521.wrf\_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

527.cam4\_r: basepeak = yes

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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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>

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