



SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR860
(3.20 GHz, Intel Xeon Gold 6146)

SPECrate2017_fp_base = 329

SPECrate2017_fp_peak = 336

CPU2017 License: 9017

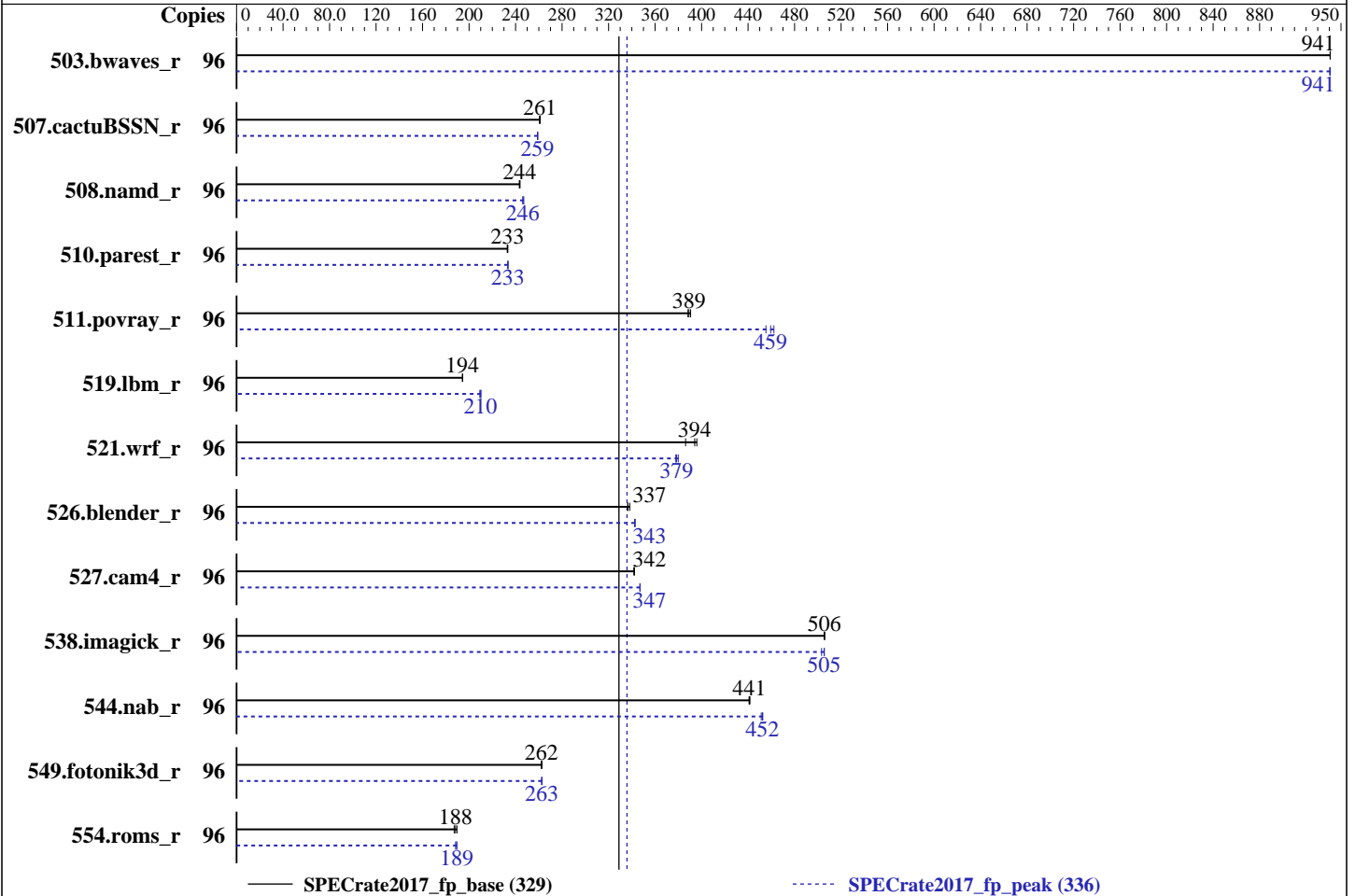
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Aug-2018

Hardware Availability: Nov-2017

Software Availability: May-2018



Hardware

CPU Name: Intel Xeon Gold 6146
 Max MHz.: 4200
 Nominal: 3200
 Enabled: 48 cores, 4 chips, 2 threads/core
 Orderable: 2,4 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: 768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)
 Storage: 1 x 800 GB SAS SSD
 Other: None

Software

OS: Red Hat Enterprise Linux Server release 7.4 (Maipo)
 Kernel 3.10.0-693.25.7.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: Lenovo BIOS Version TEE123N 1.40 released Jun-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	96	1023	941	1023	941	<u>1023</u>	<u>941</u>	96	1024	940	1023	941	<u>1023</u>	<u>941</u>
507.cactuBSSN_r	96	467	261	<u>466</u>	<u>261</u>	465	261	96	470	259	469	259	<u>469</u>	<u>259</u>
508.namd_r	96	375	243	374	244	<u>374</u>	<u>244</u>	96	369	247	<u>370</u>	<u>246</u>	370	246
510.parest_r	96	1079	233	<u>1077</u>	<u>233</u>	1076	233	96	<u>1076</u>	<u>233</u>	1076	233	1076	233
511.povray_r	96	574	391	<u>576</u>	<u>389</u>	577	388	96	485	462	492	455	<u>488</u>	<u>459</u>
519.lbm_r	96	521	194	<u>521</u>	<u>194</u>	520	194	96	481	210	484	209	<u>482</u>	<u>210</u>
521.wrf_r	96	543	396	<u>546</u>	<u>394</u>	557	386	96	<u>568</u>	<u>379</u>	566	380	569	378
526.blender_r	96	432	338	435	336	<u>434</u>	<u>337</u>	96	427	343	427	342	<u>427</u>	<u>343</u>
527.cam4_r	96	491	342	<u>491</u>	<u>342</u>	491	342	96	484	347	<u>484</u>	<u>347</u>	484	347
538.imagick_r	96	472	506	472	505	<u>472</u>	<u>506</u>	96	474	503	<u>472</u>	<u>505</u>	472	506
544.nab_r	96	<u>366</u>	<u>441</u>	367	441	366	442	96	357	453	<u>357</u>	<u>452</u>	358	451
549.fotonik3d_r	96	<u>1426</u>	<u>262</u>	1426	262	1425	263	96	1426	262	<u>1424</u>	<u>263</u>	1424	263
554.roms_r	96	<u>810</u>	<u>188</u>	805	190	815	187	96	<u>805</u>	<u>189</u>	805	189	810	188

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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 = "/home/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "\$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/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)

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General Notes (Continued)

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:
Choose Operating Mode set to Custom Mode
CPU P-state Control set to None
Page Policy set to Adaptive
C-States set to Legacy
Energy Efficient Turbo set to Disable
Platform Controlled Type set to Maximum Performance
DCU Streamer Prefetcher set to Disable
DCU IP Prefetcher set to Disable
SNC set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on SR860 Fri Aug 10 22:24:19 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 6146 CPU @ 3.20GHz
4 "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 : 12
siblings : 24
physical 0: cores 0 1 2 3 9 10 16 18 19 24 26 27
physical 1: cores 0 1 3 9 10 16 18 19 24 25 26 27
physical 2: cores 0 1 2 3 4 9 10 16 18 19 25 26
physical 3: cores 0 1 2 3 8 9 10 11 18 19 24 27

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

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Platform Notes (Continued)

```

Core(s) per socket: 12
Socket(s): 4
NUMA node(s): 8
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6146 CPU @ 3.20GHz
Stepping: 4
CPU MHz: 3200.000
BogoMIPS: 6400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-2,4,6,9,48-50,52,54,57
NUMA node1 CPU(s): 3,5,7,8,10,11,51,53,55,56,58,59
NUMA node2 CPU(s): 12,13,15,17,20,21,60,61,63,65,68,69
NUMA node3 CPU(s): 14,16,18,19,22,23,62,64,66,67,70,71
NUMA node4 CPU(s): 24-26,29,31,34,72-74,77,79,82
NUMA node5 CPU(s): 27,28,30,32,33,35,75,76,78,80,81,83
NUMA node6 CPU(s): 36-38,40,41,46,84-86,88,89,94
NUMA node7 CPU(s): 39,42-45,47,87,90-93,95
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
aperfmpperf eagerfpu pni pclmulqdq dtes64 monitor 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 fl6c rdrand lahf_lm abm 3dnowprefetch epb cat_l3 cdp_l3 invpcid_single
intel_pt 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 ibpb ibrs stibp dtherm ida arat pln pts spec_ctrl
intel_stibp ssbd

```

```

/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: 8 nodes (0-7)
node 0 cpus: 0 1 2 4 6 9 48 49 50 52 54 57
node 0 size: 97981 MB
node 0 free: 95443 MB
node 1 cpus: 3 5 7 8 10 11 51 53 55 56 58 59
node 1 size: 98304 MB
node 1 free: 95929 MB

```

(Continued on next page)



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Platform Notes (Continued)

```

node 2 cpus: 12 13 15 17 20 21 60 61 63 65 68 69
node 2 size: 98304 MB
node 2 free: 95943 MB
node 3 cpus: 14 16 18 19 22 23 62 64 66 67 70 71
node 3 size: 98304 MB
node 3 free: 95880 MB
node 4 cpus: 24 25 26 29 31 34 72 73 74 77 79 82
node 4 size: 98304 MB
node 4 free: 95934 MB
node 5 cpus: 27 28 30 32 33 35 75 76 78 80 81 83
node 5 size: 98304 MB
node 5 free: 95891 MB
node 6 cpus: 36 37 38 40 41 46 84 85 86 88 89 94
node 6 size: 98304 MB
node 6 free: 95893 MB
node 7 cpus: 39 42 43 44 45 47 87 90 91 92 93 95
node 7 size: 98304 MB
node 7 free: 95817 MB
node distances:
node  0  1  2  3  4  5  6  7
 0: 10 11 21 21 21 21 31 31
 1: 11 10 21 21 21 21 31 31
 2: 21 21 10 11 31 31 21 21
 3: 21 21 11 10 31 31 21 21
 4: 21 21 31 31 10 11 21 21
 5: 21 21 31 31 11 10 21 21
 6: 31 31 21 21 21 21 10 11
 7: 31 31 21 21 21 21 11 10

```

From /proc/meminfo

```

MemTotal:      792250376 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

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Platform Notes (Continued)

```
uname -a:
Linux SR860 3.10.0-693.25.7.el7.x86_64 #1 SMP Sat May 19 04:36:04 UTC 2018 x86_64
x86_64 x86_64 GNU/Linux
```

```
run-level 3 Aug 10 14:23
```

```
SPEC is set to: /home/cpu2017.1.0.2.ic18.0
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sdb4       xfs   686G  198G  489G  29% /home
```

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 Lenovo -[TEE123N-1.40]- 06/12/2018
Memory:
48x 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.  
-----
```

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

(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.

=====
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
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)

(Continued on next page)



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Compiler Version Notes (Continued)

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.
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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
```

(Continued on next page)



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Base Compiler Invocation (Continued)

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

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

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Base Optimization Flags (Continued)

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
```

Benchmarks using both Fortran and C:

```
ifort icc
```

Benchmarks using both C and C++:

```
icpc icc
```

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Peak Compiler Invocation (Continued)

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:

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

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Software Availability: May-2018

Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-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
```

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>

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-H.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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-H.xml>



SPEC CPU2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem SR860
(3.20 GHz, Intel Xeon Gold 6146)

SPECrate2017_fp_base = 329

SPECrate2017_fp_peak = 336

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Aug-2018

Hardware Availability: Nov-2017

Software Availability: May-2018

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