



SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR860
(3.50 GHz, Intel Xeon Gold 6144)

SPECrate2017_fp_base = 254

SPECrate2017_fp_peak = 260

CPU2017 License: 9017

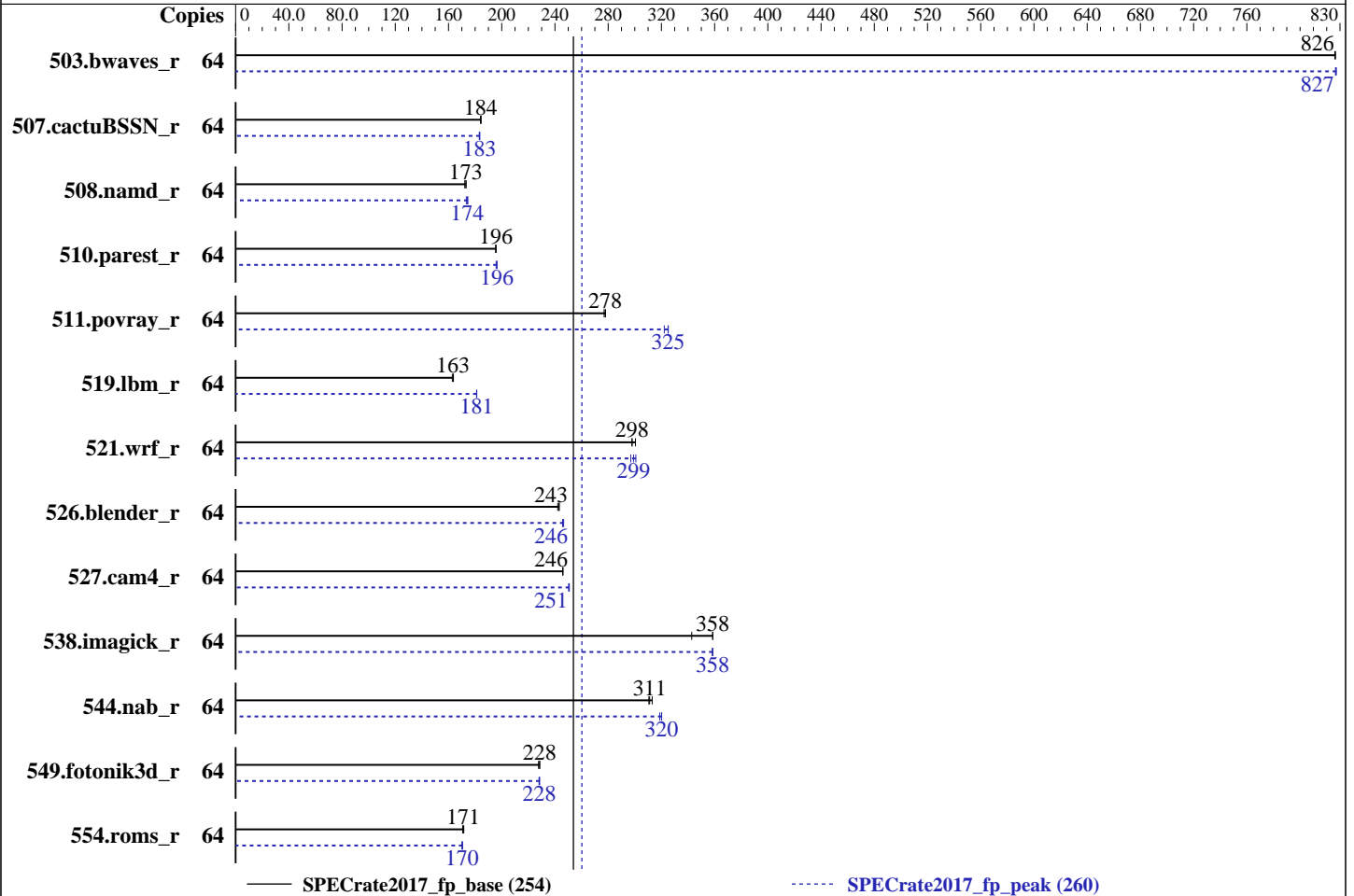
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Jul-2018

Hardware Availability: Nov-2017

Software Availability: May-2018



Hardware

CPU Name: Intel Xeon Gold 6144
 Max MHz.: 4200
 Nominal: 3500
 Enabled: 32 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	64	777	826	<u>777</u>	<u>826</u>	776	827	64	776	827	<u>776</u>	<u>827</u>	776	827
507.cactuBSSN_r	64	440	184	<u>440</u>	<u>184</u>	439	184	64	442	183	441	184	<u>442</u>	<u>183</u>
508.namd_r	64	<u>351</u>	<u>173</u>	353	172	351	173	64	<u>349</u>	<u>174</u>	348	174	351	173
510.parest_r	64	<u>856</u>	<u>196</u>	856	196	856	196	64	855	196	<u>853</u>	<u>196</u>	852	196
511.povray_r	64	540	277	538	278	<u>538</u>	<u>278</u>	64	464	322	460	325	<u>460</u>	<u>325</u>
519.lbm_r	64	<u>413</u>	<u>163</u>	414	163	412	164	64	<u>372</u>	<u>181</u>	372	181	372	181
521.wrf_r	64	477	301	481	298	<u>481</u>	<u>298</u>	64	477	301	<u>479</u>	<u>299</u>	483	297
526.blender_r	64	403	242	401	243	<u>401</u>	<u>243</u>	64	395	247	397	246	<u>396</u>	<u>246</u>
527.cam4_r	64	<u>455</u>	<u>246</u>	455	246	455	246	64	446	251	<u>447</u>	<u>251</u>	447	250
538.imagick_r	64	464	343	444	359	<u>444</u>	<u>358</u>	64	<u>444</u>	<u>358</u>	444	358	444	359
544.nab_r	64	344	313	<u>346</u>	<u>311</u>	347	311	64	338	319	336	320	<u>337</u>	<u>320</u>
549.fotonik3d_r	64	1091	229	1096	228	<u>1092</u>	<u>228</u>	64	1093	228	<u>1093</u>	<u>228</u>	1091	229
554.roms_r	64	596	171	<u>594</u>	<u>171</u>	593	171	64	<u>597</u>	<u>170</u>	598	170	596	171

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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 Thu Jul 19 22:17:15 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
4 "physical id"s (chips)
64 "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 2 3 9 16 19 26 27
physical 2: cores 0 2 3 9 16 19 26 27
physical 3: cores 1 2 3 4 8 18 24 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2

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Platform Notes (Continued)

```

Core(s) per socket:      8
Socket(s):               4
NUMA node(s):           8
Vendor ID:               GenuineIntel
CPU family:              6
Model:                   85
Model name:              Intel(R) Xeon(R) Gold 6144 CPU @ 3.50GHz
Stepping:                4
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):      0-2,6,32-34,38
NUMA node1 CPU(s):      3-5,7,35-37,39
NUMA node2 CPU(s):      8,9,11,12,40,41,43,44
NUMA node3 CPU(s):      10,13-15,42,45-47
NUMA node4 CPU(s):      16,17,19,20,48,49,51,52
NUMA node5 CPU(s):      18,21-23,50,53-55
NUMA node6 CPU(s):      24,25,28,30,56,57,60,62
NUMA node7 CPU(s):      26,27,29,31,58,59,61,63
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 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
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 6 32 33 34 38
node 0 size: 97981 MB
node 0 free: 95498 MB
node 1 cpus: 3 4 5 7 35 36 37 39
node 1 size: 98304 MB
node 1 free: 95891 MB

```

(Continued on next page)



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Platform Notes (Continued)

```

node 2 cpus: 8 9 11 12 40 41 43 44
node 2 size: 98304 MB
node 2 free: 95944 MB
node 3 cpus: 10 13 14 15 42 45 46 47
node 3 size: 98304 MB
node 3 free: 95954 MB
node 4 cpus: 16 17 19 20 48 49 51 52
node 4 size: 98304 MB
node 4 free: 95977 MB
node 5 cpus: 18 21 22 23 50 53 54 55
node 5 size: 98304 MB
node 5 free: 95971 MB
node 6 cpus: 24 25 28 30 56 57 60 62
node 6 size: 98304 MB
node 6 free: 95960 MB
node 7 cpus: 26 27 29 31 58 59 61 63
node 7 size: 98304 MB
node 7 free: 95894 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:      792250348 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

```

(Continued on next page)



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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 Jul 19 14:44

SPEC is set to: /home/cpu2017.1.0.2.ic18.0

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda4        xfs   686G  122G  565G  18% /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)

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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)

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

Base Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

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Base Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

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
```

(Continued on next page)



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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
```

Peak Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

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
```

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Peak Optimization Flags (Continued)

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  
-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
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.html>

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

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.xml>

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



SPEC CPU2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem SR860
(3.50 GHz, Intel Xeon Gold 6144)

SPECrate2017_fp_base = 254

SPECrate2017_fp_peak = 260

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

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Hardware Availability: Nov-2017

Software Availability: May-2018

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

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