



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR650  
(2.20 GHz, Intel Xeon Silver 4114)

**SPECrate2017\_fp\_base = 103**

**SPECrate2017\_fp\_peak = 104**

CPU2017 License: 9017

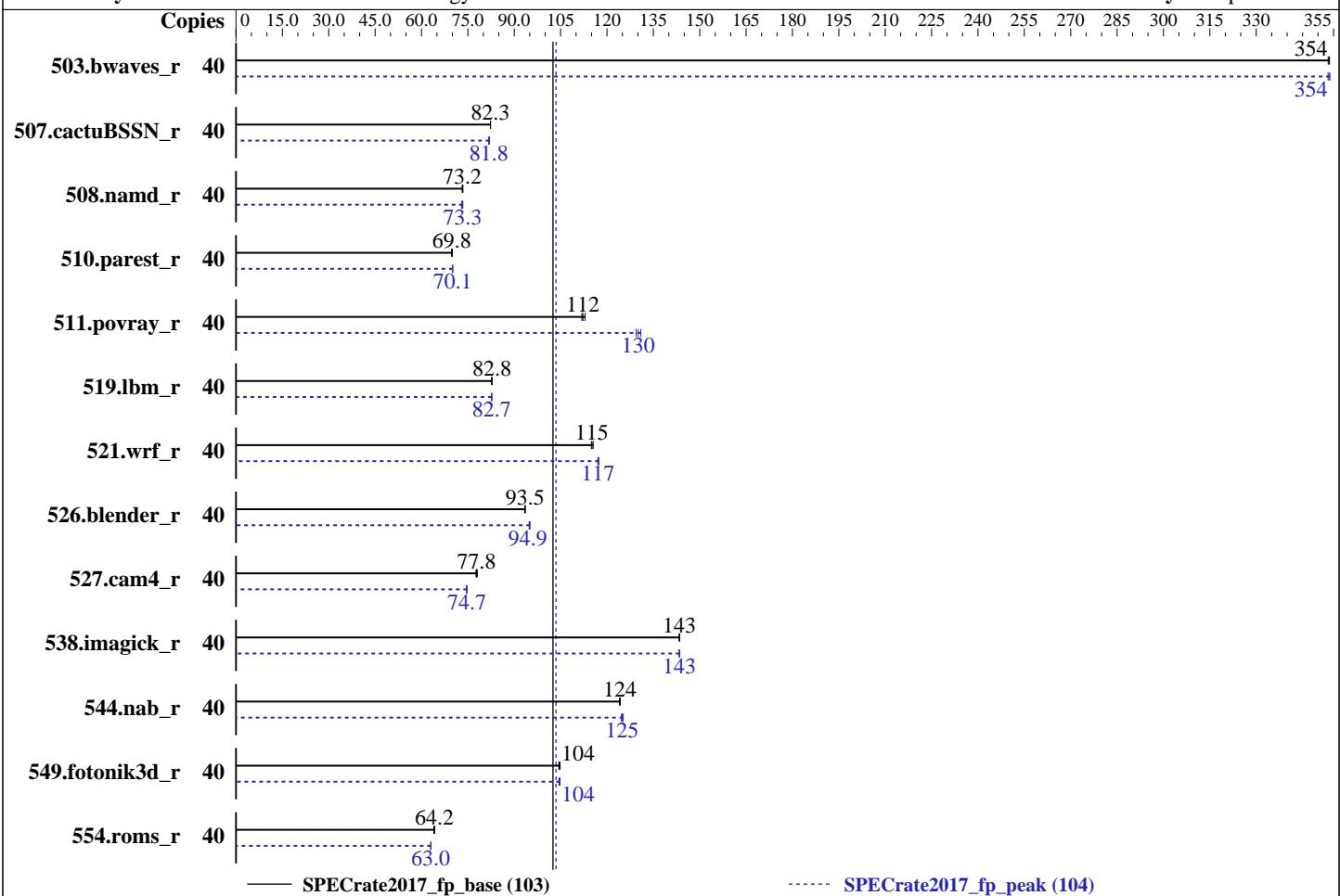
Test Date: Dec-2017

Test Sponsor: Lenovo Global Technology

Hardware Availability: Aug-2017

Tested by: Lenovo Global Technology

Software Availability: Sep-2017



| Hardware   |   | Software       |   |
|------------|---|----------------|---|
| CPU Name:  | Intel Xeon Silver 4114                                | OS:            | SUSE Linux Enterprise Server 12 SP2 (x86_64)                    |
| Max MHz.:  | 3000  | Compiler:      | Kernel 4.4.21-69-default  |
| Nominal:   | 2200  | Parallel:      | C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;    |
| Enabled:   | 20 cores, 2 chips, 2 threads/core                     | Firmware:      | Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux |
| Orderable: | 1,2 chips   | File System:   | btrfs   |
| Cache L1:  | 32 KB I + 32 KB D on chip per core                    | System State:  | Run level 3 (multi-user)  |
| L2:        | 1 MB I+D on chip per core                             | Base Pointers: | 64-bit  |
| L3:        | 13.75 MB I+D on chip per chip                         | Peak Pointers: | 64-bit  |
| Other:     | None  | Other:         | None  |
| Memory:    | 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400) |                |   |
| Storage:   | 1 x 800 GB SAS SSD                                    |                |   |
| 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    | 40     | <b>1135</b> | <b>354</b>  | 1134        | 354         | 1135       | 353         | 40     | 1134       | 354         | 1136        | 353         | <b>1135</b> | <b>354</b>  |
| 507.cactuBSSN_r | 40     | 615         | 82.3        | <b>615</b>  | <b>82.3</b> | 615        | 82.3        | 40     | <b>619</b> | <b>81.8</b> | 619         | 81.8        | 618         | 82.0        |
| 508.namd_r      | 40     | <b>519</b>  | <b>73.2</b> | 519         | 73.2        | 518        | 73.4        | 40     | 521        | 73.0        | <b>519</b>  | <b>73.3</b> | 518         | 73.4        |
| 510.parest_r    | 40     | 1495        | 70.0        | <b>1499</b> | <b>69.8</b> | 1500       | 69.8        | 40     | 1495       | 70.0        | 1493        | 70.1        | <b>1493</b> | <b>70.1</b> |
| 511.povray_r    | 40     | 827         | 113         | 835         | 112         | <b>832</b> | <b>112</b>  | 40     | 713        | 131         | 722         | 129         | <b>718</b>  | <b>130</b>  |
| 519.lbm_r       | 40     | 510         | 82.7        | 509         | 82.8        | <b>509</b> | <b>82.8</b> | 40     | <b>510</b> | <b>82.7</b> | 510         | 82.7        | 510         | 82.7        |
| 521.wrf_r       | 40     | 779         | 115         | 775         | 116         | <b>778</b> | <b>115</b>  | 40     | 765        | 117         | 763         | 117         | <b>765</b>  | <b>117</b>  |
| 526.blender_r   | 40     | <b>651</b>  | <b>93.5</b> | 652         | 93.4        | 651        | 93.6        | 40     | 641        | 95.1        | 642         | 94.8        | <b>642</b>  | <b>94.9</b> |
| 527.cam4_r      | 40     | 896         | 78.0        | <b>899</b>  | <b>77.8</b> | 901        | 77.6        | 40     | <b>937</b> | <b>74.7</b> | 938         | 74.6        | 936         | 74.7        |
| 538.imagick_r   | 40     | <b>694</b>  | <b>143</b>  | 693         | 143         | 694        | 143         | 40     | <b>694</b> | <b>143</b>  | 693         | 143         | 694         | 143         |
| 544.nab_r       | 40     | 542         | 124         | 543         | 124         | <b>542</b> | <b>124</b>  | 40     | 540        | 125         | 537         | 125         | <b>539</b>  | <b>125</b>  |
| 549.fotonik3d_r | 40     | 1487        | 105         | <b>1492</b> | <b>104</b>  | 1492       | 104         | 40     | 1487       | 105         | <b>1492</b> | <b>104</b>  | 1492        | 104         |
| 554.roms_r      | 40     | 989         | 64.2        | 993         | 64.0        | <b>990</b> | <b>64.2</b> | 40     | 1008       | 63.0        | <b>1009</b> | <b>63.0</b> | 1009        | 63.0        |

**SPECrate2017\_fp\_base = 103**

**SPECrate2017\_fp\_peak = 104**

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>



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## Platform Notes

BIOS configuration:

Choose Operating Mode set to Maximum Performance

SNC set to Enable

Hardware Prefetcher set to Disable

MONITORMWAIT set to Enable

Execute Disable Bit set to Disable

Trusted Execution Technology set to Enable

Stale AtoS set to Enable

LLC Deadline Alloc set to Disable

Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo

Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f

running on Cyborg-SPECcpu2017-SUSE12SP2 Wed Dec 6 18:56:32 2017

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) Silver 4114 CPU @ 2.20GHz
  2 "physical id"s (chips)
  40 "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 : 10
  siblings   : 20
  physical 0: cores 0 1 2 3 4 8 9 10 11 12
  physical 1: cores 0 1 2 3 4 8 9 10 11 12
```

From lscpu:

```
Architecture:           x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                40
On-line CPU(s) list:  0-39
Thread(s) per core:   2
Core(s) per socket:   10
Socket(s):             2
NUMA node(s):          2
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Silver 4114 CPU @ 2.20GHz
Stepping:               4
CPU MHz:               2194.841
BogoMIPS:              4389.68
Virtualization:        VT-x
L1d cache:             32K
```

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## Platform Notes (Continued)

L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 14080K  
NUMA node0 CPU(s): 0-9,20-29  
NUMA node1 CPU(s): 10-19,30-39  
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 aperfmpfperf eagerfpu pni pclmulqdq dtes64 monitor ds\_cpl vmx smx est tm2 ssse3 sdbg 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 ida arat epb pln pts dtherm intel\_pt tpr\_shadow vnmi flexpriority ept vpid fsgsbase tsc\_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xgetbv1 cqm\_llc cqm\_occup\_llc

/proc/cpuinfo cache data  
cache size : 14080 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 6 7 8 9 20 21 22 23 24 25 26 27 28 29  
node 0 size: 193099 MB  
node 0 free: 191064 MB  
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39  
node 1 size: 193504 MB  
node 1 free: 192457 MB  
node distances:  
node 0 1  
0: 10 21  
1: 21 10

From /proc/meminfo  
MemTotal: 395882808 kB  
HugePages\_Total: 0  
Hugepagesize: 2048 kB

From /etc/\*release\* /etc/\*version\*  
os-release:  
NAME="SLES"  
VERSION="12-SP2"  
VERSION\_ID="12.2"  
PRETTY\_NAME="SUSE Linux Enterprise Server 12 SP2"  
ID="sles"  
ANSI\_COLOR="0;32"  
CPE\_NAME="cpe:/o:suse:sles:12:sp2"

(Continued on next page)



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## Platform Notes (Continued)

uname -a:

```
Linux Cyborg-SPECcpu2017-SUSE12SP2 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC
2016 (9464f67) x86_64 x86_64 x86_64 GNU/Linux
```

run-level 3 Dec 6 15:18

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

| Filesystem | Type  | Size | Used | Avail | Use% | Mounted on |
|------------|-------|------|------|-------|------|------------|
| /dev/sdb2  | btrfs | 744G | 185G | 557G  | 25%  | /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-[IVE111I-1.01]- 08/11/2017

Memory:

24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666, configured at 2400

(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

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-----

=====

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

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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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Software Availability: Sep-2017

## 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

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.cactusBSSN_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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3
```

C++ benchmarks:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3
```

Fortran benchmarks:

```
-xCORE-AVX512 -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-AVX512 -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-AVX512 -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-AVX512 -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
```

(Continued on next page)



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## Peak Compiler Invocation (Continued)

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-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3
```

```
538.imagick_r: -xCORE-AVX512 -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-AVX512 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3
```

Fortran benchmarks:

```
503.bwaves_r: -xCORE-AVX512 -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-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs
-align array32byte
```

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## Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -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-AVX512 -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-AVX512 -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-A.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-A.xml>



# SPEC CPU2017 Floating Point Rate Result

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## Lenovo Global Technology

ThinkSystem SR650  
(2.20 GHz, Intel Xeon Silver 4114)

SPECrate2017\_fp\_base = 103

SPECrate2017\_fp\_peak = 104

CPU2017 License: 9017

Test Date: Dec-2017

Test Sponsor: Lenovo Global Technology

Hardware Availability: Aug-2017

Tested by: Lenovo Global Technology

Software Availability: Sep-2017

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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