



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR570  
(2.20 GHz, Intel Xeon Gold 5120T)

SPECrate2017\_fp\_base = 138

SPECrate2017\_fp\_peak = 141

CPU2017 License: 9017

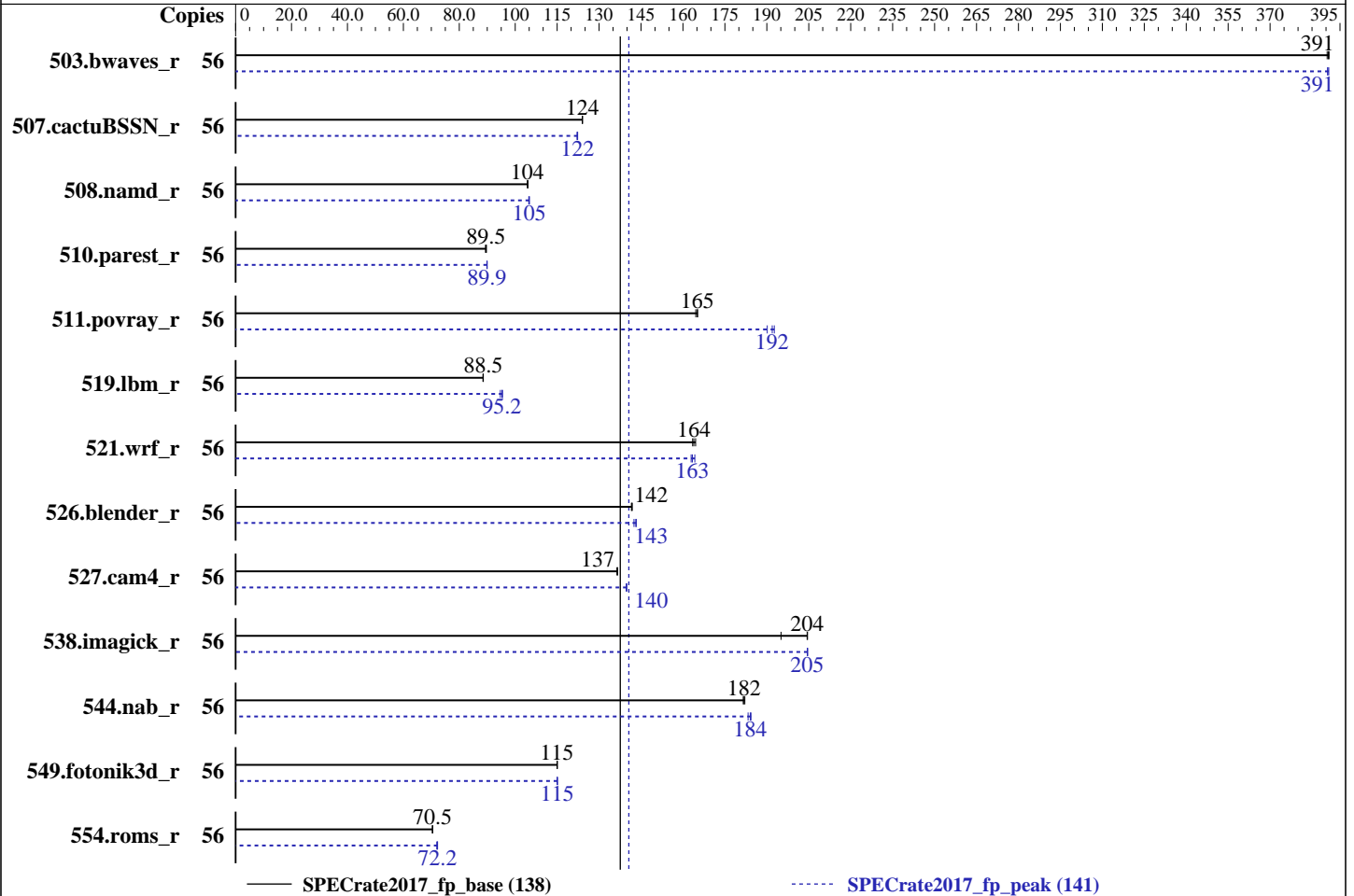
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Jun-2018

Hardware Availability: Nov-2017

Software Availability: Jan-2018



### Hardware

CPU Name: Intel Xeon Gold 5120T  
 Max MHz.: 3200  
 Nominal: 2200  
 Enabled: 28 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: 19.25 MB I+D on chip per chip  
 Other: None  
 Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)  
 Storage: 1 x 800 GB SAS SSD  
 Other: None

### Software

OS: Red Hat Enterprise Linux Server release 7.4 (Maipo)  
 Kernel 3.10.0-693.11.6.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: Lenovo BIOS Version TEE119R 1.22 released Feb-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	56	1436	391	1438	390	<b>1437</b>	<b>391</b>	56	<b>1438</b>	<b>391</b>	1436	391	1438	391
507.cactuBSSN_r	56	<b>572</b>	<b>124</b>	572	124	572	124	56	<b>580</b>	<b>122</b>	579	122	581	122
508.namd_r	56	510	104	<b>509</b>	<b>104</b>	509	105	56	507	105	506	105	<b>507</b>	<b>105</b>
510.parest_r	56	1633	89.7	1639	89.4	<b>1636</b>	<b>89.5</b>	56	1630	89.9	<b>1629</b>	<b>89.9</b>	1628	90.0
511.povray_r	56	791	165	<b>792</b>	<b>165</b>	795	165	56	679	193	<b>681</b>	<b>192</b>	688	190
519.lbm_r	56	667	88.5	<b>667</b>	<b>88.5</b>	666	88.6	56	618	95.5	623	94.7	<b>620</b>	<b>95.2</b>
521.wrf_r	56	762	165	767	163	<b>765</b>	<b>164</b>	56	770	163	764	164	<b>768</b>	<b>163</b>
526.blender_r	56	601	142	<b>602</b>	<b>142</b>	602	142	56	599	142	<b>596</b>	<b>143</b>	595	143
527.cam4_r	56	<b>717</b>	<b>137</b>	718	136	717	137	56	700	140	701	140	<b>701</b>	<b>140</b>
538.imagick_r	56	714	195	681	205	<b>681</b>	<b>204</b>	56	681	204	681	205	<b>681</b>	<b>205</b>
544.nab_r	56	<b>518</b>	<b>182</b>	517	182	519	182	56	511	184	<b>512</b>	<b>184</b>	514	183
549.fotonik3d_r	56	1896	115	<b>1898</b>	<b>115</b>	1899	115	56	<b>1897</b>	<b>115</b>	1896	115	1897	115
554.roms_r	56	1263	70.5	<b>1263</b>	<b>70.5</b>	1264	70.4	56	1237	71.9	1232	72.2	<b>1233</b>	<b>72.2</b>

SPECrate2017\_fp\_base = 138

SPECrate2017\_fp\_peak = 141

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) 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:

Choose Operating Mode set to Maximum Performance

Execute Disable Bit set to Disable

MONITOR/MWAIT set to Enable

SNC set to Enable

DCA set to Enable

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

    Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f

    running on localhost.localdomain Fri Jun 1 17:47:51 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 5120T CPU @ 2.20GHz

        2 "physical id"s (chips)

        56 "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 : 14

        siblings : 28

        physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

        physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

From lscpu:

    Architecture: x86\_64

    CPU op-mode(s): 32-bit, 64-bit

    Byte Order: Little Endian

    CPU(s): 56

    On-line CPU(s) list: 0-55

    Thread(s) per core: 2

    Core(s) per socket: 14

    Socket(s): 2

    NUMA node(s): 4

    Vendor ID: GenuineIntel

    CPU family: 6

    Model: 85

    Model name: Intel(R) Xeon(R) Gold 5120T CPU @ 2.20GHz

(Continued on next page)



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### Platform Notes (Continued)

```
Stepping: 4
CPU MHz: 2200.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 19712K
NUMA node0 CPU(s): 0-3,7-9,28-31,35-37
NUMA node1 CPU(s): 4-6,10-13,32-34,38-41
NUMA node2 CPU(s): 14-17,21-23,42-45,49-51
NUMA node3 CPU(s): 18-20,24-27,46-48,52-55
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 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 : 19712 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 3 7 8 9 28 29 30 31 35 36 37
node 0 size: 48530 MB
node 0 free: 46940 MB
node 1 cpus: 4 5 6 10 11 12 13 32 33 34 38 39 40 41
node 1 size: 49152 MB
node 1 free: 47870 MB
node 2 cpus: 14 15 16 17 21 22 23 42 43 44 45 49 50 51
node 2 size: 49152 MB
node 2 free: 47936 MB
node 3 cpus: 18 19 20 24 25 26 27 46 47 48 52 53 54 55
node 3 size: 49152 MB
node 3 free: 47919 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
```

(Continued on next page)



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### Platform Notes (Continued)

```

From /proc/meminfo
MemTotal:      197407676 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 Jun 1 17:45

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sdb2       xfs   689G   23G  666G   4% /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 -[TEE119R-1.22]- 02/06/2018
Memory:
4x NO DIMM NO DIMM
12x 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)
=====

```

(Continued on next page)



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### Compiler Version Notes (Continued)

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)

-----  
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

(Continued on next page)



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### Compiler Version Notes (Continued)

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)

-----

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  
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## Compiler Version Notes (Continued)

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

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





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## 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`

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++:

-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

(Continued on next page)



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**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Jun-2018

**Hardware Availability:** Nov-2017

**Software Availability:** Jan-2018

## Peak Other Flags (Continued)

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-C.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-C.xml>

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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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