# SPEC® CPU2017 Floating Point Rate Result

## Lenovo Global Technology

**SPECrate2017_fp_base =   183**

ThinkSystem SN550
(2.00 GHz, Intel Xeon Gold 6138T)

**SPECrate2017_fp_peak =   187**

| | | |
|---|---|---|
| **CPU2017 License:** 9017 | **Test Date:** | May-2018 |
| **Test Sponsor:** Lenovo Global Technology | **Hardware Availability:** | Aug-2017 |
| **Tested by:** Lenovo Global Technology | **Software Availability:** | Feb-2018 |

Copies scale: 0  20.0  50.0  80.0  100  120  140  160  180  200  220  240  260  280  300  320  340  360  380  400  420  440  480

| Benchmark | Copies | Base | Peak |
|---|---|---|---|
| 503.bwaves_r | 80 | 476 | 475 |
| 507.cactuBSSN_r | 80 | 164 | 161 |
| 508.namd_r | 80 | 142 | 145 |
| 510.parest_r | 80 | 111 | 111 |
| 511.povray_r | 80 | 224 | 267 |
| 519.lbm_r | 80 | 111 | 115 |
| 521.wrf_r | 80 | 210 | 209 |
| 526.blender_r | 80 | 202 | 203 |
| 527.cam4_r | 80 | 204 | 206 |
| 538.imagick_r | 80 | 294 | 295 |
| 544.nab_r | 80 | 267 | 271 |
| 549.fotonik3d_r | 80 | 143 | 143 |
| 554.roms_r | 80 | 88.5 | 90.2 |

SPECrate2017_fp_base (183)      SPECrate2017_fp_peak (187)

## Hardware

CPU Name:   Intel Xeon Gold 6138T
 Max MHz.:   3700
 Nominal:   2000
 Enabled:   40 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:   27.5 MB I+D on chip per chip
 Other:   None
 Memory:   768 GB (24 x 32 GB 2Rx4 PC4-2666V-R)
 Storage:   1 x 800 GB SAS SSD
 Other:   None

## Software

OS:   SUSE Linux Enterprise Server 12 SP2 (x86_64)
  Kernel 4.4.114-92.64-default
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 IVE113W 1.12 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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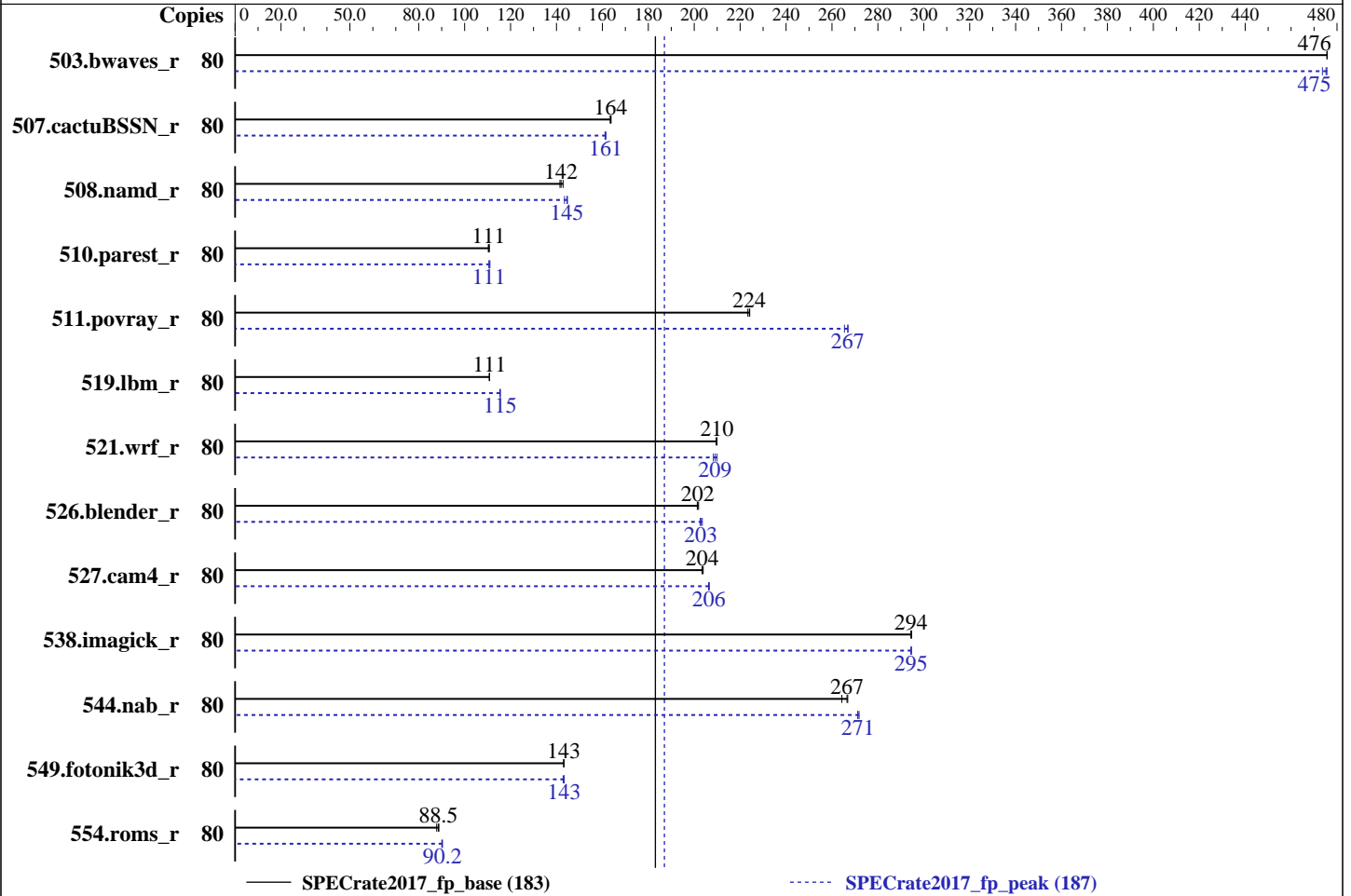SPECrate2017_fp_base = 183

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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 | 80 | **1687** | **476** | 1686 | 476 | 1687 | 476 | 80 | 1687 | 476 | **1688** | **475** | 1694 | 474 |
| 507.cactuBSSN_r | 80 | **619** | **164** | 618 | 164 | 620 | 163 | 80 | 629 | 161 | **628** | **161** | 627 | 161 |
| 508.namd_r | 80 | 537 | 142 | **535** | **142** | 532 | 143 | 80 | **526** | **145** | 525 | 145 | 530 | 144 |
| 510.parest_r | 80 | 1898 | 110 | 1889 | 111 | **1894** | **111** | 80 | **1891** | **111** | 1892 | 111 | 1885 | 111 |
| 511.povray_r | 80 | **834** | **224** | 836 | 223 | 833 | 224 | 80 | 704 | 265 | 700 | 267 | **700** | **267** |
| 519.lbm_r | 80 | **761** | **111** | 761 | 111 | 761 | 111 | 80 | 731 | 115 | **730** | **115** | 730 | 115 |
| 521.wrf_r | 80 | 855 | 210 | **854** | **210** | 854 | 210 | 80 | 860 | 208 | **857** | **209** | 853 | 210 |
| 526.blender_r | 80 | **605** | **202** | 603 | 202 | 605 | 201 | 80 | **600** | **203** | 602 | 203 | 599 | 204 |
| 527.cam4_r | 80 | 686 | 204 | 688 | 203 | **687** | **204** | 80 | **678** | **206** | 678 | 207 | 678 | 206 |
| 538.imagick_r | 80 | 676 | 294 | **676** | **294** | 675 | 295 | 80 | 676 | 294 | 675 | 295 | **676** | **295** |
| 544.nab_r | 80 | **505** | **267** | 509 | 264 | 505 | 267 | 80 | **496** | **271** | 495 | 272 | 496 | 271 |
| 549.fotonik3d_r | 80 | **2178** | **143** | 2176 | 143 | 2178 | 143 | 80 | **2176** | **143** | 2181 | 143 | 2175 | 143 |
| 554.roms_r | 80 | 1432 | 88.8 | 1448 | 87.8 | **1436** | **88.5** | 80 | 1408 | 90.3 | **1409** | **90.2** | 1412 | 90.0 |

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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)
is mitigated in the system as tested and documented.

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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** May-2018

**Hardware Availability:** Aug-2017

**Software Availability:** Feb-2018

## 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
DCU Streamer Prefetcher set to Disable
SNC set to Enable
MONITORMWAIT set to Enable
LLC dead line alloc set to Disable
 Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on SN550 Mon May 21 09:40:12 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 6138T CPU @ 2.00GHz
       2  "physical id"s (chips)
       80 "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 : 20
       siblings  : 40
       physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

 From lscpu:
    Architecture:          x86_64
    CPU op-mode(s):        32-bit, 64-bit
    Byte Order:            Little Endian
    CPU(s):                80
    On-line CPU(s) list:   0-79
    Thread(s) per core:    2
    Core(s) per socket:    20
    Socket(s):             2
    NUMA node(s):          4
    Vendor ID:             GenuineIntel
    CPU family:            6
    Model:                 85
    Model name:            Intel(R) Xeon(R) Gold 6138T CPU @ 2.00GHz
```

**(Continued on next page)**

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### Platform Notes (Continued)

```
      Stepping:              4
      CPU MHz:               1995.316
      BogoMIPS:              3990.63
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              28160K
      NUMA node0 CPU(s):     0-2,5,6,10-12,15,16,40-42,45,46,50-52,55,56
      NUMA node1 CPU(s):     3,4,7-9,13,14,17-19,43,44,47-49,53,54,57-59
      NUMA node2 CPU(s):     20-22,25,26,30-32,35,36,60-62,65,66,70-72,75,76
      NUMA node3 CPU(s):     23,24,27-29,33,34,37-39,63,64,67-69,73,74,77-79
      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 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 invpcid_single pln pts
    dtherm intel_pt rsb_ctxsw spec_ctrl retpoline kaiser 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
    xsavec xgetbv1 cqm_llc cqm_occup_llc

 /proc/cpuinfo cache data
    cache size : 28160 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 5 6 10 11 12 15 16 40 41 42 45 46 50 51 52 55 56
   node 0 size: 193123 MB
   node 0 free: 192787 MB
   node 1 cpus: 3 4 7 8 9 13 14 17 18 19 43 44 47 48 49 53 54 57 58 59
   node 1 size: 193521 MB
   node 1 free: 193198 MB
   node 2 cpus: 20 21 22 25 26 30 31 32 35 36 60 61 62 65 66 70 71 72 75 76
   node 2 size: 193521 MB
   node 2 free: 193266 MB
   node 3 cpus: 23 24 27 28 29 33 34 37 38 39 63 64 67 68 69 73 74 77 78 79
   node 3 size: 193518 MB
   node 3 free: 193145 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
```

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## Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       792253248 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 2
      # This file is deprecated and will be removed in a future service pack or release.
      # Please check /etc/os-release for details about this release.
   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"

uname -a:
   Linux SN550 4.4.114-92.64-default #1 SMP Thu Feb 1 19:18:19 UTC 2018 (c6ce5db) x86_64
   x86_64 x86_64 GNU/Linux

run-level 3 May 21 09:33

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda4       xfs   687G  170G  518G  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 -[IVE113W-1.12]- 02/06/2018
   Memory:
    24x Samsung M393A4K40BB2-CTD 32 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)
```

**(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
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Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
 FC  507.cactuBSSN_r(base)
------------------------------------------------------------------------------
```

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```
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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)
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------------------------------------------------------------------------------


==============================================================================
 FC  503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
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------------------------------------------------------------------------------


==============================================================================
FC   554.roms_r(peak)
------------------------------------------------------------------------------
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------------------------------------------------------------------------------


==============================================================================
 CC  521.wrf_r(base) 527.cam4_r(base)
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icc (ICC) 18.0.0 20170811
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CC   521.wrf_r(peak) 527.cam4_r(peak)
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## Compiler Version Notes (Continued)

```
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
```

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)**

# SPEC CPU2017 Floating Point Rate Result

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## Lenovo Global Technology

ThinkSystem SN550
(2.00 GHz, Intel Xeon Gold 6138T)

SPECrate2017_fp_base =   183

SPECrate2017_fp_peak =   187

**CPU2017 License:** 9017

**Test Sponsor:**     Lenovo Global Technology

**Tested by:**     Lenovo Global Technology

**Test Date:**     May-2018

**Hardware Availability:** Aug-2017

**Software Availability:**   Feb-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

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

Tested with SPEC CPU2017 v1.0.2 on 2018-05-20 21:40:12-0400.
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