SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology

SPECrate®2017_fp_base =   154

ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)
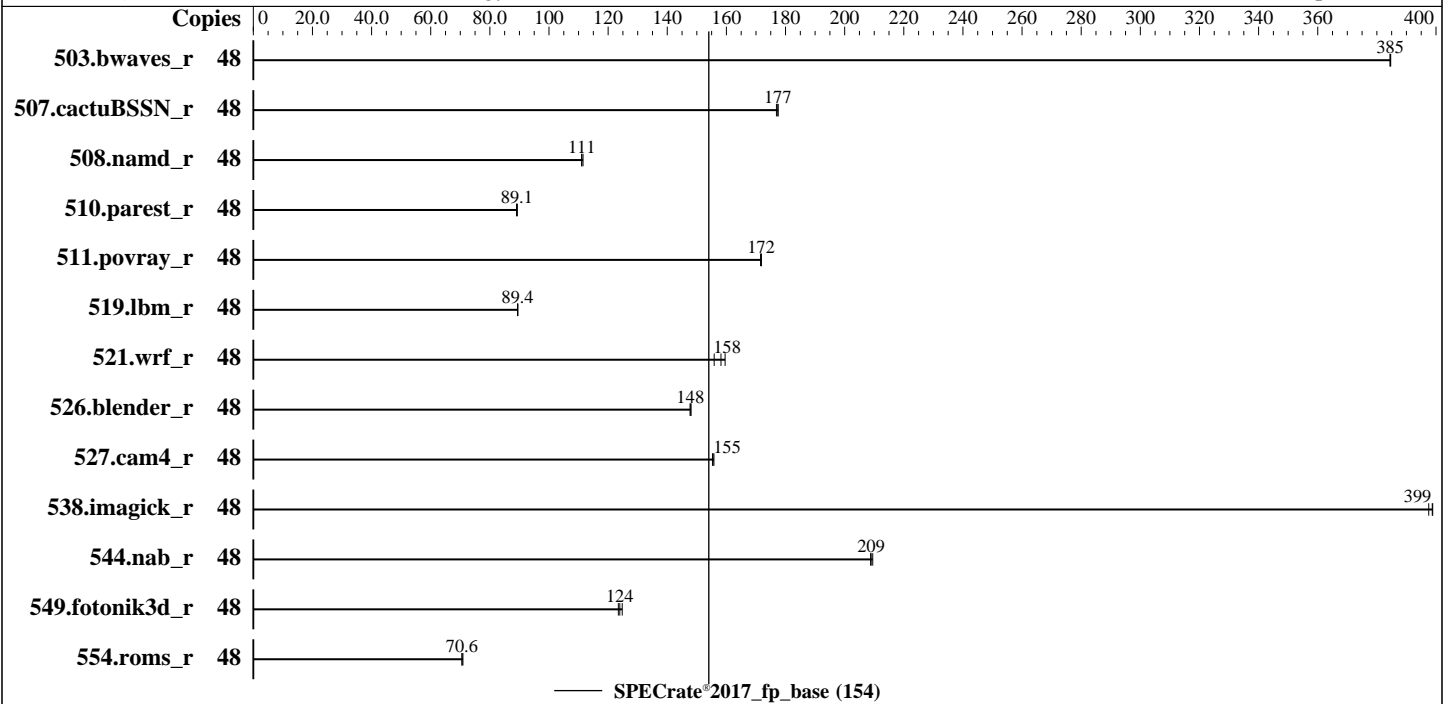
SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Copies	Benchmark	Result
503.bwaves_r	48	385
507.cactuBSSN_r	48	177
508.namd_r	48	111
510.parest_r	48	89.1
511.povray_r	48	172
519.lbm_r	48	89.4
521.wrf_r	48	158
526.blender_r	48	148
527.cam4_r	48	155
538.imagick_r	48	399
544.nab_r	48	209
549.fotonik3d_r	48	124
554.roms_r	48	70.6

SPECrate®2017_fp_base (154)

Hardware

CPU Name: Intel Xeon Silver 4214R
 Max MHz: 3500
 Nominal: 2400
Enabled: 24 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: 16.5 MB I+D on chip per chip
 Other: None
Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP1 (x86_64) Kernel 4.12.14-195-default
Compiler: C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
Parallel: No
Firmware: Lenovo BIOS Version O0E155L 2.61 released May-2020
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS set to prefer performance at the cost of additional power usage

SPEC CPU®2017 Floating Point Rate Result
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Lenovo Global Technology

ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

SPECrate®2017_fp_base =   154

SPECrate®2017_fp_peak = Not Run

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Test Date: May-2020
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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	48	1252	384	**1252**	**385**	1251	385							
507.cactuBSSN_r	48	343	177	342	177	**343**	**177**							
508.namd_r	48	**410**	**111**	409	112	411	111							
510.parest_r	48	1407	89.3	**1409**	**89.1**	1411	89.0							
511.povray_r	48	653	172	652	172	**653**	**172**							
519.lbm_r	48	**566**	**89.4**	566	89.5	566	89.4							
521.wrf_r	48	674	160	690	156	**680**	**158**							
526.blender_r	48	494	148	495	148	**494**	**148**							
527.cam4_r	48	539	156	541	155	**540**	**155**							
538.imagick_r	48	**299**	**399**	300	398	299	399							
544.nab_r	48	386	209	387	209	**387**	**209**							
549.fotonik3d_r	48	**1509**	**124**	1499	125	1515	123							
554.roms_r	48	1081	70.6	1076	70.9	**1081**	**70.6**							
SPECrate®2017_fp_base =	**154**													
SPECrate®2017_fp_peak =	**Not Run**													

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

```
The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.
The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
```

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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/j
     e5.0.1-64"
MALLOC_CONF = "retain:true"
```

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CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: May-2020

Hardware Availability: Mar-2020

Software Availability: Apr-2020

General Notes

```
 Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
 memory using Redhat Enterprise Linux 8.0
 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>
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4)
is mitigated in the system as tested and documented.
 jemalloc, a general purpose malloc implementation
 built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
 sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
LLC dead line alloc set to Disable
SNC set to Enable
Memory Data Scrambling set to Disable

 Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-9n08 Tue May 26 17:48:56 2020

 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 4214R CPU @ 2.40GHz
       2  "physical id"s (chips)
       48 "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
```

(Continued on next page)

Lenovo Global Technology

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(2.40 GHz, Intel Xeon Silver 4214R)

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Platform Notes (Continued)

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

  From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      Address sizes:         46 bits physical, 48 bits virtual
      CPU(s):                48
      On-line CPU(s) list:   0-47
      Thread(s) per core:    2
      Core(s) per socket:    12
      Socket(s):             2
      NUMA node(s):          4
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
      Stepping:              7
      CPU MHz:               2400.000
      CPU max MHz:           3500.0000
      CPU min MHz:           1000.0000
      BogoMIPS:              4800.00
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              16896K
      NUMA node0 CPU(s):     0-2,6-8,24-26,30-32
      NUMA node1 CPU(s):     3-5,9-11,27-29,33-35
      NUMA node2 CPU(s):     12-14,18-20,36-38,42-44
      NUMA node3 CPU(s):     15-17,21-23,39-41,45-47
      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 cpuid
   aperfmperf pni pclmulqdq dtes64 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 cpuid_fault epb cat_l3 cdp_l3 invpcid_single
   intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced 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 intel_pt avx512cd avx512bw avx512vl
   xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
   dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 16896 KB
```

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

SPECrate®2017_fp_base =   154

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
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Test Date: May-2020
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Platform Notes (Continued)

```
 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 6 7 8 24 25 26 30 31 32
   node 0 size: 47972 MB
   node 0 free: 47672 MB
   node 1 cpus: 3 4 5 9 10 11 27 28 29 33 34 35
   node 1 size: 48381 MB
   node 1 free: 48009 MB
   node 2 cpus: 12 13 14 18 19 20 36 37 38 42 43 44
   node 2 size: 48381 MB
   node 2 free: 48198 MB
   node 3 cpus: 15 16 17 21 22 23 39 40 41 45 46 47
   node 3 size: 48380 MB
   node 3 free: 48207 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

 From /proc/meminfo
    MemTotal:       197751284 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
       NAME="SLES"
       VERSION="15-SP1"
       VERSION_ID="15.1"
       PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
       ID="sles"
       ID_LIKE="suse"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:15:sp1"

 uname -a:
    Linux linux-9n08 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-3620 (L1 Terminal Fault):        Not affected
 Microarchitectural Data Sampling:         Not affected
 CVE-2017-5754 (Meltdown):                 Not affected
```

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

SPECrate®2017_fp_base =   154

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017	**Test Date:** May-2020
Test Sponsor: Lenovo Global Technology	**Hardware Availability:** Mar-2020
Tested by: Lenovo Global Technology	**Software Availability:** Apr-2020

Platform Notes (Continued)

```
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
                                   via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):    Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):    Mitigation: Enhanced IBRS, IBPB: conditional,
                                   RSB filling


run-level 3 May 26 17:47

SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda3      xfs   445G   68G  378G  16% /


From /sys/devices/virtual/dmi/id
   BIOS:    Lenovo -[O0E155L-2.61]- 05/20/2020
   Vendor:  Lenovo
   Product: ThinkSystem ST550 -[7X09TOZ000]-
   Product Family: ThinkSystem
   Serial:  1234567890


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.
   Memory:
     12x SK Hynix HMA82GR7CJR8N-WM 16 GB 2 rank 2933


(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C                   | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------



==============================================================================
C++                 | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

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Lenovo Global Technology

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SPECrate®2017_fp_base =   154

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017		**Test Date:**	May-2020
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Mar-2020
Tested by:	Lenovo Global Technology	**Software Availability:**	Apr-2020

Compiler Version Notes (Continued)

```
==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran         | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

SPEC CPU®2017 Floating Point Rate Result

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Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Mar-2020
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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`

Base Optimization Flags

C benchmarks:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

Lenovo Global Technology

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Test Date: May-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Base Optimization Flags (Continued)

C++ benchmarks:
```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:
```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both Fortran and C:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both C and C++:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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SPECrate®2017_fp_base = 154

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017		**Test Date:**	May-2020
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Mar-2020
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The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-H.html

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

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-H.xml

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

Tested with SPEC CPU®2017 v1.1.0 on 2020-05-26 05:48:55-0400.
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