



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR850  
(2.10 GHz, Intel Xeon Gold 6238M)

SPECrate®2017\_fp\_base = 446

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 9017

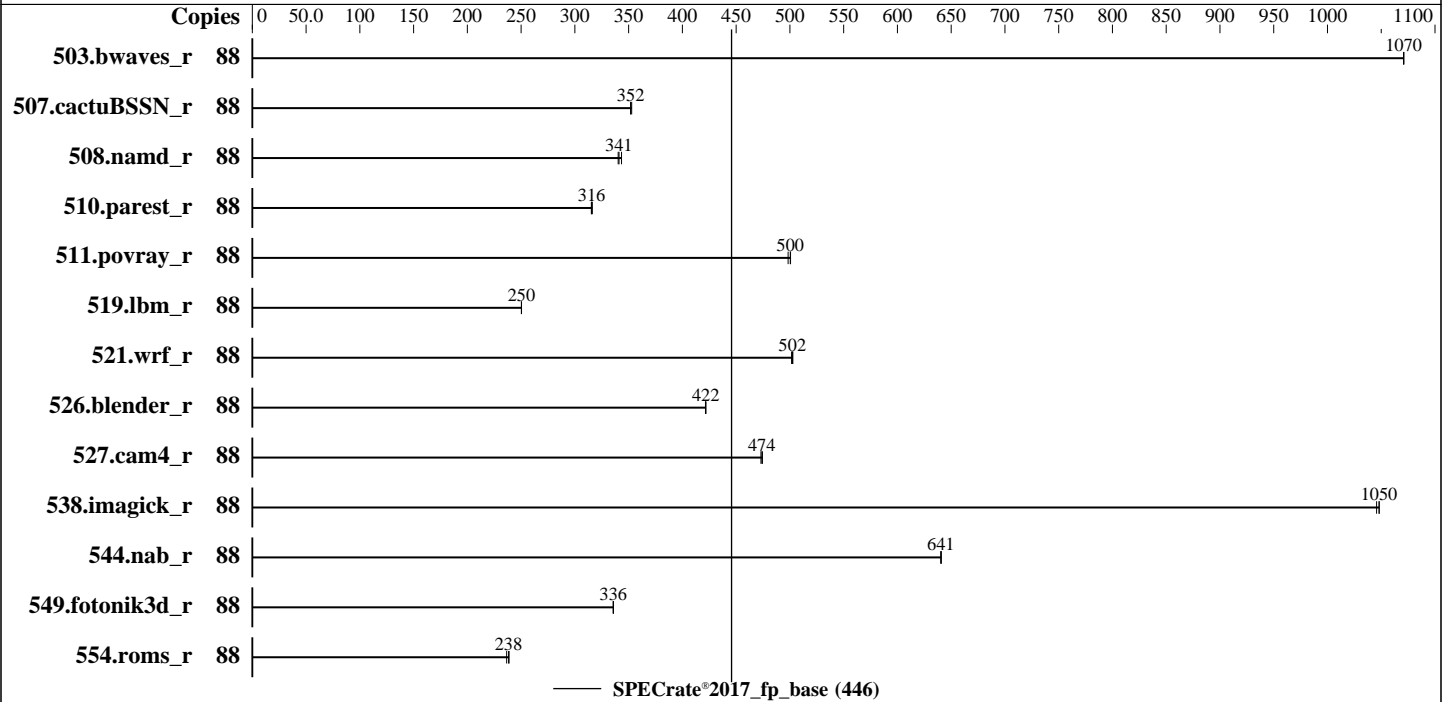
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Aug-2019

Hardware Availability: Jul-2019

Software Availability: May-2019



### Hardware

CPU Name: Intel Xeon Gold 6238M  
 Max MHz: 3700  
 Nominal: 2100  
 Enabled: 88 cores, 4 chips  
 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: 30.25 MB I+D on chip per chip  
 Other: None  
 Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)  
 Storage: 1 x 800 GB SATA SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP4 (x86\_64)  
 Kernel 4.12.14-94.41-default  
 Compiler: C/C++: Version 19.0.4.227 of Intel C/C++  
 Compiler for Linux;  
 Fortran: Version 19.0.4.227 of Intel Fortran  
 Compiler for Linux  
 Parallel: No  
 Firmware: Lenovo BIOS Version TEE142E 2.30 released Aug-2019  
 tested as TEE141E 2.30 Jul-2019  
 File System: btrfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: None  
 Power Management: --



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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    | 88     | 824         | 1070       | <u>824</u> | <u>1070</u> | 824        | 1070       |        |         |       |         |       |         |       |
| 507.cactuBSSN_r | 88     | 317         | 352        | <u>317</u> | <u>352</u>  | 316        | 353        |        |         |       |         |       |         |       |
| 508.namd_r      | 88     | 243         | 343        | <u>245</u> | <u>341</u>  | 246        | 340        |        |         |       |         |       |         |       |
| 510.parest_r    | 88     | 728         | 316        | <u>729</u> | <u>316</u>  | 730        | 315        |        |         |       |         |       |         |       |
| 511.povray_r    | 88     | 412         | 498        | <u>411</u> | <u>500</u>  | 410        | 501        |        |         |       |         |       |         |       |
| 519.lbm_r       | 88     | <u>370</u>  | <u>250</u> | 371        | 250         | 370        | 250        |        |         |       |         |       |         |       |
| 521.wrf_r       | 88     | 392         | 503        | 393        | 502         | <u>392</u> | <u>502</u> |        |         |       |         |       |         |       |
| 526.blender_r   | 88     | 318         | 421        | 318        | 422         | <u>318</u> | <u>422</u> |        |         |       |         |       |         |       |
| 527.cam4_r      | 88     | 324         | 474        | 325        | 473         | <u>325</u> | <u>474</u> |        |         |       |         |       |         |       |
| 538.imagick_r   | 88     | 209         | 1050       | <u>209</u> | <u>1050</u> | 209        | 1050       |        |         |       |         |       |         |       |
| 544.nab_r       | 88     | <u>231</u>  | <u>641</u> | 231        | 641         | 231        | 640        |        |         |       |         |       |         |       |
| 549.fotonik3d_r | 88     | <u>1021</u> | <u>336</u> | 1022       | 336         | 1021       | 336        |        |         |       |         |       |         |       |
| 554.roms_r      | 88     | 591         | 237        | <u>587</u> | <u>238</u>  | 586        | 239        |        |         |       |         |       |         |       |

SPECrate®2017\_fp\_base = 446

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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/cpu2017-1.0.5-ic19.0u4/lib/intel64"

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.5  
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.

(Continued on next page)



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**Test Date:** Aug-2019  
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**Software Availability:** May-2019

### 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.  
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.

### Platform Notes

BIOS configuration:  
Choose Operating Mode set to Maximum Performance  
Choose Operating Mode set to Custom Mode  
C-States set to Legacy  
Hyper-Threading set to Disable  
SNC set to Enable  
Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo  
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
running on linux-9o83 Wed Aug 28 02:20:40 2019

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 6238M CPU @ 2.10GHz  
4 "physical id"s (chips)  
88 "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 : 22  
siblings : 22  
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28  
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28  
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28  
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

From lscpu:  
Architecture: x86\_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 88  
On-line CPU(s) list: 0-87  
Thread(s) per core: 1  
Core(s) per socket: 22

(Continued on next page)



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### Platform Notes (Continued)

```

Socket(s): 4
NUMA node(s): 8
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238M CPU @ 2.10GHz
Stepping: 7
CPU MHz: 2100.000
CPU max MHz: 3700.0000
CPU min MHz: 1000.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 30976K
NUMA node0 CPU(s): 0-2,6-8,11-13,17,18
NUMA node1 CPU(s): 3-5,9,10,14-16,19-21
NUMA node2 CPU(s): 22-24,28-30,33-35,39,40
NUMA node3 CPU(s): 25-27,31,32,36-38,41-43
NUMA node4 CPU(s): 44-46,50-52,55-57,61,62
NUMA node5 CPU(s): 47-49,53,54,58-60,63-65
NUMA node6 CPU(s): 66-68,72-74,77-79,83,84
NUMA node7 CPU(s): 69-71,75,76,80-82,85-87
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
aperfperf 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 cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp 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 flush_l1d arch_capabilities

```

```
/proc/cpuinfo cache data
cache size : 30976 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 7 8 11 12 13 17 18
node 0 size: 193132 MB
node 0 free: 192799 MB
node 1 cpus: 3 4 5 9 10 14 15 16 19 20 21
node 1 size: 193528 MB

```

(Continued on next page)



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### Platform Notes (Continued)

```

node 1 free: 193214 MB
node 2 cpus: 22 23 24 28 29 30 33 34 35 39 40
node 2 size: 193528 MB
node 2 free: 193369 MB
node 3 cpus: 25 26 27 31 32 36 37 38 41 42 43
node 3 size: 193528 MB
node 3 free: 193371 MB
node 4 cpus: 44 45 46 50 51 52 55 56 57 61 62
node 4 size: 193528 MB
node 4 free: 193367 MB
node 5 cpus: 47 48 49 53 54 58 59 60 63 64 65
node 5 size: 193528 MB
node 5 free: 193349 MB
node 6 cpus: 66 67 68 72 73 74 77 78 79 83 84
node 6 size: 193499 MB
node 6 free: 193343 MB
node 7 cpus: 69 70 71 75 76 80 81 82 85 86 87
node 7 size: 193526 MB
node 7 free: 193350 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:      1584948792 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

From /etc/\*release\* /etc/\*version\*

```

SuSE-release:
  SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12
  PATCHLEVEL = 4
  # 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-SP4"
  VERSION_ID="12.4"
  PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"

```

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### Platform Notes (Continued)

```
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp4"
```

```
uname -a:
Linux linux-9o83 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901)
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
IBPB, IBRS_FW
```

```
run-level 3 Aug 28 02:15
```

```
SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 744G 134G 610G 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 -[TEE141E-2.30]- 07/02/2019
Memory:
48x Samsung M393A4K40CB2-CVF 32 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 Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
-----
```

```
=====
C++ | 508.namd_r(base) 510.parest_r(base)
-----
```

```
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
```

(Continued on next page)



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## Compiler Version Notes (Continued)

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====  
C++, C | 511.povray\_r(base) 526.blender\_r(base)  
=====

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
=====

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 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 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 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 19.0.4.227 Build 20190416

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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## 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
```

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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

C++ benchmarks:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
```

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -auto

-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=4 -auto

-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=4

Benchmarks using Fortran, C, and C++:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -auto

-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-linux64.2019-04-02.html>

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

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml>

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

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Tested with SPEC CPU®2017 v1.0.5 on 2019-08-27 14:20:39-0400.

Report generated on 2019-09-17 16:17:27 by CPU2017 PDF formatter v6255.

Originally published on 2019-09-17.