



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SN550  
(2.20 GHz, Intel Xeon Gold 5220R)

SPECspeed®2017\_fp\_base = 142

SPECspeed®2017\_fp\_peak = Not Run

CPU2017 License: 9017

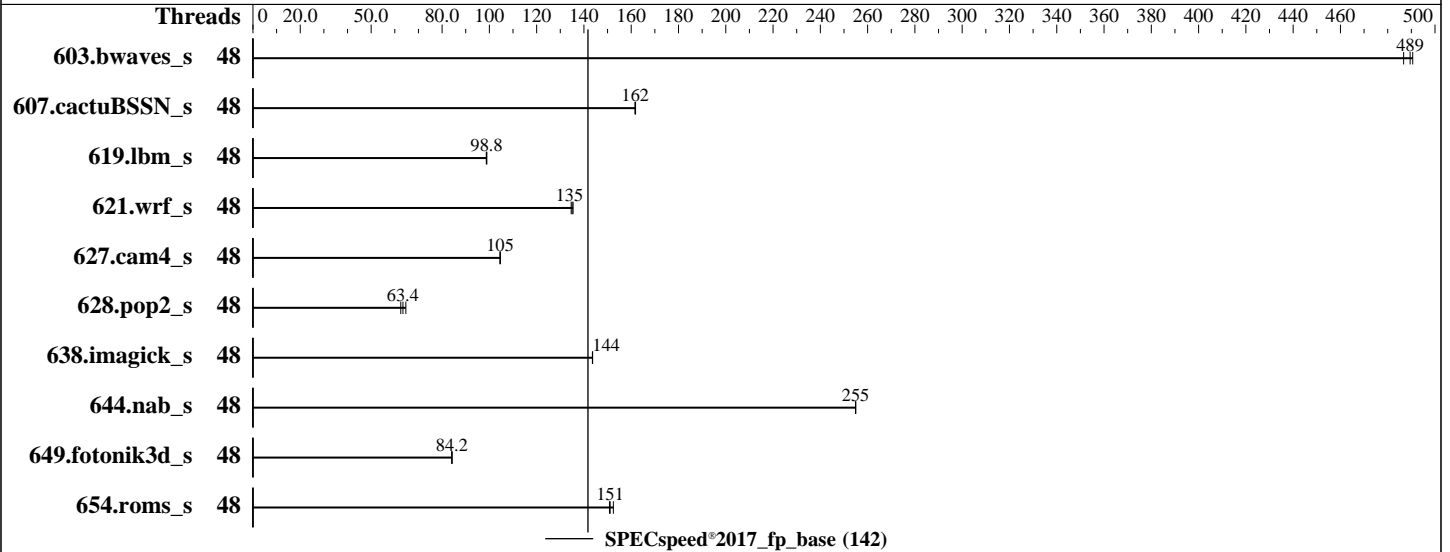
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Mar-2020

Hardware Availability: Mar-2020

Software Availability: Sep-2019



### Hardware

CPU Name: Intel Xeon Gold 5220R  
 Max MHz: 4000  
 Nominal: 2200  
 Enabled: 48 cores, 2 chips  
 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: 35.75 MB I+D on chip per chip  
 Other: None  
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
 Storage: 1 x 960 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 19.0.5.281 of Intel C/C++  
 Compiler for Linux;  
 Fortran: Version 19.0.5.281 of Intel Fortran  
 Compiler for Linux  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version IVE152L 2.51 released Feb-2020 tested as IVE151L 2.51 Jan-2020  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: None  
 Power Management: BIOS set to prefer performance at the cost of additional power usage



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## Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	48	121	487	<u>121</u>	<u>489</u>	120	491							
607.cactuBSSN_s	48	103	162	103	162	<u>103</u>	<u>162</u>							
619.lbm_s	48	53.0	98.9	53.1	98.7	<u>53.0</u>	<u>98.8</u>							
621.wrf_s	48	98.3	135	<u>98.0</u>	<u>135</u>	97.7	135							
627.cam4_s	48	84.8	105	84.7	105	<u>84.8</u>	<u>105</u>							
628.pop2_s	48	190	62.5	<u>187</u>	<u>63.4</u>	184	64.7							
638.imagick_s	48	100	144	100	144	<u>100</u>	<u>144</u>							
644.nab_s	48	68.5	255	<u>68.5</u>	<u>255</u>	68.5	255							
649.fotonik3d_s	48	<u>108</u>	<u>84.2</u>	108	84.1	108	84.2							
654.roms_s	48	104	151	<u>104</u>	<u>151</u>	103	152							

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

## 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:  
KMP\_AFFINITY = "granularity=fine,compact"  
LD\_LIBRARY\_PATH = "/home/cpu2017-1.1.0-ic19.0u5/lib/intel64"  
OMP\_STACKSIZE = "192M"

## 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

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)

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### General Notes (Continued)

is mitigated in the system as tested and documented.

### Platform Notes

BIOS configuration:

Choose Operating Mode set to Maximum Performance and then set it to Custom Mode  
MONITOR/MWAIT set to Enable  
Trusted Execution Technology set to Enable  
Hyper-Threading set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011  
running on linux-anu7 Thu Mar 12 19:32:16 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) Gold 5220R CPU @ 2.20GHz
 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 : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
```

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: 1
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 2200.000
```

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### Platform Notes (Continued)

```

CPU max MHz:          4000.0000
CPU min MHz:          1000.0000
BogoMIPS:              4400.00
Virtualization:       VT-x
L1d cache:            32K
L1i cache:            32K
L2 cache:              1024K
L3 cache:              36608K
NUMA node0 CPU(s):    0-23
NUMA node1 CPU(s):    24-47
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
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 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_lld
arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 36608 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 10 11 12 13 14 15 16 17 18 19 20 21 22 23
node 0 size: 386656 MB
node 0 free: 386058 MB
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 1 size: 387066 MB
node 1 free: 383920 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10

```

```

From /proc/meminfo
MemTotal:          792292360 kB
HugePages_Total:      0
Hugepagesize:       2048 kB

```

```

From /etc/*release* /etc/*version*
os-release:

```

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### Platform Notes (Continued)

```
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-anu7 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
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 Mar 12 19:03
```

```
SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   893G   31G  863G   4% /
```

```
From /sys/devices/virtual/dmi/id
BIOS:      Lenovo -[IVE151L-2.51]- 01/14/2020
Vendor:    Lenovo
Product:   ThinkSystem SN550  -[7X16CT00WW]-
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:  
24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)



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## Compiler Version Notes

=====  
C | 619.lbm\_s(base) 638.imagick\_s(base) 644.nab\_s(base)  
-----

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

=====  
C++, C, Fortran | 607.cactuBSSN\_s(base)  
-----

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

=====  
Fortran | 603.bwaves\_s(base) 649.fotonik3d\_s(base) 654.roms\_s(base)  
-----

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

=====  
Fortran, C | 621.wrf\_s(base) 627.cam4\_s(base) 628.pop2\_s(base)  
-----

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

## Base Compiler Invocation

C benchmarks:  
icc

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## Base Compiler Invocation (Continued)

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

## Base Portability Flags

```
603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64
```

## Base Optimization Flags

C benchmarks:

```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:

```
-m64 -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs
```

Benchmarks using both Fortran and C:

```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

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## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

-nostandard-realloc-lhs

The flags files that were used to format this result can be browsed at

[http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64\\_revD.html](http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64_revD.html)

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

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

[http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64\\_revD.xml](http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64_revD.xml)

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

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