# Lenovo Global Technology

## ThinkSystem SN550 V2
(2.30 GHz, Intel Xeon Platinum 8352M)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>386</th>
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<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Test Date:** Jul-2021

**Tested by:** Lenovo Global Technology

**Hardware Availability:** Jul-2021

**Software Availability:** Dec-2020

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### Hardware

- **CPU Name:** Intel Xeon Platinum 8352M
- **Max MHz:** 3500
- **Nominal:** 2300
- **Enabled:** 64 cores, 2 chips
- **Orderable:** 1,2 chips
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **L2:** 1.25 MB I+D on chip per core
- **L3:** 48 MB I+D on chip per chip
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
  
  - Kernel 4.18.0-240.el8.x86_64
  
  - Compiler: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;
  
  - Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux

- **Compiler Build:** 20201113 for Linux;

- **Firmware:** Lenovo BIOS Version U8E111A 1.02 released May-2021

- **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 and OS set to prefer performance at the cost of additional power usage
## Results Table

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</table>

**SPECrate®2017_fp_base =** 386

**SPECrate®2017_fp_peak =** Not Run

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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH = 
"/home/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202
1.1-revB/je5.0.1-64"

MALLOCONF = "retain:true"
```

## General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1

Transparent Huge Pages enabled by default

(Continued on next page)
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SPECraten®2017 fp_base = 386
SPECraten®2017 fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Jul-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

General Notes (Continued)

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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
CPU P-state Control set to Legacy
Hyper-Threading set to Disabled
Intel Virtualization Technology set to Disabled
SNC set to Enabled
XPT Prefetcher set to Disabled
UPI Prefetcher set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Thu Jul 29 00:10:09 2021

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) Platinum 8352M CPU @ 2.30GHz
  2 "physical id"s (chips)
  64 "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 : 32
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

(Continued on next page)
### Platform Notes (Continued)

From `lscpu` from `util-linux` 2.32.1:
- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU(s):** 64
- **On-line CPU(s) list:** 0-63
- **Thread(s) per core:** 1
- **Core(s) per socket:** 32
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Platinum 8352M CPU @ 2.30GHz
- **Stepping:** 6
- **CPU MHz:** 1877.088
- **CPU max MHz:** 2301.0000
- **CPU min MHz:** 800.0000
- **BogoMIPS:** 4600.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 49152K
- **NUMA node0 CPU(s):** 0-15
- **NUMA node1 CPU(s):** 16-31
- **NUMA node2 CPU(s):** 32-47
- **NUMA node3 CPU(s):** 48-63
- **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 monitor ds_cpl vmx smx est tm2 sse3 sdbg fma cx16 xtrm pdcm pclid 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 invpcid_single intel_puin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsb纷纷 tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_fl iavx512bw avx512vl xsaveopt xsavec xaxt_bv1 xsaoves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbinvd dtherm ida arat pml tsx axv512vmbi umip pkp ospe avx512vbmi2 qfni vaes vpcmuloqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
- **cache size:** 49152 KB
## Lenovo Global Technology

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<td>Lenovo Global Technology</td>
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<tr>
<td>Tested by:</td>
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</tr>
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</table>

### 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 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 125831 MB
node 0 free: 127956 MB

node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
node 1 size: 126504 MB
node 1 free: 128531 MB

node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 2 size: 128014 MB
node 2 free: 128494 MB

node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
node 3 size: 127597 MB
node 3 free: 128371 MB

node distances:

<table>
<thead>
<tr>
<th>node</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
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<tr>
<td>3:</td>
<td>20</td>
<td>20</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>

From `/proc/meminfo`

MemTotal: 527874268 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

From `/etc/*release* /etc/*version*

os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.3"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
    ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

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Lenovo Global Technology
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(2.30 GHz, Intel Xeon Platinum 8352M)

SPECrates

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<tr>
<td>SPCrate®2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

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

Platform Notes (Continued)

uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
    x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
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: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 28 14:32

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

From /sys/devices/virtual/dmi/id
    Vendor: Lenovo
    Product: ThinkSystem SN550 V2
    Product Family: ThinkSystem
    Serial: 1234567890

Additional information from dmidecode 3.2 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:
    16x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

BIOS:
    BIOS Vendor: Lenovo
    BIOS Version: U8E111A-1.02
    BIOS Date: 05/07/2021
    BIOS Revision: 1.2
    Firmware Revision: 1.40

(Continued on next page)
Lenovo Global Technology
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SPECrater®2017_fp_base = 386
SPECrater®2017_fp_peak = Not Run

CPU2017 License: 9017  
Test Date:    Jul-2021
Test Sponsor: Lenovo Global Technology  
Hardware Availability: Jul-2021
Tested by:   Lenovo Global Technology  
Software Availability: Dec-2020

Platform Notes (Continued)
(End of data from sysinfo program)

Compiler Version Notes

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Compiler Version Notes (Continued)

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Fortran, C         | 521.wrf_r(base) 527.cam4_r(base)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64

(Continued on next page)
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<td>Hardware Availability:</td>
<td>Jul-2021</td>
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SPECrate®2017_fp_base = 386
SPECrate®2017_fp_peak = Not Run

### Base Portability Flags (Continued)

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:

```bash
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:

```bash
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:

```bash
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both Fortran and C:

```bash
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -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
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both C and C++:

```bash
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
```

(Continued on next page)
Lenovo Global Technology
ThinkSystem SN550 V2
(2.30 GHz, Intel Xeon Platinum 8352M)

SPECraten®2017_fp_base = 386
SPECraten®2017_fp_peak = Not Run

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

Test Date: Jul-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):

- mbranches-within-32B-boundaries -ljemalloc
- -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:

- w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
- -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
- -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-multiple-gather-scatter-by-shuffles
- -mbranches-within-32B-boundaries -nostandard-realloc-lhs
- -align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-F.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-F.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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