Lenovo Global Technology
ThinkSystem SN550 V2
(2.10 GHz, Intel Xeon Gold 5318N)

SPECrater®2017_fp_base = 309
SPECrater®2017_fp_peak = Not Run

Test Sponsor: Lenovo Global Technology
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Spec CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

503.bwaves_r 48
507.cactuBSSN_r 48
508.namd_r 48
510.parest_r 48
511.povray_r 48
519.lbm_r 48
521.wrf_r 48
526.blender_r 48
527.cam4_r 48
538.imagick_r 48
544.nab_r 48
549.fotonik3d_r 48
554.roms_r 48

Hardware
CPU Name: Intel Xeon Gold 5318N
Max MHz: 3400
Nominal: 2100
Enabled: 48 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: 36 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)
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: C/C++: 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
Parallel: No
Firmware: Lenovo BIOS Version USE111A 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
Lenovo Global Technology
ThinkSystem SN550 V2
(2.10 GHz, Intel Xeon Gold 5318N)

SPECrate®2017_fp_base = 309
SPECrate®2017_fp_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base</th>
<th>Peak</th>
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<tbody>
<tr>
<td></td>
<td>Copies</td>
<td>Seconds</td>
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<tr>
<td>503.bwaves_r</td>
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<td>777</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>48</td>
<td>136</td>
</tr>
<tr>
<td>508.namd_r</td>
<td>48</td>
<td>194</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>48</td>
<td>627</td>
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<tr>
<td>511.povray_r</td>
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<td>321</td>
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<tr>
<td>519.lbm_r</td>
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<td>228</td>
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<tr>
<td>521.wrf_r</td>
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<td>379</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
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<td>284</td>
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<tr>
<td>538.imagick_r</td>
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<td>160</td>
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<tr>
<td>544.nab_r</td>
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<td>549.fotonik3d_r</td>
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<td>1000</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>48</td>
<td>489</td>
</tr>
</tbody>
</table>

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"
MALLOC_CONF = "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)
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.

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
Cl Enhanced Mode set to Enabled
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 982a61ec0915b55891ef0e16aca6c64d
running on localhost.localdomain Mon Jul 5 19:58:33 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) Gold 5318N CPU @ 2.10GHz
    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 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
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
**Platform Notes (Continued)**

From `lscpu` from `util-linux 2.32.1`:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>x86_64</td>
</tr>
<tr>
<td>CPU op-mode(s)</td>
<td>32-bit, 64-bit</td>
</tr>
<tr>
<td>Byte Order</td>
<td>Little Endian</td>
</tr>
<tr>
<td>CPU(s)</td>
<td>48</td>
</tr>
<tr>
<td>On-line CPU(s) list</td>
<td>0-47</td>
</tr>
<tr>
<td>Thread(s) per core</td>
<td>1</td>
</tr>
<tr>
<td>Core(s) per socket</td>
<td>24</td>
</tr>
<tr>
<td>Socket(s)</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node(s)</td>
<td>4</td>
</tr>
<tr>
<td>Vendor ID</td>
<td>GenuineIntel</td>
</tr>
<tr>
<td>CPU family</td>
<td>6</td>
</tr>
<tr>
<td>Model</td>
<td>106</td>
</tr>
<tr>
<td>Model name</td>
<td>Intel(R) Xeon(R) Gold 5318N CPU @ 2.10GHz</td>
</tr>
<tr>
<td>Stepping</td>
<td>6</td>
</tr>
<tr>
<td>CPU MHz</td>
<td>1689.773</td>
</tr>
<tr>
<td>CPU max MHz</td>
<td>2101.0000</td>
</tr>
<tr>
<td>CPU min MHz</td>
<td>800.0000</td>
</tr>
<tr>
<td>BogoMIPS</td>
<td>4200.00</td>
</tr>
<tr>
<td>Virtualization</td>
<td>VT-x</td>
</tr>
<tr>
<td>L1d cache</td>
<td>48K</td>
</tr>
<tr>
<td>L1i cache</td>
<td>32K</td>
</tr>
<tr>
<td>L2 cache</td>
<td>1280K</td>
</tr>
<tr>
<td>L3 cache</td>
<td>36864K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s)</td>
<td>0-11</td>
</tr>
<tr>
<td>NUMA node1 CPU(s)</td>
<td>12-23</td>
</tr>
<tr>
<td>NUMA node2 CPU(s)</td>
<td>24-35</td>
</tr>
<tr>
<td>NUMA node3 CPU(s)</td>
<td>36-47</td>
</tr>
<tr>
<td>Flags</td>
<td>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 ssse3 sdbg fma cx16 xptr 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 invpcid_single intel_papin ssbd mba ibrs ibpb ibrs Enhanced fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512if vavx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsavesopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbms_total cqm_mbms_local split_lock_detect wbinvd dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities</td>
</tr>
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</table>

/proc/cpuinfo cache data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>cache size</td>
<td>36864 KB</td>
</tr>
</tbody>
</table>

From `numactl --hardware`
Lenovo Global Technology
ThinkSystem SN550 V2
(2.10 GHz, Intel Xeon Gold 5318N)

SPECrater®2017_fp_base = 309
SPECrater®2017_fp_peak = Not Run

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

Platform Notes (Continued)

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
node 0 size: 127042 MB
node 0 free: 127815 MB
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
node 1 size: 127446 MB
node 1 free: 128585 MB
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35
node 2 size: 127649 MB
node 2 free: 128523 MB
node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47
node 3 size: 127538 MB
node 3 free: 128545 MB
node distances:
  node   0   1   2   3
  0: 10 11 20 20
  1: 11 10 20 20
  2: 20 20 10 11
  3: 20 20 11 10

From /proc/meminfo
MemTotal:       527877732 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

uname -a:
Lenovo Global Technology
ThinkSystem SN550 V2
(2.10 GHz, Intel Xeon Gold 5318N)

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

SPECrate®2017_fp_base = 309
SPECrate®2017_fp_peak = Not Run

Platform Notes (Continued)

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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 5 15:33
SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem Type  Size  Used Avail Use% Mounted on
/dev/sda4 xfs 818G 30G 789G 4% /home

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, configured at 2666

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

(End of data from sysinfo program)
## Lenovo Global Technology

**ThinkSystem SN550 V2**  
(2.10 GHz, Intel Xeon Gold 5318N)

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Jul-2021</th>
</tr>
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<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
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<td>Software Availability:</td>
<td>Dec-2020</td>
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<table>
<thead>
<tr>
<th><strong>Compiler Version Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>C++, C</strong></td>
</tr>
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</tr>
<tr>
<td><strong>C++, C, Fortran</strong></td>
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<tr>
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<tr>
<td><strong>Fortran</strong></td>
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology

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(Continued on next page)
## Lenovo Global Technology

ThinkSystem SN550 V2  
(2.10 GHz, Intel Xeon Gold 5318N)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base =</th>
<th>309</th>
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<tbody>
<tr>
<td>SPECrate®2017_fp_peak =</td>
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**CPU2017 License:** 9017  
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**Tested by:** Lenovo Global Technology  
**Test Date:** Jul-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

### Compiler Version Notes (Continued)

```
Fortran, C | 521.wrf_r(base) 527.cam4_r(base)
```

Intel (R) Fortran Intel (R) 64 Compiler Classic for applications running on Intel (R) 64, Version 2021.1 Build 20201112_000000  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
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  
- 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

(Continued on next page)
Lenovo Global Technology

ThinkSystem SN550 V2
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---

Base Portability Flags (Continued)

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:
-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:
-w -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

Fortran benchmarks:
-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:
-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++:
-w -m64 -std=c11 -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

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math

(Continued on next page)
Lenovo Global Technology
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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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