Lenovo Global Technology  
ThinkSystem SN550  
(2.40 GHz, Intel Xeon Silver 4210R)

<table>
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<th>Hardware</th>
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<td>CPU Name: Intel Xeon Silver 4210R</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Enabled: 20 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td></td>
<td>Orderable: 1,2 chips</td>
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<tr>
<td></td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
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<tr>
<td></td>
<td>L2: 1 MB I+D on chip per core</td>
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<td></td>
<td>L3: 13.75 MB I+D on chip per chip</td>
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<td></td>
<td>Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)</td>
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<td>Compiler:</td>
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<tr>
<td></td>
<td>Kernel 4.12.14-195-default</td>
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<td>Fortran: Version 19.1.1.217 of Intel Fortran</td>
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<tr>
<td>System State:</td>
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<td>Peak Pointers:</td>
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<td>Other:</td>
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<td>Power Management:</td>
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**SPECrate®2017_fp_base** = 131

**SPECrate®2017_fp_peak** = Not Run

Lenovo Global Technology

SPECrater License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Jun-2020

Hardware Availability: Mar-2020

Software Availability: Apr-2020

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### SPECrate®2017_fp_base Result

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<td>526.blender_r</td>
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<td>554.roms_r</td>
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</table>

**Hardware**

CPU Name: Intel Xeon Silver 4210R

Max MHz: 3200

Nominal: 2400

Enabled: 20 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: 13.75 MB I+D on chip per chip

Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)

Storage: 1 x 960 GB SATA SSD

Other: None
Lenovo Global Technology
ThinkSystem SN550
(2.40 GHz, Intel Xeon Silver 4210R)

Results Table

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</table>

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"
MALLOCONF = "retain:true"
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.
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 Enable
Trusted Execution Technology set to Enable
Workload Configuration set to I/O Sensitive
Patrol Scrub set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl1e6e46a485a0011
running on linux-anu7 Mon Jun  8 15:31:14 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 4210R CPU @ 2.40GHz
  2 "physical id"s (chips)
  40 "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 : 10
   siblings : 20
   physical 0: cores 0 1 2 3 4 8 9 10 11 12
   physical 1: cores 0 1 2 3 4 8 9 10 11 12

(Continued on next page)
Lenovo Global Technology

ThinkSystem SN550
(2.40 GHz, Intel Xeon Silver 4210R)

SPEC®2017 Floating Point Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

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

SPECrate®2017_fp_base = 131
SPECrate®2017_fp_peak = Not Run

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

Platform Notes (Continued)

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): 40
- On-line CPU(s) list: 0-39
- Thread(s) per core: 2
- Core(s) per socket: 10
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
- Stepping: 7
- CPU MHz: 2400.000
- CPU max MHz: 3200.0000
- CPU min MHz: 1000.0000
- BogoMIPS: 4800.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 14080K
- NUMA node0 CPU(s): 0-9,20-29
- NUMA node1 CPU(s): 10-19,30-39
- Flags: fpu vme de pse tsc msr pae mce 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 xtrb pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault ebcd cat_l3 cdcp_l3

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 20 21 22 23 24 25 26 27 28 29

(Continued on next page)
Lenovo Global Technology
ThinkSystem SN550
(2.40 GHz, Intel Xeon Silver 4210R)

SPECrater®2017_fp_base = 131
SPECrater®2017_fp_peak = Not Run

Platform Notes (Continued)

node 0 size: 386687 MB
node 0 free: 386042 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 387037 MB
node 1 free: 386542 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 792294900 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
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 Jun 8 15:30
SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 893G 55G 838G 7% /
Lenovo Global Technology
ThinkSystem SN550
(2.40 GHz, Intel Xeon Silver 4210R)

SPECrate®2017_fp_base = 131
SPECrate®2017_fp_peak = Not Run

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

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

Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
BIOS: Lenovo -[IVE155L-2.61]- 05/20/2020
Vendor: Lenovo
Product: ThinkSystem SN550 : 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)
This system support 12 DIMMs per processor, total 24 DIMMs.
24 DIMM slots installed with 32 GB DIMM for this run, and running at 2400 due to CPU limitation.

Compiler Version Notes

C               | 519.libm_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.

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.

(Continued on next page)
### Lenovo Global Technology

**ThinkSystem SN550**  
(2.40 GHz, Intel Xeon Silver 4210R)

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<tr>
<th>Specification</th>
<th>Value</th>
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### SPEC CPU 2017 Floating Point Rate Result

**SPECratenue**

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<th>SPECratenue</th>
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<tr>
<td>SPECratenue</td>
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### Compiler Version Notes (Continued)

```
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.

```
C++ benchmarks
```

```
icc
```

**Fortran**

```
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.

"""Base Compiler Invocation"

**C benchmarks:**

```
icc
```

**C++ benchmarks:**

```
icpc
```

**Fortran benchmarks:**

```
ifort
```

(Continued on next page)
## Base Compiler Invocation (Continued)

- 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

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<td>-DSPEC_LP64</td>
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<td>508.namd_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>510.parest_r</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>511.povray_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAGS -convert big_endian</td>
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<tr>
<td>521.wrf_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAGS -convert big_endian</td>
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<td>526.blender_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX -funsigned-char</td>
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<td>-DSPEC_LP64 -DSPEC_CASE_FLAGS</td>
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<td>-DSPEC_LP64</td>
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<td>544.nab_r</td>
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<td>549.fotonik3d_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## Base Optimization Flags

### C benchmarks:
- `-m64` `-qnextgen` `-std=c11`
- `--plugin-opt=-x86-branches-within-32B-boundaries` `-Wl,-z,muldefs`
- `-fuse-ld.gold -xCORE-AVX512` `-Ofast -ffast-math -flto` `-mfpmath=sse`
- `-funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### C++ benchmarks:
- `-m64` `-qnextgen` `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs` `-fuse-ld.gold -xCORE-AVX512` `-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`
Lenovo Global Technology
ThinkSystem SN550
(2.40 GHz, Intel Xeon Silver 4210R)

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<th>SPECrate©2017_fp_base = 131</th>
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<tr>
<td>SPECrate©2017_fp_peak = Not Run</td>
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

### Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- `--fused-ld=gold --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`
- `-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`
- `--fused-ld=gold --xCORE-AVX512 -Ofast --ffast-math --flt0 -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`
- `--fused-ld=gold --xCORE-AVX512 -Ofast --ffast-math --flt0 -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`
- `--fused-ld=gold --xCORE-AVX512 -Ofast --ffast-math --flt0 -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`

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-CLX-I.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-I.xml
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Tested with SPEC CPU®2017 v1.1.0 on 2020-06-08 03:31:14-0400.
Originally published on 2020-07-07.