### Lenovo Global Technology

ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

| SPECrate2017_fp_base = 117 |
| SPECrate2017_fp_peak = 120 |

| CPU2017 License: | 9017 |
| Test Sponsor: | Lenovo Global Technology |
| Tested by: | Lenovo Global Technology |
| Test Date: | Jan-2018 |
| Hardware Availability: | Aug-2017 |
| Software Availability: | Sep-2017 |

#### Hardware

- **CPU Name:** Intel Xeon Silver 4116
- **Max MHz.:** 3000
- **Nominal:** 2100
- **Enabled:** 24 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:** 16.5 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)
- **Storage:** 1 x 800 GB SAS SSD
- **Other:** None

#### Software

- **OS:** SUSE Linux Enterprise Server 12 SP2 (x86_64)
- **Kernel:** 4.4.21-69-default
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;
  Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Lenovo BIOS Version IVE111I 1.01 released Aug-2017
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
### Lenovo Global Technology

**ThinkSystem SN550**  
(2.10 GHz, Intel Xeon Silver 4116)

**SPEC CPU2017 Floating Point Rate Result**

**Lenovo Global Technology**

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

---

#### Results Table

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</tbody>
</table>

**SPECrate2017_fp_base** = 117  
**SPECrate2017_fp_peak** = 120

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/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/je5.0.1-64"
```

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.4

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>
```

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
Lenovo Global Technology
ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

SPEC CPU2017 Floating Point Rate Result
Copyright 2017-2018 Standard Performance Evaluation Corporation

SPECrate2017_fp_base = 117
SPECrate2017_fp_peak = 120

CPU2017 License: 9017
Test Date: Jan-2018
Test Sponsor: Lenovo Global Technology
Hardware Availability: Aug-2017
Tested by: Lenovo Global Technology
Software Availability: Sep-2017

General Notes (Continued)
No: 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.
No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes
BIOS configuration:
Choose Operating Mode set to Maximum Performance
SNC set to Enable
Hardware Prefetcher set to Disable
MONITORMWAIT set to Enable
Execute Disable Bit set to Disable
Intel Virtualization Technology set to Disable
DCA set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on SN550 Sun Jan 28 11:04:56 2018

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 4116 CPU @ 2.10GHz
 2 "physical id"s (chips)
 48 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 12
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13

(Continued on next page)
Lenovo Global Technology
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Tested by: Lenovo Global Technology
Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Platform Notes (Continued)

physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2095.080
BogoMIPS: 4190.16
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0-11,24-35
NUMA node1 CPU(s): 12-23,36-47
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
aperfmpref eagerfpu 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 ida arat epb pni pkbrts dtherm intel_pt
tpr_shadow vmo1 flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erms invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd
avx512bw avx512v1 xsaves opt xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 2 nodes (0-1)

(Continued on next page)
Lenovo Global Technology
ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

SPECrate2017_fp_base = 117
SPECrate2017_fp_peak = 120

Platform Notes (Continued)

node 1 free: 385853 MB
node distances:
node 0  1
    0: 10  21
    1: 21  10

From /proc/meminfo
    MemTotal:       792245524 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
    SuSE-release:
        SUSE Linux Enterprise Server 12 (x86_64)
        VERSION = 12
        PATCHLEVEL = 2
        # 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-SP2"
        VERSION_ID="12.2"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
    Linux SN550 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67) x86_64
    x86_64 x86_64 GNU/Linux

run-level 3 Jan 28 10:53

SPEC is set to: /home/cpu2017.1.0.2.ic18.0

Filesystem      Type   Size  Used Avail Use% Mounted on
/dev/sda4        xfs    687G  136G  552G  20%  /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 -[IVE111I-1.01]- 08/11/2017
    Memory:
        24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

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

**ThinkSystem SN550**  
(2.10 GHz, Intel Xeon Silver 4116)

<table>
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<th>CPU2017 License:</th>
<th>9017</th>
<th>Test Date:</th>
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<td>Hardware Availability:</td>
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<td>Lenovo Global Technology</td>
<td>Software Availability:</td>
<td>Sep-2017</td>
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**SPECrate2017_fp_base = 117**

**SPECrate2017_fp_peak = 120**

### Compiler Version Notes

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<th>Version</th>
<th>Date</th>
<th>Notes</th>
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| CC            | 519.lbm_r(base)  | 538.imagick_r(base, peak) 544.nab_r(base) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|               | 519.lbm_r(peak) | 544.nab_r(peak) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
| CXXC          | 508.namd_r(base) | 510.parest_r(base) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|               | 508.namd_r(peak) | 510.parest_r(peak) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|               | 511.povray_r(base) | 526.blender_r(base) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|               | 511.povray_r(peak) | 526.blender_r(peak) | icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |

(Continued on next page)
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Software Availability: Sep-2017

Compiler Version Notes (Continued)

FC 507.cactuBSSN_r(base)
-----------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ic (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----------------------------------------------

FC 507.cactuBSSN_r(peak)
-----------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ic (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----------------------------------------------

FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
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FC 554.roms_r(peak)
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ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----------------------------------------------

CC 521.wrf_r(base) 527.cam4_r(base)
-----------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ic (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----------------------------------------------

CC 521.wrf_r(peak) 527.cam4_r(peak)
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(Continued on next page)
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology

### Compiler Version Notes (Continued)

- **ifort (IFORT) 18.0.0 20170811**  
  Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

- **icc (ICC) 18.0.0 20170811**  
  Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

### Base Compiler Invocation

**C benchmarks:**
- icc

**C++ benchmarks:**
- icpc

**Fortran benchmarks:**
- ifort

- 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

- 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
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Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Base Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64 -std=c11

Benchmarks using both C and C++:
-m64 -std=c11

Benchmarks using Fortran, C, and C++:
-m64 -std=c11
Lenovo Global Technology
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Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Peak Compiler Invocation

C benchmarks:
  icc

C++ benchmarks:
  icpc

Fortran benchmarks:
  ifort

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
  519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
  -no-prec-div -qopt-prefetch -ffinite-math-only
  -qopt-mem-layout-trans=3

  538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
  -ffinite-math-only -qopt-mem-layout-trans=3

  544.nab_r: Same as 519.lbm_r

C++ benchmarks:
  -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
  -no-prec-div -qopt-prefetch -ffinite-math-only
  -qopt-mem-layout-trans=3

Fortran benchmarks:

(Continued on next page)
Lenovo Global Technology
ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

SPECrate2017_fp_base = 117
SPECrate2017_fp_peak = 120

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

Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Benchmarks using Fortran, C, and C++:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Peak Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64 -std=c11

Benchmarks using both C and C++:
-m64 -std=c11

(Continued on next page)
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**Peak Other Flags (Continued)**

Benchmarks using Fortran, C, and C++:
- `-m64` `-std=c11`

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.html](http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.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.xml](http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.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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