# Lenovo Global Technology

**ThinkSystem ST550**  
(2.40 GHz, Intel Xeon Silver 4214R)

**SPECraten®2017_fp_base = 144**  
**SPECraten®2017_fp_peak = Not Run**

| Copies | 0 | 20 | 40 | 60 | 80 | 100 | 115 | 130 | 145 | 160 | 175 | 190 | 205 | 220 | 235 | 250 | 265 | 280 | 300 | 315 | 330 | 345 | 360 | 375 | 390 | 405 | 420 | 435 | 450 | 465 | 480 | 495 | 510 | 525 | 540 | 555 | 570 | 585 |
|--------|---|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 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 Silver 4214R  
- **Max MHz:** 3500  
- **Nominal:** 2400  
- **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:** 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)  
- **Storage:** 1 x 480 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  
- **Parallel:** No  
- **Firmware:** Lenovo BIOS Version oOe152L 2.51 released Feb-2020 tested as oOe151L 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
Lenovo Global Technology
ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

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

Results Table

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</table>

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/cpu2017-1.1.0-ic19.0u5/lib/intel64"

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
Lenovo Global Technology
ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

SPECRate®2017_fp_base = 144
SPECRate®2017_fp_peak = Not Run

General Notes (Continued)

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.
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) 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
LLC dead line alloc set to Disable
Memory Data Scrambling set to Disable
SNC set to Enable

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on linux-9n08 Mon Mar 16 09:18:27 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 4214R CPU @ 2.40GHz
  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 : 12
  siblings : 24
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
  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
Address sizes:      48 bits physical, 48 bits virtual
CPU(s):             48
Lenovo Global Technology
ThinkSystem ST550
(2.40 GHz, Intel Xeon Silver 4214R)

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<th>9017</th>
<th>Test Date:</th>
<th>Mar-2020</th>
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<td>Lenovo Global Technology</td>
<td>Hardware Availability:</td>
<td>Mar-2020</td>
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<td>Software Availability:</td>
<td>Sep-2019</td>
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</tbody>
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**SPECrate®2017_fp_base = 144**

**SPECrate®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
Stepping: 7
CPU MHz: 2400.000
CPU max MHz: 3500.000
CPU min MHz: 1000.000
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0-2,6-8,24-26,30-32
NUMA node1 CPU(s): 3-5,9-11,27-29,33-35
NUMA node2 CPU(s): 12-14,18-20,36-38,42-44
NUMA node3 CPU(s): 15-17,21-23,39-41,45-47
Flags:

```
fpum 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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmerf pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm
pcid dca sse4_1 mca cx16 xtpr pdcm pcid dca sse4_1 mca cx16 xtpr pdcm libp bibp ibrs ibrs_hped invpcid_single
intel_pinn ssbd mba ibpb stibp ibrs_hped ibrs_enhanced trp_shadow vmmx flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ertm invpcid rtm cqm mxp rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occu llc cqm_mbb_total cqm_mmb_local
dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities
```

```
/proc/cpuinfo cache data
cache size : 16896 KB
```

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 6 7 8 24 25 26 30 31 32
node 0 size: 48001 MB
node 0 free: 45903 MB
node 1 cpus: 3 4 5 9 10 11 27 28 29 33 34 35
node 1 size: 48381 MB
node 1 free: 46690 MB

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology  
ThinkSystem ST550  
(2.40 GHz, Intel Xeon Silver 4214R)  

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**SPECrate®2017_fp_base = 144**  
**SPECrate®2017_fp_peak = Not Run**

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**Platform Notes (Continued)**

node 2 cpus: 12 13 14 18 19 20 36 37 38 42 43 44  
node 2 size: 48381 MB  
node 2 free: 46788 MB  
node 3 cpus: 15 16 17 21 22 23 39 40 41 45 46 47  
node 3 size: 48351 MB  
node 3 free: 46729 MB  
node distances:  
node 0 1 2 3  
0: 10 11 21 21  
1: 11 10 21 21  
2: 21 21 10 11  
3: 21 21 11 10

From /proc/meminfo  
MemTotal: 197751208 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*  
os-release:  
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-9n08 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 15 17:07  
SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5

(Continued on next page)
Lenovo Global Technology
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Platform Notes (Continued)

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 445G 34G 411G 8% /

From /sys/devices/virtual/dmi/id
BIOS: Lenovo -[00E151L-2.51]- 01/14/2020
Vendor: Lenovo
Product: System X -[7X09TOZ000] -
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:
12x SK Hynix HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================

C++             | 508.namd_r(base) 510.parest_r(base)
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

==============================================================================
C++, C               | 511.povray_r(base) 526.blender_r(base)
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
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(Continued on next page)
Lenovo Global Technology

ThinkSystem ST550
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SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

SPECrate®2017_fp_base = 144

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Hardware Availability: Mar-2020
Software Availability: Sep-2019

Compiler Version Notes (Continued)

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(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
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==============================================================================
Fortran | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Fortran, C | 521.wrf_r(base) 527.cam4_r(base)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
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Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

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

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

**Base Optimization Flags**

C benchmarks:
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

C++ benchmarks:
-m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:
-m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-1hs

Benchmarks using both Fortran and C:
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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<tr>
<td>Software Availability: Sep-2019</td>
</tr>
</tbody>
</table>

### Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs
```

Benchmarks using both C and C++:

```
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs
```

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-G.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-CLX-G.xml

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