# Lenovo Global Technology

## ThinkSystem SR590

(2.40 GHz, Intel Xeon Silver 4210R)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
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<thead>
<tr>
<th>SPECspeed®2017_fp_base =</th>
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<tr>
<td>SPECspeed®2017_fp_peak =</td>
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### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>20</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>20</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>20</td>
</tr>
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<td>628.pop2_s</td>
<td>20</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>20</td>
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<tr>
<td>644.nab_s</td>
<td>20</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>20</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>20</td>
</tr>
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### Hardware

- **CPU Name:** Intel Xeon Silver 4210R
- **Max MHz:** 3200
- **Nominal:** 2400
- **Enabled:** 20 cores, 2 chips
- **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
- **Other:** None
- **Memory:** 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)
- **Storage:** 1 x 960 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 C/C++
  - Compilator for Linux;
  - Fortran: Version 19.0.5.281 of Intel Fortran
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version TEE155L 2.61 released May-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
**SPEC CPU®2017 Floating Point Speed Result**

**Lenovo Global Technology**

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<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Ratio</th>
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<td>628.pop2_s</td>
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<td>74.2</td>
<td>213</td>
<td>73.8</td>
<td>214</td>
<td>73.7</td>
</tr>
</tbody>
</table>

**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:

KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.0u5/lib/intel64"
OMP_STACKSIZE = "192M"

**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

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.
Lenovo Global Technology
ThinkSystem SR590
(2.40 GHz, Intel Xeon Silver 4210R)

| SPECspeed®2017_fp_base = 85.1 |
| SPECspeed®2017_fp_peak = Not Run |

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

**Platform Notes**

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
CPU P-state Control set to Autonomous
MONITOR/MWAIT set to Enable
Hyper-Threading set to Disable
Adjacent Cache Prefetch set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed81e6e46a485a0011
running on linux-cnti Tue Jun 9 15:12:52 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)
  20 "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 : 10
  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

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): 20
On-line CPU(s) list: 0-19
Thread(s) per core: 1
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
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K

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SPECspeed®2017_fp_base = 85.1
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

L2 cache: 1024K
L3 cache: 14080K
NUMA node0 CPU(s): 0-9
NUMA node1 CPU(s): 10-19
Flags: fpu vme de pse tsc msr pae 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 monitoring ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrunc pdcd pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpx cat_l3 cdp_l3 invpcid_single intel_pdpin ssbd mba ibrs ibpib stibp ibrs_enhanced tpr_shadow vmmi f10pror fpgsbase tsc_adjust bmai hle avx2 smep bmi2 3rdsinvpcd rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsave crqm llc crqm_occu llc crqm_mbml_total crqm_mbml_local dtherm ida arat pln pts hwp_epp pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size: 14080 KB

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
  node 0 size: 96386 MB
  node 0 free: 96057 MB
  node 1 cpus: 10 11 12 13 14 15 16 17 18 19
  node 1 size: 96736 MB
  node 1 free: 96302 MB
  node distances:
    node 0: 10 21
    node 1: 21 10

From /proc/meminfo
  MemTotal: 197757288 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"

(Continued on next page)
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SPECspeed®2017_fp_base = 85.1
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jun-2020
Tested by: Lenovo Global Technology
Hardware Availability: Mar-2020
Software Availability: Sep-2019

Platform Notes (Continued)

uname -a:
    Linux linux-cnti 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 9 15:09

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5

From /sys/devices/virtual/dmi/id
    BIOS: Lenovo -[TEE155L-2.61]- 05/20/2020
    Vendor: Lenovo
    Product: ThinkSystem SR590 -[7X98RCZ000]-
    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 SM BIOS" standard.
Memory:
    4x NO DIMM NO DIMM
    12x SK Hynix HMA82GR7CJR8N-WM 16 GB 2 rank 2933

(End of data from sysinfo program)
This system support 8 DIMMs per processor, total 16 DIMMs.
12 DIMM slots installed with 16 GB DIMM for this run,
and running at 2400 due to CPU limitation.
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SPECTspeed®2017_fp_base = 85.1
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Compiler Version Notes

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<th>C</th>
<th>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</th>
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| Intel(R) C   | Intel(R) 64 Compiler for applications running on Intel(R) 64,  
<p>|              | Version 19.0.5.281 Build 20190815                  |</p>
<table>
<thead>
<tr>
<th>Copyright (C)</th>
<th>1985-2019 Intel Corporation. All rights reserved.</th>
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|                 | 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                  |
| Copyright (C)   | 1985-2019 Intel Corporation. All rights reserved. |

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Base Compiler Invocation

C benchmarks:
icc

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Base Compiler Invocation (Continued)

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byte_recl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-m64 -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
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### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- `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-I.html](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-ic19.0u5-official-linux64_rev0.xml](http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64_rev0.xml)
- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml)