# Lenovo Global Technology

**ThinkSystem SR650**  
*(2.00 GHz, Intel Xeon Silver 4109T)*

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
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<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>59.2</th>
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<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>60.6</td>
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<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
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<tbody>
<tr>
<td>Test Date:</td>
<td>Dec-2017</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Aug-2017</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Sep-2017</td>
</tr>
</tbody>
</table>

## Hardware

- **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++  
- **Fortran:** Version 18.0.0.128 of Intel Fortran
- **Firmware:** Lenovo BIOS Version IVE111C 1.00 released Jul-2017
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

### CPU Name:
Intel Xeon Silver 4109T  
**Max MHz.:** 3000  
**Nominal:** 2000  
**Enabled:** 16 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:** 11 MB I+D on chip per core  
**Other:** None  
**Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)  
**Storage:** 1 x 800 GB SAS SSD  
**Other:** None

## Software

### 603.bwaves_s  
16 threads:  
70.0

### 607.cactuBSSN_s  
16 threads:  
32.9  
71.9

### 619.lbm_s  
16 threads:  
32.6  
47.5

### 621.wrf_s  
16 threads:  
32.2  
51.8

### 627.cam4_s  
16 threads:  
32.2  
43.1

### 628.pop2_s  
16 threads:  
40.4  
45.8

### 638.imagick_s  
16 threads:  
40.5  
73.1

### 644.nab_s  
16 threads:  
73.1  
60.1

### 649.fotonik3d_s  
16 threads:  
59.0  
62.0

### 654.roms_s  
16 threads:  
67.3  
59.0

---

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base (59.2)</th>
<th>SPECspeed2017_fp_peak (60.6)</th>
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<tr>
<td>0</td>
<td>15.0</td>
<td>30.0</td>
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<tr>
<td>16</td>
<td>70.0</td>
<td>318</td>
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Lenovo Global Technology
ThinkSystem SR650
(2.00 GHz, Intel Xeon Silver 4109T)

SPECspeed2017_fp_base = 59.2
SPECspeed2017_fp_peak = 60.6

Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>318</td>
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<tr>
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<td>238</td>
<td>70.0</td>
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<td>69.9</td>
<td>238</td>
<td>70.0</td>
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<tr>
<td>619.lbm_s</td>
<td>16</td>
<td>160</td>
<td>32.8</td>
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<tr>
<td>627.cam4_s</td>
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<td>32.1</td>
<td>275</td>
<td>32.2</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>274</td>
<td>43.4</td>
<td>275</td>
<td>43.1</td>
<td>275</td>
<td>43.1</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>357</td>
<td>40.4</td>
<td>357</td>
<td>40.4</td>
<td>356</td>
<td>40.5</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
<td>239</td>
<td>73.1</td>
<td>239</td>
<td>73.1</td>
<td>239</td>
<td>73.1</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>152</td>
<td>59.9</td>
<td>151</td>
<td>60.3</td>
<td>152</td>
<td>60.1</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>16</td>
<td>253</td>
<td>62.2</td>
<td>254</td>
<td>62.0</td>
<td>254</td>
<td>62.0</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 59.2
SPECspeed2017_fp_peak = 60.6

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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"
OMP_STACKSIZE = "192M"

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
No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
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

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

Lenovo Global Technology
ThinkSystem SR650
(2.00 GHz, Intel Xeon Silver 4109T)

SPECspeed2017_fp_peak = 60.6
SPECspeed2017_fp_base = 59.2

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

General Notes (Continued)

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
Hyper-Threading set to Disable
MONITORMWAIT set to Enable
Adjacent Cache Prefetch set to Disable
XPT Prefetcher set to Enable
Stale AtoS set to Enable
DCA set to Enable

Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bccc091c0f
running on Cyborg-SUT4 Wed Dec 27 18:32:53 2017

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 4109T CPU @ 2.00GHz
2 "physical id"s (chips)
16 "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 : 8
siblings : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 1
Core(s) per socket: 8

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

**ThinkSystem SR650**

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<tr>
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#### SPEC CPU2017 License: 9017

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Test Date:** Dec-2017

**Hardware Availability:** Aug-2017

**Tested by:** Lenovo Global Technology

**Software Availability:** Sep-2017

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### Platform Notes (Continued)

- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Silver 4109T CPU @ 2.00GHz
- **Stepping:** 4
- **CPU MHz:** 1995.305
- **BogoMIPS:** 3990.61
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 11264K
- **NUMA node0 CPU(s):** 0-7
- **NUMA node1 CPU(s):** 8-15

**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
- lmr
- constant_tsc
- arch_perfmon
- pebs
- bts
- rep_good
- nopl
- xtopology
- nonstop_tsc
- aperfmperf
- eagerfpu
- pni
- pclmulqdq
- dtes64
- monitor
- ds_cpl
- vt
- vmx
- smx
- est
- tm2
- ssse3
- sdbg
- fma
- cx16
- xtr
- pdcm
- pcid
- dca
- sse4_1
- sse4_2
- x2apic
- movbe
- popcnt
- tsc_deadline_timer
- aes
- xsave
- avx
- f16c
- rdrand
- lahf_lm
- abm
- 3dnowprefetch
- ida
- arat
- intel_pt
- tpr_shadow
- vmm
- 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
- avx512vl
- xsaveopt
- xsavec
- xgetbv1
- cqm_llc
- cqm_occup_llc

```
/proc/cpuinfo cache data
   cache size : 11264 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
node 0 size: 193111 MB
node 0 free: 191454 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 193504 MB
node 1 free: 192465 MB
node distances:
   node 0 1
   0: 10 21
   1: 21 10
```

From /proc/meminfo

```
MemTotal: 395894184 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

(Continued on next page)
Lenovo Global Technology
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SPECspeed2017_fp_base = 59.2
SPECspeed2017_fp_peak = 60.6

Platform Notes (Continued)

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 Cyborg-SUT4 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 Dec 26 23:51

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
  Filesystem      Type  Size  Used Avail Use% Mounted on
  /dev/sda3      xfs   445G   60G  385G  14% /

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 -[IVE111C-1.00]- 07/17/2017
  Memory:
    24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
**SPECCPU2017 Floating Point Speed Result**

**Lenovo Global Technology**
ThinkSystem SR650  
(2.00 GHz, Intel Xeon Silver 4109T)

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<td>SPECspeed2017_fp_base</td>
<td>59.2</td>
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**CPUTest License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Dec-2017  
**Hardware Availability:** Aug-2017  
**Software Availability:** Sep-2017

**Compiler Version Notes (Continued)**

<table>
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<th>CC 619.lbm_s(peak)</th>
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<tbody>
<tr>
<td>icc (ICC) 18.0.0 20170811 Copyright (C) 1985-2017 Intel Corporation. All rights reserved.</td>
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<tr>
<th>FC 607.cactuBSSN_s(base)</th>
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<tbody>
<tr>
<td>icpc (ICC) 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. ifort (IFORT) 18.0.0 20170811 Copyright (C) 1985-2017 Intel Corporation. All rights reserved.</td>
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SPECspeed2017_fp_base = 59.2
SPECspeed2017_fp_peak = 60.6

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

Compiler Version Notes (Continued)
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

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.ibm_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 byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64
Lenovo Global Technology

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| SPECspeed2017_fp_base = 59.2 |
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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 -qopenmp -DSPEC_OPENMP

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

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

**Base Other Flags**

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

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

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

**Peak Compiler Invocation**

C benchmarks:
icc

Fortran benchmarks:
ifort

(Continued on next page)
Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifort icc

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

619.lbm_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP

638.imagick_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP

644.nab_s: Same as 638.imagick_s

Fortran benchmarks:

-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

627.cam4_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

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ThinkSystem SR650
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SPECspeed2017_fp_base = 59.2
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Dec-2017
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-prefetch
-ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
-align array32byte

Peak Other Flags

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

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

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

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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-A.xml

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Tested with SPEC CPU2017 v1.0.2 on 2017-12-27 05:32:53-0500.
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