# Lenovo Global Technology
ThinkSystem SR590  
(2.10 GHz, Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECspeed2017_int_base</th>
<th>SPECspeed2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.92</td>
<td>7.12</td>
</tr>
</tbody>
</table>

## Hardware
- **CPU Name:** Intel Xeon Silver 4110  
- **Max MHz.:** 3000  
- **Nominal:** 2100  
- **Enabled:** 16 cores, 2 chips  
- **Orderable:** 1,2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 1 MB I+D on chip per core  
- **Cache L3:** 11 MB I+D on chip per chip  
- **Memory:** 384 GB (12 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 SP3 (x86_64)  
- **Kernel:** 4.4.73-5-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:** Yes  
- **Firmware:** Lenovo BIOS Version TEE119J 1.20 released Sep-2017  
- **File System:** btrfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:**  
  - jemalloc: jemalloc memory allocator library V5.0.1;  
  - jemalloc: configured and built at default for  
    32bit (i686) and 64bit (x86_64) targets;  
  - jemalloc: built with the RedHat Enterprise 7.4,  
    and the system compiler gcc 4.8.5;  
  - jemalloc: sources avilable from jemalloc.net or releases

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

### SPECbenchmarks

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_int_base</th>
<th>SPECspeed2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>16</td>
<td>4.88</td>
<td>7.33</td>
</tr>
<tr>
<td>gcc_s</td>
<td>16</td>
<td>5.81</td>
<td>7.49</td>
</tr>
<tr>
<td>mcf_s</td>
<td>16</td>
<td>4.24</td>
<td>9.16</td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>16</td>
<td>4.57</td>
<td>9.16</td>
</tr>
<tr>
<td>xalancbmk_s</td>
<td>16</td>
<td>7.56</td>
<td>8.19</td>
</tr>
<tr>
<td>x264_s</td>
<td>16</td>
<td>4.21</td>
<td>9.42</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>16</td>
<td>4.19</td>
<td>9.42</td>
</tr>
<tr>
<td>leela_s</td>
<td>16</td>
<td>3.51</td>
<td>3.53</td>
</tr>
<tr>
<td>exchange2_s</td>
<td>16</td>
<td>10.8</td>
<td>10.8</td>
</tr>
<tr>
<td>xz_s</td>
<td>16</td>
<td>15.8</td>
<td>15.8</td>
</tr>
</tbody>
</table>
Lenovo Global Technology

ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>16</td>
<td>366</td>
<td>4.85</td>
<td>362</td>
<td>4.90</td>
<td>364</td>
<td>4.88</td>
<td>16</td>
<td>306</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>16</td>
<td>548</td>
<td>7.27</td>
<td>542</td>
<td>7.35</td>
<td>543</td>
<td>7.33</td>
<td>16</td>
<td>531</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>16</td>
<td>515</td>
<td>9.16</td>
<td>515</td>
<td>9.16</td>
<td>522</td>
<td>9.05</td>
<td>16</td>
<td>516</td>
</tr>
<tr>
<td>623.xalanchmk_s</td>
<td>16</td>
<td>187</td>
<td>7.56</td>
<td>185</td>
<td>7.64</td>
<td>188</td>
<td>7.53</td>
<td>16</td>
<td>173</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>16</td>
<td>486</td>
<td>3.51</td>
<td>486</td>
<td>3.51</td>
<td>485</td>
<td>3.52</td>
<td>16</td>
<td>484</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>16</td>
<td>272</td>
<td>10.8</td>
<td>271</td>
<td>10.8</td>
<td>271</td>
<td>10.9</td>
<td>16</td>
<td>272</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>16</td>
<td>392</td>
<td>15.8</td>
<td>391</td>
<td>15.8</td>
<td>392</td>
<td>15.8</td>
<td>16</td>
<td>388</td>
</tr>
</tbody>
</table>

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

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 syncd 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 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

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

Test Date: Jan-2018
Hardware Availability: Nov-2017
Software Availability: Sep-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
Execute Disable Bit set to Disable
MONITORMWAIT set to Enable
Per Core P-state set to Disable
XPT Prefetcher set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bdc091c0f
running on SR590-1 Tue Jan 2 16:58:53 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 4110 CPU @ 2.10GHz
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
Socket(s): 2

(Continued on next page)
## SPEC CPU2017 Integer Speed Result

**Lenovo Global Technology**  
ThinkSystem SR590  
(2.10 GHz, Intel Xeon Silver 4110)

### SPECs2017_int_base = 6.92  
**SPECs2017_int_peak = 7.12**

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

### Platform Notes (Continued)

- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz
- **Stepping:** 4
- **CPU MHz:** 2095.083
- **BogoMIPS:** 4190.16
- **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:**
```plaintext
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 xptr pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel_pt
tpr_shadow vnmi 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 xsaves xgetbv1 cqm_llc cqm_occup_llc pku ospke
```

`/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:** 193124 MB
- **node 0 free:** 192689 MB
- **node 1 cpus:** 8 9 10 11 12 13 14 15
- **node 1 size:** 193517 MB
- **node 1 free:** 193348 MB

From `/proc/meminfo`
- **MemTotal:** 395921940 kB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 kB

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

Platform Notes (Continued)

From /etc/*release* /etc/*version*
SuSE-release:
  SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12
  PATCHLEVEL = 3
# 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-SP3"
  VERSION_ID="12.3"
  PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
  ID="sles"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:
  Linux SR590-1 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4) x86_64
  x86_64 x86_64 GNU/Linux
run-level 3 Jan 2 16:56

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
  Filesystem     Type   Size  Used Avail Use% Mounted on
  /dev/sdb2      btrfs  744G   90G  654G  13% /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 -[TEE119J-1.20]- 09/06/2017
  Memory:
  12x Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666, configured at 2400
  4x NO DIMM NO DIMM

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  600.perlibench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base, peak) 657.xz_s(base)
==============================================================================

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

(Continued on next page)
# Lenovo Global Technology

ThinkSystem SR590  
(2.10 GHz, Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed2017_int_base</th>
<th>SPECspeed2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.92</td>
<td>7.12</td>
</tr>
</tbody>
</table>

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

---

**Compiler Version Notes (Continued)**

```plaintext
CC  600.perlbench_s(peak) 602.gcc_s(peak) 605.mcf_s(peak) 657.xz_s(peak)

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

CXXC 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)  
641.leela_s(base)

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

CXXC 620.omnetpp_s(peak) 623.xalancbmk_s(peak) 631.deepsjeng_s(peak)  
641.leela_s(peak)

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

FC 648.exchange2_s(base, peak)

ifort (IFORT) 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
Lenovo Global Technology
ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

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

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc

Base Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64
Lenovo Global Technology
ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_int_base = 6.92
SPECspeed2017_int_peak = 7.12

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

Peak Compiler Invocation

C benchmarks:
  icc

C++ benchmarks:
  icpc

Fortran benchmarks:
  ifort

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -D_FILE_OFFSET_BITS=64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

(Continued on next page)

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX512 -qopt-mem-layout-trans=3 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/je5.0.1-64/lib -ljemalloc

602.gcc_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX512 -qopt-mem-layout-trans=3 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc

605.mcf_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc
Lenovo Global Technology
ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

**SPEC CPU2017 Integer Speed Result**

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: Jan-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Nov-2017</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Sep-2017</td>
</tr>
</tbody>
</table>

**SPECspeed2017_int_base = 6.92**

**SPECspeed2017_int_peak = 7.12**

---

### Peak Optimization Flags (Continued)

625.x264_s: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc`

657.xz_s: Same as 602.gcc_s

C++ benchmarks:

620.omnetpp_s: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc`


631.deepsjeng_s: Same as 620.omnetpp_s

641.leela_s: Same as 620.omnetpp_s

Fortran benchmarks:


---

### Peak Other Flags

C benchmarks:

- `-m64 -std=c11`

C++ benchmarks (except as noted below):

- `-m64`

623.xalancbmk_s: `-m32`

Fortran benchmarks:

- `-m64`
**SPEC CPU2017 Integer Speed Result**

**Lenovo Global Technology**

ThinkSystem SR590
(2.10 GHz, Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECspeed2017_int_base</th>
<th>SPECspeed2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.92</td>
<td>7.12</td>
</tr>
</tbody>
</table>

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

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

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

SPEC is a registered trademark of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.2 on 2018-01-02 03:58:52-0500.
Originally published on 2018-03-06.