## Lenovo Global Technology

### ThinkSystem SR530

(2.10 GHz, Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 58.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak = 59.1</td>
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<tr>
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<th>9017</th>
</tr>
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<tr>
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<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Oct-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

- **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
- **Other:** None
- **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 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:** 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:** 64-bit
- **Other:** None

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
<td>72.4</td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>75.2</td>
<td></td>
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<tr>
<td>619.lbm_s</td>
<td>16</td>
<td>30.9</td>
<td>30.9</td>
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<tr>
<td>621.wrf_s</td>
<td>16</td>
<td>47.0</td>
<td>46.9</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>16</td>
<td>24.6</td>
<td>24.6</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>44.7</td>
<td>45.8</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>16</td>
<td>42.2</td>
<td>42.2</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
<td>77.1</td>
<td>77.1</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>58.4</td>
<td>58.5</td>
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<tr>
<td>654.roms_s</td>
<td>16</td>
<td>64.8</td>
<td>68.8</td>
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</table>
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SPECspeed2017_fp_base = 58.2
SPECspeed2017_fp_peak = 59.1

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Ratio</th>
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<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
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<td>311</td>
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<td>311</td>
<td>189</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>230</td>
<td>72.6</td>
<td>231</td>
<td>72.1</td>
<td>230</td>
<td>72.4</td>
<td></td>
<td></td>
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<tr>
<td>619.ibm_s</td>
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<td>30.9</td>
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<td>31.0</td>
<td>169</td>
<td>30.9</td>
<td></td>
<td></td>
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<tr>
<td>621.wrf_s</td>
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<td>47.1</td>
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<td>47.0</td>
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<tr>
<td>627.cam4_s</td>
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<td>24.6</td>
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<td>24.6</td>
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<tr>
<td>628.pop2_s</td>
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<td>266</td>
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<td>42.3</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>157</td>
<td>58.1</td>
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<tr>
<td>654.roms_s</td>
<td>16</td>
<td>243</td>
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<td>64.9</td>
<td>243</td>
<td>64.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 58.2
SPECspeed2017_fp_peak = 59.1

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:
KMP_AFFINITY = "granularity=fine,compact"
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

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
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo

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

**Lenovo Global Technology**
ThinkSystem SR530
(2.10 GHz, Intel Xeon Silver 4110)

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**SPECspeed2017_fp_base = 58.2**

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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Test Date:** Oct-2017

**Hardware Availability:** Aug-2017

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**Software Availability:** Sep-2017

---

**Platform Notes (Continued)**

Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b091c0f
running on linux-ickx Sat Oct 28 01:24:42 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 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
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: 2095.073
BogoMIPS: 4190.14
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
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmperf eagerfpu npi pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 x2apic movbe popcnt tsc_deadline_timer aes

(Continued on next page)
Platform Notes (Continued)

```
xsave avx f16c rdrand lahf_lm abm 3dnouprefetch 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 cqmm 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: 193101 MB
node 0 free: 191793 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 193504 MB
node 1 free: 191468 MB
node distances:
 node   0   1
 0: 10 21
 1: 21 10

From /proc/meminfo
MemTotal: 395884080 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 linux-ickx 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
x86_64 x86_64 x86_64 GNU/Linux

(Continued on next page)
Platform Notes (Continued)

run-level 3 Oct 27 18:57

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
   Filesystem   Type       Size  Used  Avail  Use% Mounted on
   /dev/sda2    btrfs       744G  176G  568G   24%  /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

(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.
------------------------------------------------------------------------------

==============================================================================
 FC   607.cactuBSSN_s(base)
------------------------------------------------------------------------------
  icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

(Continued on next page)
Compiler Version Notes (Continued)

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.

------------------------------------------------------------------------------
==============================================================================
FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
FC   603.bwaves_s(peak) 649.fotonik3d_s(peak) 654.roms_s(peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
CC  621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
------------------------------------------------------------------------------
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.
------------------------------------------------------------------------------
==============================================================================
CC   621.wrf_s(peak) 628.pop2_s(peak)
------------------------------------------------------------------------------
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Base Compiler Invocation

C benchmarks:
icc

(Continued on next page)
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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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -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-AVX512 -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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

(Continued on next page)
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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-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

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
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Peak Optimization Flags

C benchmarks:
619.lbm_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-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-AVX512 -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-AVX512 -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-AVX512
-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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nstandard-realloc-lhs -align array32byte

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512 -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

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

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
http://www.spec.org/cpu2017/flags/Lenovo-Platform-Flags-V1.2-SKL-E.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-Flags-V1.2-SKL-E.xml

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