**Lenovo Global Technology**

ThinkSystem SR650  
(2.20 GHz, Intel Xeon Gold 5120)

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

## 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 IVE111C 1.00 released Jul-2017
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

## Hardware

- **CPU Name:** Intel Xeon Gold 5120  
  Max MHz.: 3200
- **Nominal:** 2200
- **Enabled:** 28 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:** 19.25 MB I+D on chip per chip
- **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

## SPECspeed2017_fp_base = 87.0  
SPECspeed2017_fp_peak = 88.4

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tbody>
<tr>
<td>hwaves</td>
<td>28</td>
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<tr>
<td>cactuBSSN</td>
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<td>lbm</td>
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<td>imagick</td>
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<td>nab</td>
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<tr>
<td>fotonik3d</td>
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<tr>
<td>roms</td>
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| SPECspeed2017_fp_base | 87.0 |
| SPECspeed2017_fp_peak | 88.4 |

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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Seconds</th>
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<tbody>
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<td>607.cactuBSSN_s</td>
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<td>649.fotonik3d_s</td>
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<td>157</td>
<td>100</td>
<td>157</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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"

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
- DCA set to Enable
- Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo

(Continued on next page)
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SPECspeed2017_fp_base = 87.0
SPECspeed2017_fp_peak = 88.4

Platform Notes (Continued)

Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on Cyborg-SPECcpu2006-SUSE12SP2 Thu Dec 7 23:46:41 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) Gold 5120 CPU @ 2.20GHz
    2 "physical id"s (chips)
    28 "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 : 14
    siblings  : 14
    physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
    physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

From lscpu:
    Architecture:          x86_64
    CPU op-mode(s):        32-bit, 64-bit
    Byte Order:            Little Endian
    CPU(s):                28
    On-line CPU(s) list:   0-27
    Thread(s) per core:    1
    Core(s) per socket:    14
    Socket(s):             2
    NUMA node(s):          2
    Vendor ID:             GenuineIntel
    CPU family:            6
    Model:                 85
    Model name:            Intel(R) Xeon(R) Gold 5120 CPU @ 2.20GHz
    Stepping:              4
    CPU MHz:               2194.845
    BogoMIPS:              4389.69
    Virtualization:        VT-x
    L1d cache:             32K
    L1i cache:             32K
    L2 cache:              1024K
    L3 cache:              19712K
    NUMA node0 CPU(s):     0-13
    NUMA node1 CPU(s):     14-27
    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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
    aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
    fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes

(Continued on next page)
Platform Notes (Continued)

```
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epql pln pts dtherm intel_pt
tpr_shadow vnnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
errs 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

```text`
cache size: 19712 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 10 11 12 13
node 0 size: 193110 MB
node 0 free: 190755 MB
node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27
node 1 size: 193504 MB
node 1 free: 192055 MB
node distances:
node   0   1
  0:  10  21
  1:  21  10
```

From `/proc/meminfo`

```
MemTotal:       395893940 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="12.2.0"  
   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-SPECcpu2006-SUSE12SP2 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)
# SPEC CPU2017 Floating Point Speed Result

**Lenovo Global Technology**

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<table>
<thead>
<tr>
<th>SPEC Speed2017 fp_base</th>
<th>SPEC Speed2017 fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>87.0</td>
<td>88.4</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Dec-2017

**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Aug-2017  
**Software Availability:** Sep-2017

---

### Platform Notes (Continued)

run-level 3 Dec 7 18:01

SPEC is set to: /home/cpu2017.1.0.2.ic18.0

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sdb2</td>
<td>btrfs</td>
<td>744G</td>
<td>174G</td>
<td>570G</td>
<td>24%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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.

== CC 619.lbm_s(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.

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 607.cactuBSSN_s(peak) ==
```

(Continued on next page)
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**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)
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ifort (IFORT) 18.0.0 20170811
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CC  621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
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CC  621.wrf_s(peak) 628.pop2_s(peak)
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---

**Base Compiler Invocation**

C benchmarks:
icc

---
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<tr>
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Test Date: Dec-2017
Hardware Availability: Aug-2017
Software Availability: Sep-2017

**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 byterecl
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-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

(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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Hardware Availability: Aug-2017
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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

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
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5120)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>87.0</th>
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<td>SPECspeed2017_fp_peak</td>
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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 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

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

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