## SPEC® CPU2017 Floating Point Speed Result

**Lenovo Global Technology**

**ThinkSystem ST550**

(1.70 GHz, Intel Xeon Bronze 3104)

<table>
<thead>
<tr>
<th>Software Availability: Sep-2017</th>
<th>Hardware Availability: Aug-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date: Nov-2017</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Lenovo Global Technology</td>
<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name: Intel Xeon Bronze 3104</th>
<th>OS: SUSE Linux Enterprise Server 12 SP2 (x86_64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz.: 1700</td>
<td>Kernel 4.4.21-69-default</td>
</tr>
<tr>
<td>Nominal: 1700</td>
<td>Compiler: C/C++: Version 18.0.0.128 of Intel C/C++</td>
</tr>
<tr>
<td>Enabled: 12 cores, 2 chips</td>
<td>Compiler for Linux: Fortran: Version 18.0.0.128 of Intel Fortran</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
<td>Compiler for Linux</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>Parallel: Yes</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td>Firmware: Lenovo BIOS Version O0E107W 1.01 released Aug-2017</td>
</tr>
<tr>
<td>L3: 8.25 MB I+D on chip per chip</td>
<td>File System: btrfs</td>
</tr>
<tr>
<td>Other: None</td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R, running at 2133)</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Storage: 1 x 800 GB SAS SSD</td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Other: None</td>
</tr>
</tbody>
</table>

### Software

### Hardware

### Software

### 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>12</td>
<td>44.1</td>
<td>37.8</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>12</td>
<td>43.2</td>
<td>37.8</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>12</td>
<td>24.8</td>
<td>37.8</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>12</td>
<td>29.0</td>
<td>37.8</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>12</td>
<td>17.1</td>
<td>37.8</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>12</td>
<td>28.2</td>
<td>37.8</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>12</td>
<td>22.4</td>
<td>37.8</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>12</td>
<td>41.3</td>
<td>37.8</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>12</td>
<td>41.0</td>
<td>37.8</td>
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<tr>
<td>654.roms_s</td>
<td>12</td>
<td>37.2</td>
<td>37.8</td>
</tr>
</tbody>
</table>

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**Standard Performance Evaluation Corporation**

(41x43) info@spec.org

https://www.spec.org/
Results Table

<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>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>41.3</td>
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<td>12</td>
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<td>41.3</td>
<td>423</td>
<td>41.3</td>
<td></td>
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<tr>
<td>649.fotonik3d_s</td>
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</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 37.1
SPECspeed2017_fp_peak = 37.8

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"

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 0>  /proc/sys/vm/drop_caches

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Adjacent Cache Prefetch set to Disable
DCU Streamer Prefetcher set to Disable
DCA set to Enable
Uncore Frequency Scaling set to Disable
MONITORWAIT set to Enable
XPT Prefetcher set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST550
(1.70 GHz, Intel Xeon Bronze 3104)

**SPEC CPU2017 Floating Point Speed Result**

---

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

---

**SPECspeed2017_fp_base = 37.1**  
**SPECspeed2017_fp_peak = 37.8**

---

**Platform Notes (Continued)**

Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bccc091c0f  
running on ST550 Fri Nov 24 13:59:33 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) Bronze 3104 CPU @ 1.70GHz
 2 "physical id"s (chips)
 12 "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 : 6
siblings : 6
physical 0: cores 0 1 2 3 4 5
physical 1: cores 0 1 2 3 4 5
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                12
On-line CPU(s) list:   0-11
Thread(s) per core:    1
Core(s) per socket:    6
Socket(s):             2
NUMA node(s):          2
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Bronze 3104 CPU @ 1.70GHz
Stepping:              4
CPU MHz:               1696.021
BogoMIPS:              3392.04
Virtualization:        VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              1024K
L3 cache:              8448K
NUMA node0 CPU(s):     0-5
NUMA node1 CPU(s):     6-11
Flags:                 fpu vme de pse tsc msr mce cx8 apic sep mtrr pge mca cmov
                        pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdscp
                        lm constant_tsc 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 xtrr 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 lah_f_lm abm 3dnowprefetch arat epb pln pts dtherm intel_pt
tpr_shadow vmmi flexpriority ept vpid fsqsbse tsc_adjust bmi1 hle avx2 smep bmi2
erns invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd
avx512bw avx512vl xsxveopt xsavex xgetbvxv1 cqm_llc cqm_occup_llc
```

/proc/cpuinfo cache data

```
cache size : 8448 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
node 0 size: 193111 MB
node 0 free: 191880 MB
node 1 cpus: 6 7 8 9 10 11
node 1 size: 193504 MB
node 1 free: 192446 MB
node distances:

node 0 1
0:  10  21
1:  21  10
```

From /proc/meminfo

```
MemTotal:       395894372 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 ST550 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 Nov 24 03:14

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>109G</td>
<td>636G</td>
<td>15%</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 -[00E107W-1.01]- 08/11/2017
- Memory:
  - 12x Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666, configured at 2133

(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)
Lenovo Global Technology
ThinkSystem ST550
(1.70 GHz, Intel Xeon Bronze 3104)

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

SPECspeed2017_fp_base = 37.1
SPECspeed2017_fp_peak = 37.8

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
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==============================================================================
CC  621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
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icc (ICC) 18.0.0 20170811
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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

Base Compiler Invocation
C benchmarks:
icc

(Continued on next page)
## 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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>-DSPEC_LP64</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## 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

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Lenovo Global Technology
ThinkSystem ST550
(1.70 GHz, Intel Xeon Bronze 3104)

SPECspeed2017_fp_base = 37.1
SPECspeed2017_fp_peak = 37.8

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

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
Lenovo Global Technology
ThinkSystem ST550
(1.70 GHz, Intel Xeon Bronze 3104)

SPECspeed2017_fp_base = 37.1
SPECspeed2017_fp_peak = 37.8

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

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

**ThinkSystem ST550**  
(1.70 GHz, Intel Xeon Bronze 3104)

<table>
<thead>
<tr>
<th>SPECspeed_2017_fp_base</th>
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<td>SPECspeed_2017_fp_peak</td>
<td>37.8</td>
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**Tested by:** Lenovo Global Technology

#### 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/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/Intel-ic18.0-official-linux64.xml)
- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-Flags-V1.2-SKL-E.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-Flags-V1.2-SKL-E.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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