# SPEC® CPU2017 Floating Point Speed Result

**Lenovo Global Technology**  
ThinkSystem SD650  
(2.10 GHz, Intel Xeon Platinum 8160)

**SPECspeed2017_fp_base = 115**  
**SPECspeed2017_fp_peak = 116**

## Hardware

<table>
<thead>
<tr>
<th>Thread</th>
<th>SPECspeed2017_fp_base (115)</th>
<th>SPECspeed2017_fp_peak (116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>607.cactuBSSN_s 48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>619.lbm_s 48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>621.wrf_s 48</td>
<td>48</td>
<td>48</td>
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<tr>
<td>627.cam4_s 48</td>
<td>48</td>
<td>48</td>
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<tr>
<td>628.pop2_s 48</td>
<td>48</td>
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</tr>
<tr>
<td>638.imagick_s 48</td>
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<td>644.nab_s 48</td>
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<tr>
<td>649.fotonik3d_s 48</td>
<td>48</td>
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</tr>
<tr>
<td>654.roms_s 48</td>
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</table>

## Software

<table>
<thead>
<tr>
<th>Software</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 12 SP2 (x86_64)</td>
</tr>
<tr>
<td>Compiler</td>
<td>C/C++: Version 18.0.0.128 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler for Linux</td>
<td>Fortran: Version 18.0.0.128 of Intel Fortran</td>
</tr>
<tr>
<td>Parallel</td>
<td>Yes</td>
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<tr>
<td>Firmware</td>
<td>Lenovo BIOS Version OTE105K 1.00 released Mar-2018</td>
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<tr>
<td>File System</td>
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<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers</td>
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<tr>
<td>Peak Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

## CPU Information

- **CPU Name:** Intel Xeon Platinum 8160  
- **Max MHz.:** 3700  
- **Nominal:** 2100  
- **Enabled:** 48 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:** 33 MB I+D on chip per core  
- **Other:** None  
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R)  
- **Storage:** 1 x 800 GB SAS SSD  
- **Other:** None

## Test Information

- **CPU2017 License:** 9017  
- **Test Sponsor:** Lenovo Global Technology  
- **Test Date:** Jun-2018  
- **Hardware Availability:** Mar-2018  
- **Tested by:** Lenovo Global Technology  
- **Software Availability:** Feb-2018  
- **Tested by:** Lenovo Global Technology  
- **Software Availability:** Feb-2018
Lenovo Global Technology
ThinkSystem SD650
(2.10 GHz, Intel Xeon Platinum 8160)

SPECspeed2017_fp_base = 115
SPECspeed2017_fp_peak = 116

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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<tbody>
<tr>
<td>603.bwaves_s</td>
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<td>107</td>
<td>147</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 115
SPECspeed2017_fp_peak = 116

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

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
Yes: 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.
Yes: 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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disable
Lenovo Global Technology
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Platform Notes (Continued)

Adjacent Cache Prefetch set to Disable
DCU Streamer Prefetcher set to Disable
MONITOR/MWAIT set to Enable
DCA set to Enable
Stale AtoS set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on linux-nlle Thu Jun 7 16:48:17 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) Platinum 8160 CPU @ 2.10GHz
  2 "physical id"s (chips)
  48 "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 : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8160 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2095.064
BogoMIPS: 4190.12
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 33792K
NUMA node0 CPU(s): 0-23

(Continued on next page)
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Platform Notes (Continued)

NUMA node1 CPU(s): 24-47
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 sdbp
tma cx16 xptr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb invpcid_single pln pts
dtherm intel_pt rsb_cttsxw spec_ctrl retpoline kaiser tpr_shadow vnmi flexpriority
epi 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

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 14 15 16 17 18 19 20 21 22 23
node 0 size: 193109 MB
node 0 free: 192607 MB
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 1 size: 193504 MB
node 1 free: 193031 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo

MemTotal: 395892880 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP2

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"

(Continued on next page)
**Platform Notes (Continued)**

```
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-nlle 4.4.114-92.64-default #1 SMP Thu Feb 1 19:18:19 UTC 2018 (c6ce5db)
x86_64 x86_64 x86_64 GNU/Linux
```

```
run-level 3 Jun 7 16:45
```

```
SPEC is set to: /home/cpu2017.1.0.2.ic18.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 405G 8.4G 397G 3% /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 -[OTE105K-1.00]- 03/13/2018
Memory:
   12x Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666
   4x NO DIMM NO DIMM
```

(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)
```

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Test Sponsor: Lenovo Global Technology
Hardware Availability: Mar-2018
Tested by: Lenovo Global Technology
Software Availability: Feb-2018

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 607.cactuBSSN_s(peak)
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)
ifort (IFORT) 18.0.0 20170811
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icc (ICC) 18.0.0 20170811
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CC 621.wrf_s(peak) 628.pop2_s(peak)
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## Lenovo Global Technology

### ThinkSystem SD650

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<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>SPECspeed2017_fp_base</td>
<td>115</td>
</tr>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>116</td>
</tr>
</tbody>
</table>

### Compiler Version Notes (Continued)

```
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.lbm_s: `-DSPEC_LP64`
- 621.wrf_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
- 627.cam4_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-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`

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### Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- 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
-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
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Tested by: Lenovo Global Technology

Test Date: Jun-2018
Hardware Availability: Mar-2018
Software Availability: Feb-2018

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-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 -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-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
Lenovo Global Technology
ThinkSystem SD650
(2.10 GHz, Intel Xeon Platinum 8160)

SPECspeed2017_fp_base = 115
SPECspeed2017_fp_peak = 116

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
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-C.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-C.xml

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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 2018-06-07 04:48:17-0400.