# Lenovo Global Technology

ThinkSystem SD650  
(2.30 GHz, Intel Xeon Gold 6140)  

**SPECspeed2017_fp_base** = 106  
**SPECspeed2017_fp_peak** = 107

## Hardware

<table>
<thead>
<tr>
<th>Application</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
<td>36</td>
<td>139</td>
<td>142</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>621.wrf_s</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>36</td>
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</tr>
</tbody>
</table>

## Software

- **OS**: SUSE Linux Enterprise Server 12 SP2 (x86_64)  
- **Kernel**: 4.4.114-92.64-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  
- **Parallel**: Yes  
- **Firmware**: Lenovo BIOS Version OTE105K 1.00 released Mar-2018  
- **File System**: xfs  
- **System State**: Run level 3 (multi-user)  
- **Base Pointers**: 64-bit  
- **Peak Pointers**: 64-bit  
- **Other**: None
## SPEC CPU2017 Floating Point Speed Result

**Lenovo Global Technology**  
ThinkSystem SD650  
(2.30 GHz, Intel Xeon Gold 6140)

**SPECspeed2017_fp_base** = 106  
**SPECspeed2017_fp_peak** = 107

---

### Results Table

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</tr>
</tbody>
</table>

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### 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

(Continued on next page)
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SPEC CPU2017 Floating Point Speed Result
Copyright 2017-2018 Standard Performance Evaluation Corporation

Lenovo Global Technology

SPECspeed2017_fp_base = 106
SPECspeed2017_fp_peak = 107

CPU2017 License: 9017
Test Date: Jun-2018
Test Sponsor: Lenovo Global Technology
Hardware Availability: Mar-2018
Tested by: Lenovo Global Technology
Software Availability: Feb-2018

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 96c45e4568ad54c135fd618bce091c0f
running on oc2 Thu Jun  7 15:26:01 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) Gold 6140 CPU @ 2.30GHz
  2 "physical id"s (chips)
  36 "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 : 18
siblings : 18
physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 36
On-line CPU(s) list: 0-35
Thread(s) per core: 1
Core(s) per socket: 18
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6140 CPU @ 2.30GHz
Stepping: 4
CPU MHz: 2294.607
BogoMIPS: 4589.21
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-17

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

NUMA node1 CPU(s): 18-35
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
            aperf perf 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
            xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb invpcid_single pln pts
dtherm intel_pt rsb_ctxtsw spec_ctrl retpoline kaiser 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 vec xgetbv1 cqm_llc cqm_occup_llc

/proc/cpuinfo cache data
  cache size: 25344 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 14 15 16 17
node 0 size: 193109 MB
node 0 free: 192453 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 1 size: 193504 MB
node 1 free: 193066 MB
node distances:
node  0  1
e  10  21
0:  10  21
1:  21  10

From /proc/meminfo
  MemTotal: 395892504 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"
Platform Notes (Continued)

ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
    Linux oc2 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 15:24

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda3      xfs   446G   25G  421G   6% /

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

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Hardware Availability: Mar-2018
Tested by: Lenovo Global Technology
Software Availability: Feb-2018
Test Date: Jun-2018

Compiler Version Notes (Continued)

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)
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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)
==============================================================================
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
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Lenovo Global Technology

**ThinkSystem SD650**

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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jun-2018  
**Hardware Availability:** Mar-2018  
**Software Availability:** Feb-2018

### Base Compiler Invocation

C benchmarks:

```bash
icc
```

Fortran benchmarks:

```bash
ifort
```

Benchmarks using both Fortran and C:

```bash
ifort icc
```

Benchmarks using Fortran, C, and C++:

```bash
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:

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

Fortran benchmarks:

```bash
-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:

```bash
-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
```

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

Benchmarks using Fortran, C, and C++:
- `-xCORE-AVX512`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-gopt-prefetch`  
- `-ffinite-math-only`  
- `-gopt-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`

### Peak Portability Flags

Same as Base Portability Flags
## Lenovo Global Technology

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### CPU2017 License: 9017  
Test Sponsor: Lenovo Global Technology  
Tested by: Lenovo Global Technology  
Test Date: Jun-2018  
Hardware Availability: Mar-2018  
Software Availability: Feb-2018

## 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

## Peak Other Flags

### C benchmarks:

-m64 -std=c11

(Continued on next page)
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-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