## Lenovo Global Technology

ThinkSystem SR950  
(2.10 GHz, Intel Xeon Platinum 8160M)

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

### SPECspeed2017_fp_base = 173  
### SPECspeed2017_fp_peak = 174

<table>
<thead>
<tr>
<th>Threads</th>
<th>603.bwaves_s</th>
<th>607.cactuBSSN_s</th>
<th>619.lbm_s</th>
<th>621.wrf_s</th>
<th>627.cam4_s</th>
<th>628.pop2_s</th>
<th>638.imagick_s</th>
<th>644.nab_s</th>
<th>649.fotonik3d_s</th>
<th>654.roms_s</th>
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<tr>
<td>96</td>
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</tbody>
</table>

- **Hardware**
  - **CPU Name:** Intel Xeon Platinum 8160M  
  - **Max MHz.:** 3700  
  - **Nominal:** 2100  
  - **Enabled:** 96 cores, 4 chips  
  - **Orderable:** 2,4 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 chip  
  - **Memory:** 1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)  
  - **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  
  - **Parallel:** Yes  
  - **Firmware:** Lenovo BIOS Version PSE103K 1.00 released Jun-2017  
  - **File System:** btrfs  
  - **System State:** Run level 3 (multi-user)  
  - **Base Pointers:** 64-bit  
  - **Peak Pointers:** 64-bit  
  - **Other:** None
Lenovo Global Technology

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Results Table

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<tr>
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<td>61.5</td>
<td>256</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 173
SPECspeed2017_fp_peak = 174

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
No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
No: 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.
No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly

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

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

General Notes (Continued)

generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disable
MONITORMWAIT set to Enable
DCU Streamer Prefetcher set to Disable
XPT Prefetcher set to Enable
Stale AtoS set to Enable
DCA set to Enable
Trusted Execution Technology set to Enable
LLC Deadline Alloc set to Disable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on linux-uyxw Tue Dec 26 22:13:11 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) Platinum 8160M CPU @ 2.10GHz
  4 "physical id"s (chips)
  96 "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
  physical 2: 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 3: 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

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**Hardware Availability:** Sep-2017  
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**Software Availability:** Sep-2017

### Platform Notes (Continued)

- **CPU(s):** 96
- **On-line CPU(s) list:** 0-95
- **Thread(s) per core:** 1
- **Core(s) per socket:** 24
- **Socket(s):** 4
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Platinum 8160M CPU @ 2.10GHz
- **Stepping:** 4
- **CPU MHz:** 2095.067
- **BogoMIPS:** 4190.13
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 33792K
- **NUMA node0 CPU(s):** 0-23
- **NUMA node1 CPU(s):** 24-47
- **NUMA node2 CPU(s):** 48-71
- **NUMA node3 CPU(s):** 72-95
- **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 aperfmpref eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrunc 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 pln pts dtherm intel_pt tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  
  **erms invpcid rtm cqm avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512v1 xsaveopt xsaves xgetbv1 cqm_llc cqm_occup_llc

/proc/cpuinfo cache data  
  **cache size:** 33792 KB

From numactl --hardware  
  **WARNING:** a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  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: 386500 MB
  node 0 free: 384887 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: 387042 MB
  node 1 free: 385660 MB
  node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
  node 2 size: 387042 MB
  node 2 free: 385819 MB

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Platform Notes (Continued)

node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 387038 MB
node 3 free: 385683 MB
node distances:
node 0 1 2 3
 0: 10 21 21 21
 1: 21 10 21 21
 2: 21 21 10 21
 3: 21 21 21 10

From /proc/meminfo
MemTotal: 1584767360 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-uyxw 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
  x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Dec 26 16:17

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
  Filesystem  Type  Size  Used Avail Use% Mounted on
  /dev/sda2  btrfs  744G  42G  702G  6% /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 -[PSE103K-1.00]- 06/19/2017
  Memory:
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Software Availability: Sep-2017

Platform Notes (Continued)

48x NO DIMM NO DIMM
48x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

(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)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
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ifort (IFORT) 18.0.0 20170811
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==============================================================================
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
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Compiler Version Notes (Continued)

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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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
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### Base Portability Flags

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<tr>
<th>Benchmark</th>
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<td>603.bwaves_s</td>
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<td><code>-DSPEC_LP64</code></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td><code>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</code></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td><code>-DSPEC_LP64 -DSPEC_CASE_FLAG</code></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td><code>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl</code></td>
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</tr>
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</table>

### 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 -nostandard-realloc-lhs -align array32byte`

### Base Other Flags

**C benchmarks:**
- `-m64 -std=c11`

**Fortran benchmarks:**
- `-m64`

(Continued on next page)
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<td>Software Availability: Sep-2017</td>
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</table>

### Base Other Flags (Continued)

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

### 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`

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Lenovo Global Technology
ThinkSystem SR950
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**CPU2017 License:** 9017
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

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</table>

**Peak Optimization Flags (Continued)**

For 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 -gopenmp`
- `nstandard-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 -gopenmp`
  - `DSPEC_OPENMP -nstandard-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-prefetch`
  - `-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nstandard-realloc-lhs`
  - `-align array32byte`

**Peak Other Flags**

C benchmarks:
- `m64 -std=c11`

For 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)
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SPECspeed2017_fp_base = 173
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Software Availability: Sep-2017

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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