## Lenovo Global Technology

**ThinkSystem SR850**

(2.10 GHz, Intel Xeon Platinum 8176)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
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<tr>
<td>SPECspeed2017_fp_peak</td>
<td>168</td>
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</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Platinum 8176
- **Max MHz.:** 3800
- **Nominal:** 2100
- **Enabled:** 112 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:** 38.5 MB I+D on chip per chip

### Software

- **OS:** SUSE Linux Enterprise Server 12 SP2 (x86_64)
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version TEE115E 1.01 released Aug-2017
- **System State:** Run level 3 (multi-user)

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
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<tr>
<td>bwaves_s</td>
<td>112</td>
<td>763</td>
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<td>lbm_s</td>
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<td>wrf_s</td>
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<td>220</td>
<td>621</td>
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<tr>
<td>cam4_s</td>
<td>112</td>
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<td>627</td>
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<td>pop2_s</td>
<td>112</td>
<td>148</td>
<td>628</td>
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<td>638</td>
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<td>149</td>
<td>649</td>
</tr>
<tr>
<td>roms_s</td>
<td>112</td>
<td>193</td>
<td>654</td>
</tr>
</tbody>
</table>

**Notes:**
- All results are in millions of floating point operations per second (MFLOPS).
- Benchmark times are average of three runs.
- Results are rounded to the nearest integer.
**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

Lenovo Global Technology
ThinkSystem SR850
(2.10 GHz, Intel Xeon Platinum 8176)

SPECspeed2017_fp_base = 167
SPECspeed2017_fp_peak = 168

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

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
DCU Streamer Prefetcher set to Disable
MONITOR/WAIT set to Enable
Trusted Execution Technology set to Enable
XPT Prefetcher 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 96c45e4568d54c135fd618bcc091c0f
running on Electron-02 Fri Dec 22 23:29:33 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) Platinum 8176 CPU @ 2.10GHz
  4 "physical id"s (chips)
  112 "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 : 28
  siblings : 28
  physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:
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Platform Notes (Continued)

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8176 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2095.054
BogoMIPS: 4190.10
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-27
NUMA node1 CPU(s): 28-55
NUMA node2 CPU(s): 56-83
NUMA node3 CPU(s): 84-111
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmperf eagerfpu pni pclmulqdq dtel64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpc pdcn pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3nowprefetch ida arat epb pln pts dtherm intel_pt
tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erm sinvpcid rtm cmp mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 cmp_llc cmp_occupp llc

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
ode 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 24 25 26 27
node 0 size: 386658 MB
node 0 free: 385522 MB
node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55
node 1 size: 387057 MB

(Continued on next page)
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Platform Notes (Continued)

node 1 free: 385773 MB
node 2 cpus: 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
81 82 83
node 2 size: 387057 MB
node 2 free: 386118 MB
node 3 cpus: 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105
106 107 108 109 110 111
node 3 size: 387054 MB
node 3 free: 385520 MB
node distances:
node 0 1 2 3
0:  10  21  21  31
1:  21  10  31  21
2:  21  31  10  21
3:  31  21  21  10

From /proc/meminfo
MemTotal: 1584975296 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
  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 Electron-02 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 22 18:38

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

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 689G 209G 481G 31% /home

(Continued on next page)
Platform Notes (Continued)

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 -[TEE115E-1.01]- 08/11/2017
Memory:
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.
------------------------------------------------------------------------------
==============================================================================
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.
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.
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Hardware Availability: Aug-2017
Software Availability: Sep-2017

Compiler Version Notes (Continued)

==============================================================================
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
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)
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icc (ICC) 18.0.0 20170811
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Base Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

(Continued on next page)
### Base Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
- icpc
- icc
- ifort

### Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<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>
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<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>
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<td>-DSPEC_LP64</td>
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</table>

### Base Optimization Flags

**C benchmarks:**
- -xCORE-AVX512 -ipo -03 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

**Fortran benchmarks:**
- -DSPEC_OPENMP -xCORE-AVX512 -ipo -03 -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 -03 -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 -03 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
- -nostandard-realloc-lhs -align array32byte
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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

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

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### Peak Optimization Flags (Continued)

**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 Other Flags

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

**Fortran benchmarks:**
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**Benchmarks using both Fortran and C:**
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<td>Sep-2017</td>
</tr>
</tbody>
</table>

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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