## Lenovo Global Technology

ThinkSystem SN550  
(2.10 GHz, Intel Xeon Platinum 8176)  

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
</table>
| OS: SUSE Linux Enterprise Server 12 SP2 (x86_64)  
Kernel 4.4.21-69-default | CPU Name: Intel Xeon Platinum 8176  
Max MHz.: 3800  
Nominal: 2100  
Enabled: 56 cores, 2 chips, 2 threads/core  
Orderable: 1.2 chips |  
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 |  
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R)  
Storage: 1 x 800 GB SAS SSD  
Other: None |  
Firmware: Lenovo BIOS Version IVE111I 1.01 released Aug-2017  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-bit |  
Other: jemalloc: jemalloc memory allocator library  
V5.0.1;  
jemalloc: configured and built at default for 32bit (i686) and 64bit (x86_64) targets;  
jemalloc: built with the RedHat Enterprise 7.4, and the system compiler gcc 4.8.5;  
jemalloc: sources available from jemalloc.net or releases |  
Compiler: C/C++: Version 18.0.0.128 of Intel C/C++  
Compiler for Linux: Fortran: Version 18.0.0.128 of Intel Fortran  
Compiler for Linux |  
Parallel: No |  
Firmware: Lenovo BIOS Version IVE111I 1.01 released Aug-2017  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-bit |  
Other: jemalloc: jemalloc memory allocator library  
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Lenovo Global Technology
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**SPECrate2017_int_base** = 263
**SPECrate2017_int_peak** = 275

Results Table

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<td>646</td>
<td>187</td>
<td>648</td>
<td>187</td>
<td>112</td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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"

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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

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)

(Continued on next page)
General Notes (Continued)

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 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
SNC set to Enable
Hardware Prefetcher set to Disable
MONITORWAIT set to Enable
Execute Disable Bit set to Disable
Intel Virtualization Technology set to Disable
DCA set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bce091c0f
running on SN550 Mon Dec  4 10:42:41 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
  2 "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 : 56
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

(Continued on next page)
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**SPECrate2017_int_base** = 263
**SPECrate2017_int_peak** = 275

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

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**Platform Notes (Continued)**

From lscpu:
- **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:** 2
- **Core(s) per socket:** 28
- **Socket(s):** 2
- **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:** 2095.070
- **BogoMIPS:** 4190.14
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 39424K
- **NUMA node0 CPU(s):** 0-3, 7-9, 14-17, 21-23, 56-59, 63-65, 70-73, 77-79
- **NUMA node1 CPU(s):** 4-6, 10-13, 18-20, 24-27, 60-62, 66-69, 74-76, 80-83
- **NUMA node2 CPU(s):** 28-31, 35-37, 42-45, 49-51, 54-55, 84-87, 91-93, 98-101, 105-107
- **NUMA node3 CPU(s):** 32-34, 38-41, 46-48, 52-55, 88-90, 94-97, 102-104, 108-111

**Flags:**
- fpu vme de pse tsc msr pae mca cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpes gb rdtsscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperfmperf eagerfp bu pni pclmulqdq dttes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat eps pln pts dtherm intel_pt tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  
  emts invpnc rtm cmp avx512f avx512d rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cmp_11c cmp_occup_11c

/proc/cpuinfo cache data
- **cache size:** 39424 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 7 8 9 14 15 16 17 21 22 23 56 57 58 59 63 64 65 70 71 72 73 77 78 79
  - **node 0 size:** 193114 MB
  - **node 0 free:** 192299 MB

---

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SPECrate2017_int_base = 263
SPECrate2017_int_peak = 275

Platform Notes (Continued)

node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 60 61 62 66 67 68 69 74 75 76 80 81 82 83
node 1 size: 193521 MB
node 1 free: 192940 MB
node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 84 85 86 87 91 92 93 98 99 100 101 105 106 107
node 2 size: 193521 MB
node 2 free: 192946 MB
node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 88 89 90 94 95 96 97 102 103 104 108 109 110 111
node 3 size: 193518 MB
node 3 free: 192955 MB
node distances:
node 0 1 2 3
  0: 10 11 21 21
  1: 11 10 21 21
  2: 21 21 10 11
  3: 21 21 11 10

From /proc/meminfo
MemTotal: 792243944 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 SN550 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 4 10:40
SPEC is set to: /home/cpu2017.1.0.2.ic18.0

(Continued on next page)
Lenovo Global Technology
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SPEC CPU2017 Integer Rate Result
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Lenovo Global Technology

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

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda4      xfs   687G  136G  552G  20% /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 -[IVE111I-1.01]- 08/11/2017
Memory:
  24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
  525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC   500.perlbench_r(peak) 502.gcc_r(peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
  541.leela_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)
  541.leela_r(peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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### Lenovo Global Technology

ThinkSystem SN550  
(2.10 GHz, Intel Xeon Platinum 8176)

#### SPEC CPU2017 Integer Rate Result

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tr>
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<tr>
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<td>275</td>
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#### 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

#### Compiler Version Notes (Continued)

```
FC  548.exchange2_r(base, peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
```

#### Base Compiler Invocation

- **C benchmarks:**
  - `icc`

- **C++ benchmarks:**
  - `icpc`

- **Fortran benchmarks:**
  - `ifort`

#### Base Portability Flags

- `500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64`
- `502.gcc_r: -DSPEC_LP64`
- `505.mcf_r: -DSPEC_LP64`
- `520.omnetpp_r: -DSPEC_LP64`
- `523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX`
- `525.x264_r: -DSPEC_LP64`
- `531.deepsjeng_r: -DSPEC_LP64`
- `541.leela_r: -DSPEC_LP64`
- `548.exchange2_r: -DSPEC_LP64`
- `557.xz_r: -DSPEC_LP64`

#### Base Optimization Flags

- **C benchmarks:**
  - `-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
  - `-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc`

- **C++ benchmarks:**
  - `-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
  - `-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc`

(Continued on next page)
**SPEC CPU2017 Integer Rate Result**

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**Lenovo Global Technology**  
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| SPECrate2017_int_base = 263 |
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### Base Optimization Flags (Continued)

ForTRAN benchmarks:
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=3`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-L/usr/local/je5.0.1-64/lib`  
- `-ljemalloc`

### Base Other Flags

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

C++ benchmarks:
- `-m64`

FORTRAN benchmarks:
- `-m64`

### Peak Compiler Invocation

C benchmarks:
- `icc`

C++ benchmarks:
- `icpc`

FORTRAN benchmarks:
- `ifort`

### Peak Portability Flags

500.perlbmch_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalanchmk_r: `-D_FILE_OFFSET_BITS=64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`
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Peak Optimization Flags

C benchmarks:

500.perlbench_r -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-fno-strict-overflow -L/usr/local/je5.0.1-64/lib
-ljemalloc

502.gcc_r -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib
-ljemalloc

525.x264_r -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -fno-alias
-L/usr/local/je5.0.1-64/lib -ljemalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-64/lib -ljemalloc

523.xalancbmk_r -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:

-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
## Lenovo Global Technology

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**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Dec-2017  
**Hardware Availability:** Aug-2017  
**Software Availability:** Sep-2017

### Peak Other Flags

- C benchmarks (except as noted below):
  - `-m64 -std=c11`
  - `502.gcc_r: -m32 -std=c11`

- C++ benchmarks (except as noted below):
  - `-m64`
  - `523.xalancbmk_r: -m32`

- Fortran benchmarks:
  - `-m64`

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)

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