Lenovo Global Technology
ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4208)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
CPU2017 License: 9017
Test Date: May-2019
Hardware Availability: Apr-2019
Test Sponsor: Lenovo Global Technology
Software Availability: Nov-2018
Tested by: Lenovo Global Technology

**Hardware**
- **CPU Name:** Intel Xeon Silver 4208
- **Max MHz.:** 3200
- **Nominal:** 2100
- **Enabled:** 16 cores, 2 chips, 2 threads/core
- **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:** 11 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

**Software**
- **OS:** SUSE Linux Enterprise Server 15 (x86_64)
- **Kernel:** 4.12.14-25.13-default
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux;
  Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
- **Parallel:** No
- **Firmware:** Lenovo BIOS Version IVE135M 2.10 released Jan-2019
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** None

---

**SPECrate2017_int_base = 82.5**
**SPECrate2017_int_peak = Not Run**

### Test Results

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
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SPEC CPU2017 Integer Rate Result

SPECrate2017_int_base = 82.5
SPECrate2017_int_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>500.perlbench_r</td>
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<td>826</td>
<td>61.7</td>
<td>816</td>
<td>62.5</td>
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<td>502.gcc_r</td>
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<td>630</td>
<td>71.9</td>
<td>630</td>
<td>71.9</td>
<td>629</td>
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<td>505.mcf_r</td>
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<td>456</td>
<td>113</td>
<td>449</td>
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<td><strong>115</strong></td>
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<tr>
<td>520.omnetpp_r</td>
<td>32</td>
<td>713</td>
<td><strong>58.9</strong></td>
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<td>714</td>
<td>58.8</td>
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<tr>
<td>523.xalancbmk_r</td>
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<td>525.x264_r</td>
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<tr>
<td>531.deepsjeng_r</td>
<td>32</td>
<td>542</td>
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<td>67.7</td>
<td>541</td>
<td>67.7</td>
</tr>
<tr>
<td>541.leela_r</td>
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<td>62.1</td>
<td>863</td>
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<td><strong>856</strong></td>
<td><strong>61.9</strong></td>
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<tr>
<td>548.exchange2_r</td>
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<td>143</td>
<td>589</td>
<td>142</td>
<td><strong>588</strong></td>
<td><strong>142</strong></td>
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<tr>
<td>557.xz_r</td>
<td>32</td>
<td>628</td>
<td>55.1</td>
<td>629</td>
<td>54.9</td>
<td><strong>628</strong></td>
<td><strong>55.0</strong></td>
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</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/cpu2017-1.0.5-ic19.0u1/lib/intel64"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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>

NA: 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) (Continued on next page)
Lenovo Global Technology
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SPECrater2017_int_base = 82.5
SPECrater2017_int_peak = Not Run

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General Notes (Continued)

is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Trusted Execution Technology set to Enable
Stale AtoS set to Enable
Sysinfo program /home/cpu2017-1.0.5-ic19.0ul/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on linux-cq9p Tue May 14 10:18:12 2019

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) Silver 4208 CPU @ 2.10GHz
  2 "physical id"s (chips)
  32 "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 : 8
  siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4208 CPU @ 2.10GHz
Stepping: 6

(Continued on next page)
## Lenovo Global Technology

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**Platform Notes (Continued)**

```plaintext
CPU MHz:             2100.000
CPU max MHz:         3200.0000
CPU min MHz:         800.0000
BogoMIPS:            4200.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            11264K
NUMA node0 CPU(s):   0-7,16-23
NUMA node1 CPU(s):   8-15,24-31
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 cpuid
                      aperfmperf pni pclmulqdq dtes64 ksm 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 cpuid_fault epb cat_13 cdp_13 invpcid_single ssbd
                      mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1
                      hle avx2 smep bmi2 ombat mcm rdseed avx512f rdseed adx smap clflushopt clwb intel_pt
                      avx512cd avx512bw avx512v1 xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
datatherm ida arat pti plts pku ospke avx512_vnni flush_l1d arch_capabilities
```

From /proc/cpuinfo cache data
```
cache size : 11264 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  16  17  18  19  20  21  22  23
node  0  size:  193096 MB
node  0  free:  186751 MB
node  1  cpus:  8  9  10  11  12  13  14  15  24  25  26  27  28  29  30  31
node  1  size:  193059 MB
node  1  free:  193069 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10
```

From /proc/meminfo
```
MemTotal:       395884704 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

From /etc/*release* /etc/*version*
```
os-release:
```

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Platform Notes (Continued)

NAME="SLES"
VERSION="15"
VERSION_ID="15"
PRETTY_NAME="SUSE Linux Enterprise Server 15"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 May 14 10:16

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 893G 38G 855G 5% /

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 -[IVE135M-2.10]- 01/16/2019
Memory:
24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  500.perlibench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base)
557.xz_r(base)
==============================================================================

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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Compiler Version Notes (Continued)

CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
541.leela_r(base)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

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

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

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
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**Base Optimization Flags**

C benchmarks:
- `-Wl,-z,muldefs`  `-xCORE-AVX512`  `-ipo`  `-O3`  `-no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

C++ benchmarks:
- `-Wl,-z,muldefs`  `-xCORE-AVX512`  `-ipo`  `-O3`  `-no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

Fortran benchmarks:
- `-Wl,-z,muldefs`  `-xCORE-AVX512`  `-ipo`  `-O3`  `-no-prec-div`
- `-qopt-mem-layout-trans=4`  `-nostandard-realloc-lhs`  `-align array32byte`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

The flags files that were used to format this result can be browsed at:


http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-A.html

You can also download the XML flags sources by saving the following links:


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

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