Lenovo Global Technology
ThinkSystem SN550
(2.70 GHz, Intel Xeon Gold 6226)

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

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 162</th>
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</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak = Not Run</td>
</tr>
</tbody>
</table>

| Copies | 0 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 | 315 | 330 |
|--------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 500.perlbench_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 502.gcc_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 505.mcf_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 520.omnetpp_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 523.xalancbmk_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 525.x264_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 531.deepsjeng_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 541.leela_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 548.exchange2_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |
| 557.xz_r | 48 | | | | | | | | | | | | | | | | | | | | | | | |

Hardware
CPU Name: Intel Xeon Gold 6226
Max MHz: 3700
Nominal: 2700
Enabled: 24 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: 19.25 MB I+D on chip per chip
Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software
OS: SUSE Linux Enterprise Server 15 (x86_64)
Compiler: C/C++: Version 19.0.4.227 of Intel
C/C++ Compiler for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran
Compiler for Linux
Parallel: No
Firmware: Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 2.30 Jul-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --
Lenovo Global Technology
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SPECrater®2017_int_base = 162
SPECrater®2017_int_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Copies</td>
<td>Seconds</td>
</tr>
<tr>
<td>500.perlbench_r</td>
<td>48</td>
<td>635</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>48</td>
<td>514</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>48</td>
<td>355</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>48</td>
<td>620</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>48</td>
<td>270</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>48</td>
<td>256</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>48</td>
<td>411</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>48</td>
<td>621</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>48</td>
<td>385</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>48</td>
<td>498</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/cpu2017-1.0.5-ic19.0u4/lib/intel64"

Binaries compiled on a system with 1x Intel Core i9-799X 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) is mitigated in the system as tested and documented.
Lenovo Global Technology

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SPEC CPU®2017 Integer Rate Result
Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECRate®2017_int_base = 162
SPECRate®2017_int_peak = Not Run

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

Test Date: Sep-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

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
SNC set to Enable
Stale AtoS set to Enable
Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-cq9p Thu Sep 12 15:35:44 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) Gold 6226 CPU @ 2.70GHz
  2 "physical id"s (chips)
  48 "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 : 12
  siblings : 24
  physical 0: cores 0 2 3 4 5 6 8 9 10 11 12 13
  physical 1: cores 0 2 3 4 5 8 9 10 11 12 13 14

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SN550**  
(2.70 GHz, Intel Xeon Gold 6226)

### SPEC CPU®2017 Integer Rate Result

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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Sep-2019  
**Hardware Availability:** Jul-2019  
**Tested by:** Lenovo Global Technology  
**Software Availability:** May-2019

| Stepping: | 7 |
| CPU MHz: | 2700.000 |
| CPU max MHz: | 3700.0000 |
| CPU min MHz: | 1200.0000 |
| BogoMIPS: | 5400.00 |
| Virtualization: | VT-x |
| L1d cache: | 32K |
| L1i cache: | 32K |
| L2 cache: | 1024K |
| L3 cache: | 19712K |
| NUMA node0 CPU(s): | 0-2, 6-8, 24-26, 30-32 |
| NUMA node1 CPU(s): | 3-5, 9-11, 27-29, 33-35 |
| NUMA node2 CPU(s): | 12-14, 17-19, 36-38, 41-43 |
| NUMA node3 CPU(s): | 15, 16, 20-23, 39, 40, 44-47 |

**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 cpuid aperfmperf nmi pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtask 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_l3 cdp_l3 invpcid_single intel_pni ssbd mba ibrs ibpb tpr_shadow vmmflexpriority etp vpid fsal fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cmx mxpb rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsaves xsavec xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

```
/platform/cpuinfo_cache_data
```

```
cache size : 19712 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 6 7 8 24 25 26 30 31 32
node 0 size: 193135 MB
node 0 free: 186943 MB
node 1 cpus: 3 4 5 9 10 11 27 28 29 33 34 35
node 1 size: 193494 MB
node 1 free: 193252 MB
node 2 cpus: 12 13 14 17 18 19 36 37 38 41 42 43
node 2 size: 193523 MB
node 2 free: 193131 MB
node 3 cpus: 15 16 20 21 22 23 39 40 44 45 46 47
node 3 size: 193520 MB
node 3 free: 193222 MB
node distances:
node 0 1 2 3
 0: 10 11 21 21
```

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SPECrater\textsuperscript{\textregistered}2017\textunderscore int\_base = 162
SPECrater\textsuperscript{\textregistered}2017\textunderscore int\_peak = Not Run

Test Date: Sep-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Platform Notes (Continued)

1: 11 10 21 21
2: 21 21 10 11
3: 21 21 11 10

From /proc/meminfo
MemTotal: 792241744 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
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 Sep 12 15:34

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sdb3</td>
<td>xfs</td>
<td>893G</td>
<td>61G</td>
<td>833G</td>
<td>7%</td>
<td>/</td>
</tr>
</tbody>
</table>

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 -[IVE141E-2.30]- 07/02/2019
Memory:
24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
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**Compiler Version Notes**

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<th>500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)</th>
</tr>
</thead>
</table>
|       | Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416
|       | Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
|       |--------------------------------------------------------------------------------------------|
| C++   | 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 19.0.4.227 Build 20190416
|       | Copyright (C) 1985-2019 Intel Corporation. All rights reserved. |
|       |--------------------------------------------------------------------------------------------|
| Fortran| 548.exchange2_r(base) |
|       | Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416
|       | Copyright (C) 1985-2019 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
```
## Lenovo Global Technology

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| SPECrate®2017_int_base = | 162 |
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### Base Portability Flags (Continued)

- 523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leea_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `--qopt-mem-layout-trans=4`  
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`  
- `-lqkmalloc`

**C++ benchmarks:**
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `--qopt-mem-layout-trans=4`  
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`  
- `-lqkmalloc`

**Fortran benchmarks:**
- `-Wl,-z,muldefs`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-no-prec-div`  
- `--qopt-mem-layout-trans=4`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/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-D.html](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.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-D.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.xml)

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Tested with SPEC CPU®2017 v1.0.5 on 2019-09-12 03:35:44-0400.  
Originally published on 2019-10-01.