# SPEC® CPU2017 Integer Rate Result

## Lenovo Global Technology

ThinkSystem SN550  
(2.10 GHz, Intel Xeon Gold 6230)

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>225</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate2017_int_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Copies</th>
<th>500.perlbench_r</th>
<th>80</th>
<th>SPECrate2017_int_base</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>502.gcc_r</td>
<td>80</td>
<td>173</td>
</tr>
<tr>
<td></td>
<td>505.mcf_r</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>520.omnetpp_r</td>
<td>80</td>
<td>154</td>
</tr>
<tr>
<td></td>
<td>523.xalancbmk_r</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>525.x264_r</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>531.deepsjeng_r</td>
<td>80</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>541.leela_r</td>
<td>80</td>
<td>177</td>
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<tr>
<td></td>
<td>548.exchange2_r</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>557.xz_r</td>
<td>80</td>
<td>150</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6230  
  - Max MHz.: 3900  
  - Nominal: 2100  
  - Enabled: 40 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: 27.5 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 19.0.1.144 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
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ThinkSystem SN550
(2.10 GHz, Intel Xeon Gold 6230)

SPEC CPU2017 Integer Rate Result
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Lenovo Global Technology

SPECrate2017_int_base = 225
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>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
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<td>732</td>
<td>174</td>
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<td>173</td>
<td>740</td>
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<tr>
<td>502.gcc_r</td>
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<td>608</td>
<td>186</td>
<td>607</td>
<td>187</td>
<td>608</td>
<td>186</td>
</tr>
<tr>
<td>505.mcf_r</td>
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<td>429</td>
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<tr>
<td>520.omnetpp_r</td>
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<td>525.x264_r</td>
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<td>430</td>
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<td>326</td>
<td>430</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>485</td>
<td>189</td>
<td>486</td>
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<tr>
<td>541.leela_r</td>
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<td>770</td>
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<td>178</td>
<td>750</td>
<td>177</td>
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<tr>
<td>548.exchange2_r</td>
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<td>526</td>
<td>398</td>
<td>526</td>
<td>398</td>
<td>526</td>
<td>398</td>
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<tr>
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<td>80</td>
<td>577</td>
<td>150</td>
<td>577</td>
<td>150</td>
<td>577</td>
<td>150</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-ic19.0u1/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)
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ThinkSystem SN550
(2.10 GHz, Intel Xeon Gold 6230)

SPECrate2017_int_base = 225
SPECrate2017_int_peak = Not Run

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

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-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd0f2999c33d61f64985e45859ea9
running on linux-4brr Sun May 5 12:42:16 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 6230 CPU @ 2.10GHz
  2 "physical id"s (chips)
  80 "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 : 20
siblings : 40
physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 80
On-line CPU(s) list: 0-79
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz

(Continued on next page)
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology

---

**Platform Notes (Continued)**

- **Stepping:** 6
- **CPU MHz:** 2100.000
- **CPU max MHz:** 3900.0000
- **CPU min MHz:** 800.0000
- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 28160K
- **NUMA node0 CPU(s):** 0-2, 5, 6, 10-12, 15, 16, 40-42, 45, 46, 50-52, 55, 56
- **NUMA node1 CPU(s):** 3, 4, 7-9, 13, 14, 17-19, 43, 44, 47-49, 53, 54, 57-59
- **NUMA node2 CPU(s):** 20-22, 25, 26, 30-32, 35, 36, 60-62, 65, 66, 70-72, 75, 76
- **NUMA node3 CPU(s):** 23, 24, 27-29, 33, 34, 37-39, 63, 64, 67-69, 73, 74, 77-79
- **Flags:** fpu vme de pse tsc msr pae mce 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 ntopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 ds_cpl 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 fl64 rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap cflushtpt clwb intel_pt avx512cd avx512bw avx512v1 xsaveopt xsave xsmaves cqmm_bb cmqm_occup_llc cmqm_mbb_total cmqm_mbb_local dtherm ida arat pni pts pku ospke avx512_vnni flush_lld arch_capabilities

```
/proc/cpuinfo cache data
  cache size : 28160 KB
```

From numactl --hardware  
WARNING: a numactl 'node' might or might not correspond to a physical chip.

<table>
<thead>
<tr>
<th>available: 4 nodes (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>node 0 cpus: 0 1 2 3 6 10 11 12 15 16 40 41 42 45 46 50 51 52 55 56</td>
</tr>
<tr>
<td>node 0 size: 193133 MB</td>
</tr>
<tr>
<td>node 0 free: 186774 MB</td>
</tr>
<tr>
<td>node 1 cpus: 3 4 7 8 9 13 14 17 18 19 43 44 47 48 49 53 54 57 58 59</td>
</tr>
<tr>
<td>node 1 size: 193521 MB</td>
</tr>
<tr>
<td>node 1 free: 193175 MB</td>
</tr>
<tr>
<td>node 2 cpus: 20 21 22 25 26 30 31 32 35 36 60 61 62 65 66 70 71 72 75 76</td>
</tr>
<tr>
<td>node 2 size: 193521 MB</td>
</tr>
<tr>
<td>node 2 free: 193216 MB</td>
</tr>
<tr>
<td>node 3 cpus: 23 24 27 28 29 33 34 37 38 39 63 64 67 68 69 73 74 77 78 79</td>
</tr>
<tr>
<td>node 3 size: 193490 MB</td>
</tr>
<tr>
<td>node 3 free: 193237 MB</td>
</tr>
<tr>
<td>node distances:</td>
</tr>
<tr>
<td>node 0 1 2 3</td>
</tr>
<tr>
<td>0: 10 11 21 21</td>
</tr>
</tbody>
</table>

(Continued on next page)
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<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: May-2019</th>
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<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Apr-2019</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Nov-2018</td>
</tr>
</tbody>
</table>

### SPECrate2017_int_base = 225

### SPECrate2017_int_peak = Not Run

---

### Platform Notes (Continued)

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

From `/proc/meminfo`

- **MemTotal:** 792235356 kB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 kB

From `/etc/*release*/etc/*version*`

```plaintext
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_PW

**run-level 3** May 5 12:40

**SPEC is set to:** /home/cpu2017-1.0.5-ic19.0u1

<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/sda3</td>
<td>xfs</td>
<td>891G</td>
<td>46G</td>
<td>845G</td>
<td>6%</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 -[IVE135M-2.10]- 01/16/2019
- **Memory:**
  - 24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
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**Test Sponsor:** Lenovo Global Technology  
**Test Date:** May-2019  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Apr-2019  
**Software Availability:** Nov-2018

### Compiler Version Notes

---

**CC**  500.perlbench_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.

---

**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.

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**FC** 548.exchange2_r(base)  
---

Intel(R) Fortran 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:**  
```bash
icc -m64 -std=c11
```

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

**Fortran benchmarks:**  
```bash
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

(Continued on next page)
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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.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

**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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.5 on 2019-05-05 00:42:15-0400.
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