### Lenovo Global Technology

**ThinkSystem SN550 V2**  
(2.30 GHz, Intel Xeon Silver 4316)

**SPEC CPU®2017 Integer Rate Result**  
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**SPECRate®2017_int_base = 273**  
**SPECRate®2017_int_peak = Not Run**

<table>
<thead>
<tr>
<th>Copy</th>
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<tr>
<td>500. perlbench_r</td>
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<td>502. gcc_r</td>
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<td>505. mcf_r</td>
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<tr>
<td>520. omnetpp_r</td>
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<tr>
<td>523. xalancbmk_r</td>
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<tr>
<td>525. x264_r</td>
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<td>541. leela_r</td>
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<td>548. exchange2_r</td>
<td>80</td>
</tr>
<tr>
<td>557. xz_r</td>
<td>80</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Silver 4316  
- **Max MHz:** 3400  
- **Nominal:** 2300  
- **Enabled:** 40 cores, 2 chips, 2 threads/core  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **Cache L2:** 1.25 MB I+D on chip per core  
- **Cache L3:** 30 MB I+D on chip per core  
- **Other:** None  
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

#### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)  
- **Kernel:** 4.18.0-240.el8.x86_64  
- **Compiler:** C/C++, Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;  
- **Parallel:** No  
- **Firmware:** Lenovo BIOS Version U8E111A 1.02 released May-2021  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
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Results Table

<table>
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<td>154</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"

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = 
MALLOC_CONF = "retain:true"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
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

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

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
C-States set to Legacy
DCU Streamer Prefetcher set to Disabled
UPI Link Disable set to Disabled 1 Link
SNC set to Enabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec915b55891ef0e1eacfc64d
running on localhost.localdomain Sat Jun 26 20:53:17 2021

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 4316 CPU @ 2.30GHz
    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 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
    physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

From lscpu from util-linux 2.32.1:
    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

(Continued on next page)
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Test Date: Jun-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Platform Notes (Continued)

Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
Stepping: 6
CPU MHz: 1991.444
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
NUMA node0 CPU(s): 0-9,40-49
NUMA node1 CPU(s): 10-19,50-59
NUMA node2 CPU(s): 20-29,60-69
NUMA node3 CPU(s): 30-39,70-79
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 md慎gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor 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 f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_ppln ssbd mbx ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid ept_ad fsal bts cpl lbw bibs smep bmi2 rdx bmi2 3dnowavcpuid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsavesopt xsaves xsaveopt xsavec xsaveopt cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local split_lock_detect wbnoiwmd dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfn vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdrid md_clear pconfig flush_l1d arch_capabilities /proc/cpuinfo cache data

cache size : 30720 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 4 5 6 7 8 9 40 41 42 43 44 45 46 47 48 49
node 0 size: 126295 MB
node 0 free: 127945 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 50 51 52 53 54 55 56 57 58 59
node 1 size: 126609 MB
node 1 free: 128516 MB
node 2 cpus: 20 21 22 23 24 25 26 27 28 29 60 61 62 63 64 65 66 67 68 69
node 2 size: 127035 MB
node 2 free: 128446 MB

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Platform Notes (Continued)

node 3 cpus: 30 31 32 33 34 35 36 37 38 39 70 71 72 73 74 75 76 77 78 79
node 3 size: 127314 MB
node 3 free: 128445 MB
node distances:
node 0 1 2 3
0: 10 11 20 20
1: 11 10 20 20
2: 20 20 10 11
3: 20 20 11 10

From /proc/meminfo
MemTotal: 527871432 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
/sbin/tuned-adm active
Current active profile: throughput-performance

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swaps barriers and __user pointer
CVE-2017-5753 (Spectre variant 1):
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### Platform Notes (Continued)

- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling  
- **CVE-2020-0543 (Special Register Buffer Data Sampling):** Not affected  
- **CVE-2019-11135 (TSX Asynchronous Abort):** Not affected

---

**run-level 3 Jun 26 05:34**

**SPEC is set to:** /home/cpu2017-1.1.8-ic2021.1-revB  
**Filesystem** Type Size Used Avail Use% Mounted on  
/dev/sda4 xfs 818G 110G 708G 14% /home

---

From /sys/devices/virtual/dmi/id

- **Vendor:** Lenovo  
- **Product:** ThinkSystem SN550 V2  
- **Product Family:** ThinkSystem  
- **Serial:** 1234567890

---

Additional information from dmidecode 3.2 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.

- **Memory:** 16x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2666

---

**BIOS:**  
- **BIOS Vendor:** Lenovo  
- **BIOS Version:** U8E111A-1.02  
- **BIOS Date:** 05/07/2021  
- **BIOS Revision:** 1.2  
- **Firmware Revision:** 1.40

---

(End of data from sysinfo program)

---

**Compiler Version Notes**

```
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)  
| 525.x264_r(base) 557.xz_r(base)
```

---

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2021.1 Build 20201113  
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**Compiler Version Notes (Continued)**

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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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**Fortran**  | 548.exchange2_r(base) |

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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64,  
Version 2021.1 Build 20201112_000000  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Base Compiler Invocation**

C benchmarks:  
*icx*

C++ benchmarks:  
*icpx*

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 |
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| Tested by: | Lenovo Global Technology |

**CPU2017 License:** 9017

**Software Availability:** Dec-2020

**Hardware Availability:** Jul-2021

---

**Base Optimization Flags**

C benchmarks:
- `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

C++ benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

Fortran benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte`
- `-auto -mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-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-ICElake-E.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-ICElake-E.xml

http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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

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