# Lenovo Global Technology

**ThinkSystem SN550 V2**

**CPU Model:** Intel Xeon Gold 6326

**License:** CPU2017 License: 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**CPU Name:** Intel Xeon Gold 6326

**Max MHz:** 3500

**Nominal:** 2900

**Enabled:** 32 cores, 2 chips

**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:** 24 MB I+D on chip per chip

**Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R)

**Storage:** 1 x 960 GB SATA SSD

**Other:** None

**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage

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**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:** Yes

**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:** jemalloc memory allocator V5.0.1

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**Hardware**

| Threads | 0 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 16.0 | 17.0 | 18.0 | 19.0 | 20.0 | 21.0 | 22.0 | 23.0 |
|---------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 600.perlbench_s | 32 | 7.00 |
| 602.gcc_s | 32 | 10.5 |
| 605.mcf_s | 32 | 18.9 |
| 620.omnetpp_s | 32 | 10.1 |
| 623.xalancbk_s | 32 | 13.5 |
| 625.x264_s | 32 | 16.9 |
| 631.deepsjeng_s | 32 | 5.84 |
| 641.leela_s | 32 | 4.77 |
| 648.exchange2_s | 32 | |
| 657.xz_s | 32 | 20.2 |

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**Test Date:** Jul-2021

**Hardware Availability:** Jul-2021

**Software Availability:** Dec-2020

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**SPEC CPU®2017 Integer Speed Result**

**SPECspeed®2017_int_base = 11.5**

**SPECspeed®2017_int_peak = Not Run**
# SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**

ThinkSystem SN550 V2
(2.90 GHz, Intel Xeon Gold 6326)

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
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</tbody>
</table>

**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:

- **KMP_AFFINITY** = "granularity=fine,scatter"
- **LD_LIBRARY_PATH** = 
  
- **MALLOC_CONF** = "retain:true"
- **OMP_STACKSIZE** = "192M"

**General Notes**

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

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
```

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.

(Continued on next page)
SPEC CPU®2017 Integer Speed Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology
ThinkSystem SN550 V2
(2.90 GHz, Intel Xeon Gold 6326)

SPECSpeed®2017_int_base = 11.5
SPECSpeed®2017_int_peak = Not Run

General Notes (Continued)

ejemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
CPU P-state Control set to Cooperative with Legacy
C-States set to Legacy
Hyper-Threading set to Disabled
UPI Link Disable set to Disabled 1 Link
UPI Prefetcher set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Sat Jul  3 16:24:36 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) Gold 6326 CPU @ 2.90GHz
  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 : 16
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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):                 32
On-line CPU(s) list:    0-31
Thread(s) per core:     1
Core(s) per socket:     16
Socket(s):              2
NUMA node(s):           2
Vendor ID:              GenuineIntel
CPU family:             6

(Continued on next page)
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<td>Lenovo Global Technology</td>
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<td>Jul-2021</td>
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<td>Dec-2020</td>
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</tbody>
</table>

**Platform Notes (Continued)**

Model: 106
Model name: Intel(R) Xeon(R) Gold 6326 CPU @ 2.90GHz
Stepping: 6
CPU MHz: 3293.716
CPU max MHz: 3500.0000
CPU min MHz: 800.0000
BogoMIPS: 5800.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 24576K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
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 pdelgb 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 lahm_lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pmm ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid ext_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ersed invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsavesopt xsaveopt xsave xsaveopt xmem vsgsbase vs petrol xsaves cmp_legacy cmp_mbb_total cmp_mbb_local split_lock_detect wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vmbni umip pku ospke avx512_vmbmi2 gfnl vaes vpclmulqdq avx512_vnni avx512_bitalg tmc avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lld arch_capabilities

/procb/cpufreq data cache
  cache size : 24576 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 8 9 10 11 12 13 14 15
  node 0 size: 251107 MB
  node 0 free: 257009 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  node 1 size: 250919 MB
  node 1 free: 257385 MB
  node distances:
    node 0 1
    0: 10 20
    1: 20 10

From /proc/meminfo

(Continued on next page)
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Test Date: Jul-2021
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Platform Notes (Continued)

MemTotal:  527881868 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

From /etc/*release*/etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhe1"
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 sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 3 15:01

(Continued on next page)
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Test Sponsor: Lenovo Global Technology
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Specspeed\textsuperscript{2017\_int\_base} = 11.5
Specspeed\textsuperscript{2017\_int\_peak} = Not Run

Platform Notes (Continued)

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem Type Size Used Avail Use\% Mounted on
/dev/sda4 xfs 818G 30G 789G 4\% /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

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       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base)
| 625.x264_s(base) 657.xz_s(base)
==============================================================================
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.
==============================================================================
C++     | 620.onetcpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
| 641.leela_s(base)
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**Compiler Version Notes (Continued)**

```
Fortran | 648.exchange2_s(base)
```

```
Intel(R) Fortran Intel(R) 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**

- 600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
- 602.gcc_s: -DSPEC_LP64
- 605.mcf_s: -DSPEC_LP64
- 620.omnetpp_s: -DSPEC_LP64
- 623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
- 625.x264_s: -DSPEC_LP64
- 631.deepsjeng_s: -DSPEC_LP64
- 641.leela_s: -DSPEC_LP64
- 648.exchange2_s: -DSPEC_LP64
- 657.xz_s: -DSPEC_LP64

**Base Optimization Flags**

- C benchmarks:
  - -DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX2
  - -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
  - -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
  - -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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Base Optimization Flags (Continued)

C++ benchmarks:
-DSPEC_OPENMP -m64 -Wl,-z,muldefs -xCORE-AVX2 -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:
-m64 -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries

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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