# Lenovo Global Technology

**ThinkSystem ST650 V2**  
(2.80 GHz, Intel Xeon Silver 4309Y)

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### SPEC Speed 2017 Floating Point Speed Result

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

<table>
<thead>
<tr>
<th>Software</th>
</tr>
</thead>
</table>
| **OS:** | Red Hat Enterprise Linux 8.3 (Ootpa)  
| **Compiler:** | Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux; C/C++: Version 2021.1 of Intel C/C++ 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  
| **Power Management:** | BIOS and OS set to prefer performance at the cost of additional power usage

### Hardware

| CPU Name: | Intel Xeon Silver 4309Y  
| Max MHz: | 3600  
| Nominal: | 2800  
| Enabled: | 16 cores, 2 chips  
| Orderable: | 1.2 chips  
| Cache L1: | 32 KB I + 48 KB D on chip per core  
| L2: | 1.25 MB I+D on chip per core  
| L3: | 12 MB I+D on chip per chip  
| Other: | None  
| Memory: | 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
| Storage: | 1 x 960 GB SATA SSD  
| Other: | None

### Test Data

- **Test Date:** Jun-2021  
- **Hardware Availability:** Jul-2021  
- **Software Availability:** Dec-2020

### Test Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>94.5</td>
<td>Not Run</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>55.5</td>
<td>Not Run</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>69.0</td>
<td>Not Run</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>44.8</td>
<td>Not Run</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>42.9</td>
<td>Not Run</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>69.0</td>
<td>Not Run</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>119</td>
<td>Not Run</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>69.9</td>
<td>Not Run</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>70.9</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

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Lenovo Global Technology
ThinkSystem ST650 V2
(2.80 GHz, Intel Xeon Silver 4309Y)

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

Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
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<tr>
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<td>95.3</td>
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<td>92.6</td>
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<tr>
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</tbody>
</table>

SPECspeed®2017_fp_base = 78.2
SPECspeed®2017_fp_peak = Not Run

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic2021.1-revB/je5.0.1-64"
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)
**General Notes (Continued)**

jemalloc, 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
C-States set to Legacy
Adjacent Cache Prefetch set to Disabled
Hyper-Threading set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acfc64d
running on localhost.localdomain Wed Jun 23 00:35:28 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 4309Y CPU @ 2.80GHz
  2 "physical id"s (chips)
  16 "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 : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7
```

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):  16
On-line CPU(s) list:  0-15
Thread(s) per core:  1
Core(s) per socket:  8
Socket(s):  2
NUMA node(s):  2
Vendor ID:  GenuineIntel
CPU family:  6
Model:  106
Model name:  Intel(R) Xeon(R) Silver 4309Y CPU @ 2.80GHz
Stepping:  6
```
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Test Date: Jun-2021
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Software Availability: Dec-2020

SPECspeed®2017_fp_base = 78.2
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

CPU MHz: 936.823
BogoMIPS: 5600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 12288K
NUMA node0 CPU(s): 0-7
NUMA node1 CPU(s): 8-15
Flags: fpu vme de pse tsc msr pae 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 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 f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pni ssbd mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid cqm pat pifi pfdir tsc_adjust tsc tpm dt platform ida arat pti aperfmperf pid cmip pcid sva namse mvovereview mmx2 vme fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pni ssbd mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid cqm pat pifi pfdir tsc_adjust tsc tpm dt platform ida arat pti aperfmperf pid cmip pcid sva namse mvovereview mmx2 vme fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pni ssbd mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid cqm pat pifi pfdir tsc_adjust tsc tpm dt platform ida arat pti aperfmperf pid cmip pcid sva namse mvovereview mmx2 vme fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pni ssbd mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid cqm pat pifi pfdir tsc_adjust tsc tpm dt platform ida arat pti aperfmperf pid cmip pcid sva namse mvovereview mmx2 vme fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pni ssbd mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid cqm pat pifi pfdir tsc_adjust tsc tpm dt platform ida arat pti aperfmperf pid cmip pcid sva namse mvovereview mmx2 vme fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes f16c rdrand lahf_lm abm 3dnowprefetch cpuidFault epb cat_l3 invpcidSingle intelPni ssbd mba ibpb stibp ibrsEnhanced tprShadow vnmi FlexPriority Ept Vpid EptAd FsgsBase TscAdjust Bmi1 Hle Avx2 Smep Bmi2 Ets Invpcid Cqm Pat Pifi Pdflr TscAdjust Tsc Tpm Dt Platform Idar At Pti Aperfmperf Pid Cmip Pcid Sva Namse Mvovereview Mmx2 Vme Fma Cx16 Xtpd Pdcm Pcid Dca Sse4_1 Sse4_2 X2apic Movbe Popcnt TscDeadlineTimer Aes F16c Rdrand Lahf_Lm Abm 3DnowPrefetch CpuIdFault Epb Cat_L3 InvpcidSingle IntelPni Ssbd Mba Ibp IbpB Stibp IbrsEnhanced TprShadow Vnmi FlexPriority Ept Vpid EptAd FsgsBase TscAdjust Bmi1 Hle Avx2 Smep Bmi2 Erms Invpcid Cqm RdT_A Avx512F Avx512Dq RdsrAdx Smap Avx512Ifma Cllflushopt Clwb Intel_Pt Avx512Cd Sha_Ni Avx512Bw Avx512Vl Xsavesopt XasveCx XgbvBl Xsaves CqmLlc Cqm_OCCup_Llc Cqm_Mbb_Total Cqm_Mbb_Local Split_Lock_Detect Wbnoinvd Dtherm Idar Aрат Ptn Pts Avx512Vbmi Ump Pku OsPke Avx512_Vbmi2 Gfni Vaes Vpclmulqdq Avx512_Vnni Avx512_Bitalg Tme Avx512_Vpocpntdq Lai57 Rdpid Md_Clear Pconfig Flush_Lld Arch_Capabilities

/proc/cpuinfo cache data
  cache size : 12288 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
  node 0 size: 508438 MB
  node 0 free: 515062 MB
  node 0 size: 508438 MB
  node 0 free: 515436 MB
  node distances:
    node 0 1
    0: 10 20
    1: 20 10

From /proc/meminfo
  MemTotal: 1056499128 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

/sbin/tuned-adm active
  Current active profile: balanced

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<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>78.2</th>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
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**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jun-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

**Platform Notes (Continued)**

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

```plaintext
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
```

```plaintext
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): Not affected
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swaps barriers and __user pointer sanitization
- 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 23 00:34

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

<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>
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<tbody>
<tr>
<td>/dev/sda4</td>
<td>xfs</td>
<td>818G</td>
<td>108G</td>
<td>710G</td>
<td>14%</td>
<td>/home</td>
</tr>
</tbody>
</table>

From `/sys/devices/virtual/dmi/id`

```plaintext
Vendor: Lenovo
Product: ThinkSystem ST650V2
Product Family: ThinkSystem
Serial: 1234567890
```

(Continued on next page)
Platform Notes (Continued)

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:
32x 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 | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base) |
| Intel(R) C 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. |
| алкоголь |
| 607.cactuBSSN_s(base) |
| Intel(R) C++ 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. |
| Intel(R) C 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. |
| Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on |
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Copyright 2017-2021 Standard Performance Evaluation Corporation

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**SPECspeed®2017_fp_base = 78.2**

**SPECspeed®2017 fp_peak = Not Run**

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**Compiler Version Notes (Continued)**

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Fortran, C | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)

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:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

---

**Base Portability Flags**

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
   -assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64
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Base Optimization Flags

C benchmarks:
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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.

Tested with SPEC CPU®2017 v1.1.8 on 2021-06-22 12:35:28-0400.
Originally published on 2021-07-20.