# SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**

ThinkSystem ST650 V2
(2.30 GHz, Intel Xeon Silver 4310T)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base = 10.7</th>
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<tbody>
<tr>
<td>SPECspeed®2017_int_peak = Not Run</td>
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</tbody>
</table>

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

| 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 |
|---------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 600.perlbench_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 602.gcc_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 605.mcf_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 620.omnetpp_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 623.xalancbmk_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 625.x264_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 631.deepsjeng_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 641.leela_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 648.exchange2_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 657.xz_s | 40 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

**Hardware**

- **CPU Name:** Intel Xeon Silver 4310T  
  - **Max MHz:** 3400  
  - **Nominal:** 2300  
  - **Enabled:** 20 cores, 2 chips, 2 threads/core  
  - **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:** 15 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

**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 U8E113E 1.10 released Aug-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
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Test Date: Sep-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>20.3</td>
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SPECspeed®2017_int_base = 10.7
SPECspeed®2017_int_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,scatter"
LD_LIBRARY_PATH = 
  "/home/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202
  1.1-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
Filesysten 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

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca346d
running on localhost.localdomain Thu Sep 9 18:20:52 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 4310T CPU @ 2.30GHz
            2 "physical id"s (chips)
            40 "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 : 10
  siblings : 20
  physical 0: cores 0 1 2 3 4 5 6 7 8 9
  physical 1: cores 0 1 2 3 4 5 6 7 8 9

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): 40
  On-line CPU(s) list: 0-39
  Thread(s) per core: 2
  Core(s) per socket: 10
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: GenuineIntel
  CPU family: 6
  Model: 106
  Model name: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
  Stepping: 6
  CPU MHz: 1685.163
  BogoMIPS: 4600.00

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<td>Software Availability:</td>
<td>Dec-2020</td>
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### Platform Notes (Continued)

- Virtualization: VT-x
- L1d cache: 48K
- L1i cache: 32K
- L2 cache: 1280K
- L3 cache: 15360K
- NUMA node0 CPU(s): 0-9, 20-29
- NUMA node1 CPU(s): 10-19, 30-39
- 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 nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrpr 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_13 invpcid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs-enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ertms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaveves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoivd dtherm ida arat pni pts avx512vmbmi umip kpu ospke avx512_vbmi2 gfnl vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

 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 20 21 22 23 24 25 26 27 28 29
  - node 0 size: 501711 MB
  - node 0 free: 515270 MB
  - node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
  - node 1 size: 501636 MB
  - node 1 free: 515116 MB
- node distances:
  - node 0: 0 1
  - node 1: 0 1

 From /proc/meminfo
- MemTotal: 1056493936 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

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

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

(Continued on next page)
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Platform Notes (Continued)

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): 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/swapsgs 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 Sep 9 18:20

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 818G 108G 710G 14% /home

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem ST650V2
Product Family: ThinkSystem
Serial: 1234567890

Additional information from dmidecode 3.2 follows. WARNING: Use caution when you

(Continued on next page)
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**Platform Notes (Continued)**

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: U8E113E-1.10  
- BIOS Date: 08/31/2021  
- BIOS Revision: 1.10  
- Firmware Revision: 1.41

(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)

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

- 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)  
- 641.leela_s(base)

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

- 648.exchange2_s(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  
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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-AVX512
-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
-1jemalloc

C++ benchmarks:
-DSPEC_OPENMP
-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/
-1qkmalloc

Fortran benchmarks:
-m64
-xCORE-AVX512
-O3
-ipo
-no-prec-div
-qopt-mem-layout-trans=4
-nostandard-realloc-lhs
-align array32byte
-auto
-mbranches-within-32B-boundaries
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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-F.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-F.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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