# Lenovo Global Technology

**ThinkSystem ST650 V2**  
(2.10 GHz, Intel Xeon Platinum 8352V)

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**SPECspeed**

- **SPECspeed**\textsuperscript{\textregistered}2017\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered} int\textsubscript{\textregistered} base = 11.9
- **SPECspeed**\textsuperscript{\textregistered}2017\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered} int\textsubscript{\textregistered} peak = Not Run

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### Hardware

- **CPU Name:** Intel Xeon Platinum 8352V  
  - **Max MHz:** 3500  
  - **Nominal:** 2100  
  - **Enabled:** 72 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:** 54 MB I+D on chip per chip  
  - **Other:** None

- **Memory:** 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)  
- **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;  
  - C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version U8E109PT1 1.01 released Apr-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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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** May-2021  
**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** Jul-2021  
**Software Availability:** Feb-2021

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**Threads**

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>144</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>144</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>144</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>144</td>
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<tr>
<td>623.xalancbmk_s</td>
<td>144</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>144</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>144</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>144</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>144</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>144</td>
</tr>
</tbody>
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**SPECspeed**\textsuperscript{\textregistered}2017\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered}\textsubscript{\textregistered} int\textsubscript{\textregistered} base (11.9)
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>10.7</td>
<td>372</td>
<td>10.7</td>
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<td>24.4</td>
<td>253</td>
<td>24.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SPECspeed®2017_int_base = 11.9**

**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/cpu2017-1.1.5-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.5-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

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.
Lenovo Global Technology  
ThinkSystem ST650 V2  
(2.10 GHz, Intel Xeon Platinum 8352V)  

**SPECspeed®2017_int_base = 11.9**  
**SPECspeed®2017_int_peak = Not Run**

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**General Notes (Continued)**

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

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**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/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
routing on localhost.localdomain Tue May 11 18:31:05 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) Platinum 8352V CPU @ 2.10GHz  
2 "physical id"s (chips)  
144 "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 : 36  
siblings : 72  
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35  
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

From lscpu:

Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 144  
On-line CPU(s) list: 0-143  
Thread(s) per core: 2  
Core(s) per socket: 36  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 106  
Model name: Intel(R) Xeon(R) Platinum 8352V CPU @ 2.10GHz  
Stepping: 6

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| SPECspeed\textsuperscript{®}2017\textsubscript{\textit{int}}\textsubscript{base} | 11.9 |
| SPECspeed\textsuperscript{®}2017\textsubscript{\textit{int}}\textsubscript{peak} | Not Run |

### Platform Notes (Continued)

```plaintext
CPU MHz:                          2504.974  
BogoMIPS:                       4200.00  
Virtualization:                VT-x  
L1d cache:                      48K  
L1i cache:                      32K  
L2 cache:                       1280K  
L3 cache:                       55296K  
NUMA node0 CPU(s):             0-35,72-107  
NUMA node1 CPU(s):             36-71,108-143  
Flags:                          fpu vme de pse tsc msr pae mce cmov  
tag 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  
aperfmpref perfect pni pclmulqdq dtetc64 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  
axv f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single  
intel_pipl ssbd mba ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept  
vpid ept_ad fsgsb tsc_adjust bmi1 hle avx2 smep bmi2  
msr invpcid cqm mibm_total  
intel_pplm mba ibs ibp ibsp ibrs_enhanced tpr_shadow vmmi flexpriority ept  
vpi dpm_tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a  
avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha_ni  
avx512bw avx512vl xsaves xsaveopt xsaves xgetbv1 xsave vcpu vpd vpd_cache vcpu vpd_cache  
avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lld arch_capabilities
```

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.  
```plaintext
available: 2 nodes (0-1)  
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107  
node 0 size: 480314 MB  
node 0 free: 514643 MB  
node 1 cpus: 36 37 38 39 36 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107  
node 1 size: 479623 MB  
node 1 free: 515371 MB  
node distances:  
  node 0 1  
    0: 10 20  
    1: 20 10
```

From `/proc/meminfo`  
```plaintext
MemTotal:  1056469388 kB
```

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SPECSpeed®2017_int_base = 11.9
SPECSpeed®2017_int_peak = Not Run

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

Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

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): 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
corners 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 May 11 18:28

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 818G 50G 768G 7% /home

(Continued on next page)
Platform Notes (Continued)

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

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.
Memory:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: Lenovo
BIOS Version: U8E109PT1-1.01
BIOS Date: 04/28/2021
BIOS Revision: 1.1
Firmware Revision: 1.20

(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.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
       | 641.leela_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.
==============================================================================
Fortran | 648.exchange2_s(base)
==============================================================================
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on

(Continued on next page)
COMPILER VERSION NOTES (CONTINUED)

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.perlbmk_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 -ljemalloc

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/
SPEC CPU® 2017 Integer Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

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SPECspeed®2017_int_base = 11.9
SPECspeed®2017_int_peak = Not Run

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<th>CPU2017 License: 9017</th>
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<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Feb-2021</td>
</tr>
</tbody>
</table>

Base Optimization Flags (Continued)

C++ benchmarks (continued):
- lqkmalloc

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

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

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