Lenovo Global Technology

ThinkSystem ST650 V2
(2.30 GHz, Intel Xeon Gold 5320T)

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

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perbench_s</td>
<td>4</td>
</tr>
<tr>
<td>602.gcc_s</td>
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</tr>
<tr>
<td>605.mcf_s</td>
<td>10</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>13</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>13</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>16</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>5</td>
</tr>
<tr>
<td>641.leela_s</td>
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</tr>
<tr>
<td>648.exchange2_s</td>
<td>19</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>23</td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Gold 5320T
Max MHz: 3500
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
L2: 1.25 MB I+D on chip per core
L3: 30 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
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
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SPECSpeed®2017_int_base = 11.6
SPECSpeed®2017_int_peak = Not Run

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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SPECSpeed®2017_int_base = 11.6
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-ic2021.1-revB/jre5.0.1-64"
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.
### SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**  
ThinkSystem ST650 V2  
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology

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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  

**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 982a61ec0915b55891e0e16aca6c46d  
running on localhost.localdomain Tue Jul 6 18:54:12 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 5320T 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  
  Socket(s): 2  
  NUMA node(s): 2  
  Vendor ID: GenuineIntel  
  CPU family: 6  
  Model: 106  
  Model name: Intel(R) Xeon(R) Gold 5320T CPU @ 2.30GHz  
  Stepping: 6  
  CPU MHz: 2969.225  
  BogoMIPS: 4600.00

(Continued on next page)
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</table>

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**Platform Notes (Continued)**

Virtualization: VT-x

L1d cache: 48K

L1i cache: 32K

L2 cache: 1280K

L3 cache: 30720K

NUMA node0 CPU(s): 0-19, 40-59

NUMA node1 CPU(s): 20-39, 60-79

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 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 xtrr 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_pni ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnlm flexpriority ept vpid ept_ad fsbgbase tsc_adjust bml1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occap_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoind vdtsc Newtonsoft dtherm ida arat pln pts avx512vmbi umpk pku ospke avx512_vbmi2 gfnl vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid 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: 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 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

node 0 size: 485525 MB

node 0 free: 514994 MB

node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79

node 1 size: 488126 MB

node 1 free: 515267 MB

node distances:

node 0 1

0: 10 20

1: 20 10

From /proc/meminfo

```
MemTotal:      1056485276 kB
HugePages_Total:     0
Hugepagesize:    2048 kB
```

/sbin/tuned-adm active

Current active profile: balanced

(Continued on next page)
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Platform Notes (Continued)

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/swapgs 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 Jul 6 18:53

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

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**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 2933

**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**

```
<table>
<thead>
<tr>
<th>Language</th>
<th>Benchmark(s)</th>
</tr>
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<tr>
<td>C</td>
<td>600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(base)</td>
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</table>
|          | 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 Intel(R) 64, Version 2021.1 Build 20201112_000000  
|          | Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |
```
**SPEC CPU®2017 Integer Speed Result**

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### Base Compiler Invocation

C benchmarks:
- icx

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

### Base Portability Flags

- **perlibench_s:** `--DSPEC_LP64 --DSPEC_LINUX_X64`
- **gcc_s:** `--DSPEC_LP64`
- **mcf_s:** `--DSPEC_LP64`
- **omnetpp_s:** `--DSPEC_LP64`
- **xalancbmk_s:** `--DSPEC_LP64 --DSPEC_LINUX`
- **x264_s:** `--DSPEC_LP64`
- **deepsjeng_s:** `--DSPEC_LP64 --DSPEC_LINUX`
- **leela_s:** `--DSPEC_LP64`
- **exchange2_s:** `--DSPEC_LP64`
- **xz_s:** `--DSPEC_LP64`

### Base Optimization Flags

**C benchmarks:**

**C++ benchmarks:**

**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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