## Lenovo Global Technology

**ThinkSystem ST650 V2**  
(2.10 GHz, Intel Xeon Gold 5318S)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 315</th>
<th>SPECrate®2017_int_peak = Not Run</th>
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</thead>
<tbody>
<tr>
<td>Lenovo Global Technology</td>
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</tr>
<tr>
<td>Jul-2021</td>
<td>Jul-2021</td>
</tr>
<tr>
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<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Dec-2020</td>
<td>Dec-2020</td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name: Intel Xeon Gold 5318S</th>
<th>OS: Red Hat Enterprise Linux 8.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz: 3400</td>
<td>(Ootpa)</td>
</tr>
<tr>
<td>Nominal: 2100</td>
<td>Kernel 4.18.0-240.el8.x86_64</td>
</tr>
<tr>
<td>Enabled: 48 cores, 2 chips, 2 threads/core</td>
<td>C/C++, Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
<td>Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
<td>Parallel: No</td>
</tr>
<tr>
<td>L2: 1.25 MB I+D on chip per core</td>
<td>Firmware: Lenovo BIOS Version U8E111A 1.02 released May-2021</td>
</tr>
<tr>
<td>L3: 36 MB I+D on chip per chip</td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Other: None</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Memory: 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)</td>
<td>Peak Pointers: Not Applicable</td>
</tr>
<tr>
<td>Storage: 1 x 960 GB SATA SSD</td>
<td>Other: None</td>
</tr>
<tr>
<td>Other: None</td>
<td>Power Management: BIOS and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>SPEC CPU®2017 Integer Rate Result</th>
</tr>
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<tbody>
<tr>
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</tr>
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</tr>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
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<tr>
<td>Tested by: Lenovo Global Technology</td>
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<td>Hardware Availability: Jul-2021</td>
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<td>Software Availability: Dec-2020</td>
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<table>
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<tr>
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<th>500.perlbench_r</th>
<th>502.gcc_r</th>
<th>505.mcf_r</th>
<th>520.omnetpp_r</th>
<th>523.xalancbmk_r</th>
<th>525.x264_r</th>
<th>531.deepsjeng_r</th>
<th>541.leela_r</th>
<th>548.exchange2_r</th>
<th>557.xz_r</th>
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<tr>
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<td>212</td>
<td>262</td>
<td>424</td>
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<td>460</td>
<td>473</td>
<td>487</td>
<td>500</td>
<td>513</td>
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<td>424</td>
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### Test Parameters

**Test Date:** Jul-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020
## Lenovo Global Technology

ThinkSystem ST650 V2
(2.10 GHz, Intel Xeon Gold 5318S)

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<th>Seconds</th>
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<td>178</td>
</tr>
</tbody>
</table>

**SPECrate®2017_int_base = 315**

**SPECrate®2017_int_peak = Not Run**

### Results Table

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

### Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

### 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:

```
LD_LIBRARY_PATH = 

MALLOC_CONF = "retain:true"
```

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
Memory using Red Hat Enterprise Linux 8.1
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
```

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**

ThinkSystem ST650 V2
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</tbody>
</table>

**SPECrater®2017_int_base =** 315

**SPECrater®2017_int_peak =** Not Run

---

**General Notes (Continued)**

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

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.

---

**Platform Notes**

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
DCU Streamer Prefetcher set to Disabled
SNC set to Enabled
UPI Link Disable set to Disabled 1 Link

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Wed Jul 7 21:25:06 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 5318S CPU @ 2.10GHz
2 "physical id"s (chips)
96 "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 : 24
siblings : 48
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
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
```

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): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
```

(Continued on next page)
### Lenovo Global Technology

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</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2020</td>
</tr>
</tbody>
</table>

---

**Platform Notes (Continued)**

Vendor ID:           GenuineIntel  
CPU family:          6  
Model:               106  
Model name:          Intel(R) Xeon(R) Gold 5318S CPU @ 2.10GHz  
Stepping:            6  
CPU MHz:             2600.000  
BogoMIPS:            4200.00  
Virtualization:      VT-x  
L1d cache:           48K  
L1i cache:           32K  
L2 cache:            1280K  
L3 cache:            36864K  
NUMA node0 CPU(s):   0-11,48-59  
NUMA node1 CPU(s):   12-23,60-71  
NUMA node2 CPU(s):   24-35,72-83  
NUMA node3 CPU(s):   36-47,84-95  
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 aperfmpref pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pccid 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_ppin ssbd mib ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase 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 xsaveopt xsavec xSAVE xgetbv xsaes cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512vbm1 umip pku ospe avx512_vbmi2 gfn vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size: 36864 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 48 49 50 51 52 53 54 55 56 57 58 59
  node 0 size: 252335 MB
  node 0 free: 257146 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71
  node 1 size: 252744 MB
  node 1 free: 257756 MB
  node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 37 72 73 74 75 76 77 78 79 80 81 82 83
  node 2 size: 252280 MB
  node 2 free: 257584 MB
  node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 85 86 87 88 89 90 91 92 93 94 95
  node 3 size: 252205 MB

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

Lenovo Global Technology
ThinkSystem ST650 V2
(2.10 GHz, Intel Xeon Gold 5318S)

Copyright 2017-2021 Standard Performance Evaluation Corporation

Lenovo Global Technology
Test Sponsor: Lenovo Global Technology

Lenovo Global Technology
Tested by: Lenovo Global Technology

CPU2017 License: 9017
Test Date: Jul-2021

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

SPECrade®2017_int_base = 315
SPECrade®2017_int_peak = Not Run

Platform Notes (Continued)

node 3 free: 257733 MB
node distances:
node  0  1  2  3
0:  10 11 20 20
1:  11 10 20 20
2:  20 20 10 11
3:  20 20 11 10

From /proc/meminfo
MemTotal: 1056481140 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB:
CVE-2017-5715 (Spectre variant 2):

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST650 V2
(2.10 GHz, Intel Xeon Gold 5318S)

SPEC CPU®2017 Integer Rate Result

SPECRate®2017_int_base = 315
SPECRate®2017_int_peak = Not Run

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

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

Platform Notes (Continued)
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 7 21:22

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 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

C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
        | 525.x264_r(base) 557.xz_r(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++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
        | 541.leela_r(base)

(Continued on next page)
# Lenovo Global Technology

## SPEC CPU®2017 Integer Rate Result

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**SPECrate®2017_int_base = 315**

**SPECrate®2017_int_peak = Not Run**

---

### Compiler Version Notes (Continued)

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 | 548.exchange2_r (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:**

```text
icx
```

**C++ benchmarks:**

```text
icpx
```

**Fortran benchmarks:**

```text
ifort
```

### Base Portability Flags

```text
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64  
502.gcc_r: -DSPEC_LP64  
505.mcf_r: -DSPEC_LP64  
520.omnetpp_r: -DSPEC_LP64  
523.xalanchmk_r: -DSPEC_LP64 -DSPEC_LINUX  
525.x264_r: -DSPEC_LP64  
531.deepsjeng_r: -DSPEC_LP64  
541.leela_r: -DSPEC_LP64  
548.exchange2_r: -DSPEC_LP64  
557.zx_r: -DSPEC_LP64
```
**SPEC CPU®2017 Integer Rate Result**

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**Test Date:** Jul-2021  
**Hardware Availability:** Jul-2021

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---

**Base Optimization Flags**

**C benchmarks:**
- `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

**C++ benchmarks:**
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

**Fortran benchmarks:**
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-gopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte`
- `-auto -mbranches-within-32B-boundaries`
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

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**The flags files that were used to format this result can be browsed at**


**You can also download the XML flags sources by saving the following links:**


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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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