# Lenovo Global Technology

## SPEC CPU®2017 Integer Speed Result

### CPU2017 License: 9017

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
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<td>May-2021</td>
</tr>
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<td>Jul-2021</td>
</tr>
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### Lenovo Global Technology

#### ThinkSystem ST650 V2

<table>
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<th>(2.20 GHz, Intel Xeon Gold 6338N)</th>
</tr>
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</table>

#### SPECspeed®2017_int_base = 11.9

**SPECspeed®2017_int_peak = Not Run**

## Hardware

### CPU Name: Intel Xeon Gold 6338N

- **Max MHz:** 3500
- **Nominal:** 2200
- **Enabled:** 64 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:** 48 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

## 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
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Threads</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>128</td>
<td>246</td>
<td>7.23</td>
<td>245</td>
<td>7.25</td>
<td>247</td>
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<tr>
<td>602.gcc_s</td>
<td>128</td>
<td>376</td>
<td>10.6</td>
<td>373</td>
<td>10.7</td>
<td>374</td>
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<tr>
<td>605.mcf_s</td>
<td>128</td>
<td>244</td>
<td>19.3</td>
<td>244</td>
<td>19.3</td>
<td>244</td>
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<tr>
<td>620.omnetpp_s</td>
<td>128</td>
<td>132</td>
<td>12.3</td>
<td>136</td>
<td>12.0</td>
<td>136</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>128</td>
<td>104</td>
<td>13.6</td>
<td>104</td>
<td>13.6</td>
<td>104</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>128</td>
<td>103</td>
<td>17.2</td>
<td>103</td>
<td>17.2</td>
<td>103</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>128</td>
<td>243</td>
<td>5.91</td>
<td>243</td>
<td>5.90</td>
<td>243</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>128</td>
<td>352</td>
<td>4.85</td>
<td>351</td>
<td>4.86</td>
<td>351</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>128</td>
<td>152</td>
<td>19.4</td>
<td>152</td>
<td>19.4</td>
<td>153</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>128</td>
<td>255</td>
<td>24.2</td>
<td>255</td>
<td>24.2</td>
<td>255</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-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

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Wed May 19 18:07:24 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 6338N CPU @ 2.20GHz
  2 "physical id"s (chips)
  128 "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 : 32
siblings : 64
  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
  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

From lscpu:
Architecture:         x86_64
CPU op-mode(s):       32-bit, 64-bit
Byte Order:           Little Endian
CPU(s):               128
On-line CPU(s) list:  0-127
Thread(s) per core:   2
Core(s) per socket:   32
Socket(s):            2
NUMA node(s):         2
Vendor ID:            GenuineIntel
CPU family:           6
Model:                106
Model name:           Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
Stepping:             6

(Continued on next page)
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SPECSpeed®2017_int_base = 11.9
SPECSpeed®2017_int_peak = Not Run

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

Platform Notes (Continued)

CPU MHz: 2700.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 49152K
NUMA node0 CPU(s): 0-31, 64-95
NUMA node1 CPU(s): 32-63, 96-127
Flags: fpu vme de pse sse mmm cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse2 ss ht tm pbe syscall nx pdeldgb rdtscp
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref 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_l3 invpclid_single
intel_ppln ssbd mba ibrs ibbp stibp ibrs_enhanced tpr_shadow vni flexpriority ept
vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpintel cqm dts
avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni
avx512bw avx512vl xsaves xsaveopt xsavec xgetbv1 xsavecpum_behavior cqm mmboot_like
cqm_multilib_local split_lock_detect wbnoinvd dtherm ida arat plnt pts avx512vbmi umip pk
ospke avx512_vbmi1 gfnl vaes vpcmlqdq avx512vnni avx512_vclalg tme
avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lld arch_capabilities

/proc/cpuinfo cache data
  cache size : 49152 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 20 21 22 23 24 25 26 27
  node 1 cpus: 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
  node 1 size: 483607 MB
  node 1 free: 514663 MB
  node distances:
    node   0   1
    0:  10  20
    1:  20  10

From /proc/meminfo
  MemTotal: 1056474892 KB
  HugePages_Total: 0

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**Platform Notes (Continued)**

- **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 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 May 19 18:02**

- **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

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

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#### Platform Notes (Continued)

- **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 2666

- **BIOS:**
  - **Vendor:** Lenovo
  - **Version:** U8E109PT1-1.01
  - **Date:** 04/28/2021
  - **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)  |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on</td>
</tr>
<tr>
<td>Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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Compiler Version Notes (Continued)
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.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-bounds
-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-bounds
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin/
-lqkmalloc

(Continued on next page)
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Base Optimization Flags (Continued)

Fortran benchmarks:
-m64 -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-branches-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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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