Lenovo Global Technology
ThinkSystem SR650 V2
(2.00 GHz, Intel Xeon Gold 6338)

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Hardware Availability: Jul-2021
Software Availability: Feb-2021

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**Hardware**
- CPU Name: Intel Xeon Gold 6338
- Max MHz: 3200
- Nominal: 2000
- 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)
- Storage: 1 x 960 GB SATA SSD
- Other: None

**Software**
- OS: SUSE Linux Enterprise Server 15 SP2 (x86_64)
  Kernel 5.3.18-22-default
- 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: No
- Firmware: Lenovo BIOS Version AFE109PT1 1.00
  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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SPECrate®2017_fp_base = 390
SPECrate®2017_fp_peak = Not Run

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

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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 =
    "/home/cpu2017-1.1.5-ic2021.1-revA-update1/lib/intel64:/home/cpu2017-1.1.5-ic2021.1-revA-update1/je5.0.1-64"
MALLOCC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7940X CPU + 64GB RAM memory using openSUSE Leap 15.2
Transparent Huge Pages enabled by default

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.00 GHz, Intel Xeon Gold 6338)

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SPECrated®2017_fp_peak = Not Run

CPU2017 License: 9017
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Test Date: May-2021
Hardware Availability: Jul-2021
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General Notes (Continued)

Prior to runcpu invocation
Filesystem page cache synced and cleared with:

csync; echo 3> /proc/sys/vm/drop_caches
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
DCU Streamer Prefetcher set to Disabled
DCU IP Prefetcher set to Disabled
SNC set to Enabled
Patrol Scrub set to Disabled

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revA-update1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost Fri May 28 01:48:16 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 6338 CPU @ 2.00GHz
  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:

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SR650 V2**  
(2.00 GHz, Intel Xeon Gold 6338)

### SPEC CPU®2017 Floating Point Rate Result

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**SPECrate®2017_fp_base =** 390  
**SPECrate®2017_fp_peak =** Not Run

### Platform Notes (Continued)

- **Architecture:** x86_64  
- **CPU op-mode(s):** 32-bit, 64-bit  
- **Byte Order:** Little Endian  
- **Address sizes:** 46 bits physical, 57 bits virtual  
- **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):** 4  
- **Vendor ID:** GenuineIntel  
- **CPU family:** 6  
- **Model:** 106  
- **Model name:** Intel(R) Xeon(R) Gold 6338 CPU @ 2.00GHz  
- **Stepping:** 6  
- **CPU MHz:** 2600.000  
- **BogoMIPS:** 4000.00  
- **Virtualization:** VT-x  
- **L1d cache:** 48K  
- **L1i cache:** 32K  
- **L2 cache:** 1280K  
- **L3 cache:** 49152K  
- **NUMA node0 CPU(s):** 0-15,64-79  
- **NUMA node1 CPU(s):** 16-31,80-95  
- **NUMA node2 CPU(s):** 32-47,96-111  
- **NUMA node3 CPU(s):** 48-63,112-127  
- **Flags:** fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc 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 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_13 invpcid_single ssbd mba ibrs ibpb ibp enhanced tpr_shadow vmm vflexpriority ept vpid ept_ad fsgsbase ts dcat_adjust bni hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xsavec xsavec xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local wboinvd dtherm ida arat pln pts avx512vmbi umip pku ospke avx512_vbmi2 gfn vaes vpcmrelofq avx512_vnni avx512_bitalg 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: 4 nodes (0-3)  
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 64 65 66 67 68 69 70 71 72 73 74 75  
(Continued on next page)
Platform Notes (Continued)

76 77 78 79
node 0 size: 257631 MB
node 0 free: 257213 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 80 81 82 83 84 85 86 87 88
  89 90 91 92 93 94 95
node 1 size: 258006 MB
node 1 free: 257641 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 96 97 98 99 100 101 102
  103 104 105 106 107 108 109 110 111
node 2 size: 258040 MB
node 2 free: 257657 MB
node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 112 113 114 115 116 117
  118 119 120 121 122 123 124 125 126 127
node 3 size: 258036 MB
node 3 free: 257716 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:       1056476292 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 15 SP2

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP2"
    VERSION_ID="15.2"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15:sp2"

uname -a:
Linux localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) x86_64
x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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

**Lenovo Global Technology**

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**Platform Notes (Continued)**

- **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 May 28 01:45**

**SPEC is set to:** /home/cpu2017-1.1.5-ic2021.1-revA-update1

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
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<tr>
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<td>xfs</td>
<td>893G</td>
<td>82G</td>
<td>811G</td>
<td>10%</td>
<td>/</td>
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From /sys/devices/virtual/dmi/id

- **Vendor:** Lenovo
- **Product:** ThinkSystem SR650 V2 MB
- **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

**BIOS:**

- **BIOS Vendor:** Lenovo
- **BIOS Version:** AFE109PT1-1.00
- **BIOS Date:** 04/28/2021
- **BIOS Revision:** 1.0
- **Firmware Revision:** 1.0

(End of data from sysinfo program)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.00 GHz, Intel Xeon Gold 6338)

SPECrater\textsuperscript{2017}\_fp\_base = 390
SPECrater\textsuperscript{2017}\_fp\_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

Compiler Version Notes

<table>
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<tr>
<th>C</th>
<th>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</th>
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<tbody>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
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<tr>
<th>C++</th>
<th>508.namd_r(base) 510.parest_r(base)</th>
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</thead>
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<tr>
<th>C++, C</th>
<th>511.povray_r(base) 526.blender_r(base)</th>
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<tr>
<th>C++, C, Fortran</th>
<th>507.cactuBSSN_r(base)</th>
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<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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</table>

<table>
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<tr>
<th>Fortran</th>
<th>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</th>
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</thead>
<tbody>
<tr>
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Lenovo Global Technology
ThinkSystem SR650 V2
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECrate®2017_fp_base = 390
SPECrate®2017_fp_peak = Not Run

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

Compiler Version Notes (Continued)

==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_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.
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.
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
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Software Availability: Feb-2021

Base Portability Flags (Continued)

527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mmfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -fflto
-mmfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mmfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mmfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SR650 V2**  
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**Test Date:** May-2021  
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### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

- `-flto`  
- `-mfpmath=sse`  
- `-funroll-loops`  
- `-qopt-mem-layout-trans=4`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-multiple-gather-scatter-by-shuffles`  
- `-mbranches-within-32B-boundaries`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto`  
- `-ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

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:

- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml)  

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