**Lenovo Global Technology**

**ThinkSystem SR650 V2**

(2.10 GHz, Intel Xeon Gold 6338T)

---

**Software**

<table>
<thead>
<tr>
<th>Spec</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 15 SP2 (x86_64) Kernel 5.3.18-22-default</td>
</tr>
<tr>
<td>Compiler</td>
<td>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</td>
</tr>
<tr>
<td>Parallel</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware</td>
<td>Lenovo BIOS Version AFE111A 1.02 released May-2021</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
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</tbody>
</table>

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**Hardware**

<table>
<thead>
<tr>
<th>Spec</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 6338T</td>
</tr>
<tr>
<td>Max MHZ</td>
<td>3400</td>
</tr>
<tr>
<td>Nominal</td>
<td>2100</td>
</tr>
<tr>
<td>Enabled</td>
<td>48 cores, 2 chips</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2</td>
<td>1.25 MB I+D on chip per core</td>
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<tr>
<td>L3</td>
<td>36 MB I+D on chip per chip</td>
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<tr>
<td>Other</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)</td>
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<tr>
<td>Storage</td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

---

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Jun-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Dec-2020  

---

**SPEC speed**

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<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed\textsuperscript{2017_fp_base}</th>
<th>SPECspeed\textsuperscript{2017_fp_peak}</th>
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<tbody>
<tr>
<td>603.bwaves.s</td>
<td>48</td>
<td>Not Run</td>
</tr>
<tr>
<td>607.cactuBSSN.s</td>
<td>48</td>
<td>223</td>
</tr>
<tr>
<td>619.lbm.s</td>
<td>48</td>
<td>141</td>
</tr>
<tr>
<td>621.wrf.s</td>
<td>48</td>
<td>135</td>
</tr>
<tr>
<td>627.cam4.s</td>
<td>48</td>
<td>124</td>
</tr>
<tr>
<td>628.pop2.s</td>
<td>48</td>
<td>75.8</td>
</tr>
<tr>
<td>638.imagick.s</td>
<td>48</td>
<td>188</td>
</tr>
<tr>
<td>644.nab.s</td>
<td>48</td>
<td>299</td>
</tr>
<tr>
<td>649.fotonik3d.s</td>
<td>48</td>
<td>110</td>
</tr>
<tr>
<td>654.roms.s</td>
<td>48</td>
<td>224</td>
</tr>
</tbody>
</table>

---

**SPEC CPU\textsuperscript{2017 Floating Point Speed Result}\textsuperscript{2017\_fp\_base} = 181\textsuperscript{2017\_fp\_peak} = Not Run**
**SPEC CPU®2017 Floating Point Speed Result**

**Lenovo Global Technology**

ThinkSystem SR650 V2  
(2.10 GHz, Intel Xeon Gold 6338T)

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

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>48</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>74.7</td>
<td>223</td>
<td>76.0</td>
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<td>638.imagick_s</td>
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<td>644.nab_s</td>
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</tr>
<tr>
<td>649.fotonik3d_s</td>
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<td>83.9</td>
<td>109</td>
<td>83.0</td>
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<tr>
<td>654.roms_s</td>
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<td>224</td>
<td>70.1</td>
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<td></td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 181**

**SPECspeed®2017_fp_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,compact"
- 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
Adjacent Cache Prefetch set to Disabled
Hyper-Threading set to Disabled
LLC Prefetch set to Enable

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revA-update1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost Wed Jun 23 18:21:58 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 6338T CPU @ 2.10GHz
 2 "physical id"s (chips)
 48 "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 : 24
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 2.33.1:
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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106

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

SPECspeed\textsuperscript{\textregistered}2017\_fp\_base = 181
SPECspeed\textsuperscript{\textregistered}2017\_fp\_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Jun-2021
Hardware Availability: Jul-2021
Software Availability: Dec-2020

Platform Notes (Continued)

Model name: Intel(R) Xeon(R) Gold 6338T CPU @ 2.10GHz
Stepping: 6
CPU MHz: 2929.600
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 36864K
NUMA node0 CPU(s): 0-23
NUMA node1 CPU(s): 24-47
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 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 xtrunc pdcm pcid dca sse4_1_l1e_2 x2apic movbe popcnt tsc_deadline_timer aes xsave f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault ebpx cat13 invpcid_single ssbd mba ibrs ibpb stibp ibrs\_enhanced tpr\_shadow vnmi flexpriority ept\_ad fsgsbase\_adjust bml \_hle avx2 smep bmi2 erts invpcid rtm cqm rdt\_a avx512f
avx512dq rdseed adx smap avx512ifma clflushopt clwb\_intel\_pt avx512cd\_sha\_ni
avx512bw avx512vl \_xsaveopt xsaves xgetbv1 xsavec cqm\_llc cqm\_occup\_llc cqm\_mbm\_total
cqm\_mbm\_local wbnoinvd dtherm ida arat pni pts avx512\_vmx1 umip pku ospke
avx512\_vmx12 gfn vi avx12.5mvclqdu avx512\_vnni avx512\_bitalg tme avx512\_vpopcntdq
la57 rdpid md\_clear pconfig flush\_ld arch\_capabilitie

From /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: 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
node 0 size: 515646 MB
node 0 free: 515029 MB
node 0 free: 515613 MB
node 0 free: 515613 MB
node distances:
node 0 1
0: 10 20
1: 20 10

From /proc/meminfo

```
MemTotal: 1056495428 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR650 V2
(2.10 GHz, Intel Xeon Gold 6338T)

SPECspeed®2017_fp_base = 181
SPECspeed®2017_fp_peak = Not Run

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

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

Platform Notes (Continued)

/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:

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
CVE-2018-3639 (Speculative Store Bypass): Bypass disabled via prctl and
CVE-2017-5753 (Spectre variant 1): seccomp
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB:
CVE-2020-0543 (Special Register Buffer Data Sampling): conditional, RSB filling
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jun 23 18:21

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revA-update1
Filesistem   Type  Size  Used Avail Use% Mounted on
/dev/sdb2   xfs  893G  105G  788G  12% /

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR650 V2 MB
Product Family: ThinkSystem
Serial: 1234567890

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

ThinkSystem SR650 V2  
(2.10 GHz, Intel Xeon Gold 6338T)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>181</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**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

**BIOS:**
- BIOS Vendor: Lenovo
- BIOS Version: AFE111A-1.02
- BIOS Date: 05/07/2021
- BIOS Revision: 1.2
- Firmware Revision: 1.10

(End of data from sysinfo program)

### Compiler Version Notes

```
<table>
<thead>
<tr>
<th>C</th>
<th>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>C++, C, Fortran</th>
<th>607.cactuBSSN_s(base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Fortran</th>
<th>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</th>
</tr>
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<tbody>
<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
<td></td>
</tr>
</tbody>
</table>
```

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

SPECspeed®2017_fp_base = 181
SPECspeed®2017_fp_peak = Not Run

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

Compiler Version Notes (Continued)

Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_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.
Intel(R) C 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:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64
## Base Optimization Flags

**C benchmarks:**
- `m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
- `ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
- `mbranches-within-32B-boundaries`

**Fortran benchmarks:**
- `m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
- `nostandard-realloc-lhs -mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

**Benchmarks using both Fortran and C:**
- `m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
- `DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

**Benchmarks using Fortran, C, and C++:**
- `m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
- `DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

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: