## Lenovo Global Technology

**ThinkSystem SR650**  
(2.20 GHz, Intel Xeon Gold 6238R)

<table>
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<th>CPU2017 License: 9017</th>
<th>SPECrate®2017_fp_base = 268</th>
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<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Test Date: Jun-2020</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Hardware Availability: Mar-2020</td>
</tr>
<tr>
<td><strong>Tested by:</strong> Lenovo Global Technology</td>
<td>Software Availability: Apr-2020</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6238R  
  - Max MHz: 4000  
  - Nominal: 2200  
  - Enabled: 56 cores, 2 chips, 2 threads/core  
  - Orderable: 1, 2 chips  
  - Cache L1: 32 KB I + 32 KB D on chip per core  
  - L2: 1 MB I+D on chip per core  
  - L3: 38.5 MB I+D on chip per chip  
  - Other: None  
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)  
- **Storage:** 1 x 800 GB SATA SSD  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.1  
  - (Ootpa)  
  - Kernel 4.18.0-147.el8.x86_64  
- **Compiler:** C/C++: Version 19.1.1.217 of Intel  
  - C/C++  
  - Compiler for Linux; Fortran: Version 19.1.1.217 of Intel Fortran  
  - Compiler for Linux  
- **Parallel:** No  
- **Firmware:** Lenovo BIOS Version IVE155L 2.61 released May-2020  
- **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 set to prefer performance at the cost of additional power usage

---

### SPEC CPU®2017 Floating Point Rate Result

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**Parallel:** No  
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**System State:** Run level 3 (multi-user)  
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SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 6238R)

CPU2017 License: 9017
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Results Table

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</tr>
</tbody>
</table>

SPECrater®2017_fp_base = 268
SPECrater®2017_fp_peak = Not Run

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

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.
The correct version of C/C++ compiler is: Versio19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

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/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/j
e5.0.1-64"
MALLOCONF = "retain:true"
LENovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 6238R)

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SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jun-2020
Tested by: Lenovo Global Technology
Hardware Availability: Mar-2020
Software Availability: Apr-2020

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
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.
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
MONITOR/MWAIT set to Enable
SNC set to Enable
Workload Configuration set to I/O Sensitive
Trusted Execution Technology set to Enable
Patrol Scrub set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe6e46a485a0011
running on localhost.localdomain Mon Jun 15 05:13:15 2020

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 6238R CPU @ 2.20GHz
  2 "physical id"s (chips)
  112 "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 : 28
  siblings : 56
  physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
                   28 29 30

(Continued on next page)
Lenovo Global Technology
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Hardware Availability: Mar-2020
Software Availability: Apr-2020

Platform Notes (Continued)

physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 2183.398
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-3,7-9,14-17,21-23,28-31,35-37,42-45,49-51,56-59,63-65,68-71
NUMA node1 CPU(s): 4-6,10-13,18-20,24-27,32-34,38-41,46-48,52-55,60-62,66-69,74-76,80-83
NUMA node2 CPU(s): 28-31,35-37,42-45,49-51,84-87,91-93,98-101,105-107
NUMA node3 CPU(s): 32-34,38-41,46-48,52-55,88-90,94-97,102-104,108-111
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 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
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_l3 cdp lppe
invpcid_single intel_pinn ssbd mba ibrs ibpb ibrsEnhanced tpr_shadow vmmi
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ersed invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
cqm_mbb_local dtherm ida arat pln pts pkup ospke avx512_vnni md_clear flush_l1d
arch_capabilities

/proc/cpuinfo cache data
cache size : 39424 KB

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 6238R)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

**Platform Notes (Continued)**

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 7 8 9 14 15 16 17 21 22 23 56 57 58 59 63 64 65 70 71 72 73 77 78 79
node 0 size: 193149 MB
node 0 free: 192357 MB
node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 60 61 62 66 67 68 69 74 75 76 80 81 82 83
node 1 size: 193530 MB
node 1 free: 193286 MB
node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 84 85 86 87 91 92 93 98 99 100 101 105 106 107
node 2 size: 193530 MB
node 2 free: 193121 MB
node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 88 89 90 94 95 96 97 102 103 104 108 109 110 111
node 3 size: 193504 MB
node 3 free: 193133 MB
node distances:

node 0: 10 11 21 21
node 1: 11 10 21 21
node 2: 21 21 10 11
node 3: 21 21 11 10

From `/proc/meminfo`
MemTotal: 792283948 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From `/etc/*release* /etc/*version*`

```
os-release:
  NAME="Red Hat Enterprise Linux"
  VERSION="8.1 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.1"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
  ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga
```

uname -a:

```
Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
```

(Continued on next page)
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<tr>
<th>SPECrate®2017_fp_base =</th>
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Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Platform Notes (Continued)

x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

- 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

run-level 3 Jun 15 05:07

SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sdb2      xfs    689G   44G  645G   7% /home

From /sys/devices/virtual/dmi/id
  BIOS: Lenovo -[IVE155L-2.61]- 05/20/2020
  Vendor: Lenovo
  Product: ThinkSystem SR650 -[7X05RCZ000]-
  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:
  24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from syssinfo program)

Compiler Version Notes
===============================================================================
C | 519.libm_r(base) 538.imagick_r(base) 544.nab_r(base)
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
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(Continued on next page)
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**CPU2017 License:** 9017
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

### Compiler Version Notes (Continued)

| C++, C++ | 508.namd_r(base) 510.parest_r(base) |
|-----------------------------|
| Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1 | NextGen Build 20200304 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| C++, C | 511.povray_r(base) 526.blender_r(base) |
|-----------------------------|
| Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1 | NextGen Build 20200304 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| C++, C, Fortran | 507.cactuBSSN_r(base) |
|-----------------------------|
| Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1 | NextGen Build 20200304 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |
| Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 | NextGen Build 20200304 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |
| Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| Fortran | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base) |
|-----------------------------|
| Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

| Fortran, C | 521.wrf_r(base) 527.cam4_r(base) |
|-----------------------------|
| Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |
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SPECrater\textsuperscript{®}2017\textsuperscript{\textregistered}_\textsuperscript{fp}_\textsuperscript{peak} = Not Run
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Test Date: Jun-2020
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Compiler Version Notes (Continued)

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1

NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc 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
522.blender_r: -DSPEC\_LP64 -DSPEC\_LINUX -funsigned-char
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

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## Base Optimization Flags

### C benchmarks:
- `-m64`  
- `-qnextgen`  
- `-std=c11`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`  
- `-funroll-loops -qopt-mem-layout-trans=4`  
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### C++ benchmarks:
- `-m64`  
- `-qnextgen`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`  
- `-Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`  
- `-funroll-loops -qopt-mem-layout-trans=4`  
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### Fortran benchmarks:
- `-m64`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`  
- `-Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -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`  
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### Benchmarks using both Fortran and C:
- `-m64`  
- `-qnextgen`  
- `-std=c11`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`  
- `-Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-prefetch`  
- `-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs -align array32byte`  
- `-auto -mbranches-within-32B-boundaries`  
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### Benchmarks using both C and C++:
- `-m64`  
- `-qnextgen`  
- `-std=c11`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`  
- `-Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`  
- `-funroll-loops -qopt-mem-layout-trans=4`  
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

### Benchmarks using Fortran, C, and C++:
- `-m64`  
- `-qnextgen`  
- `-std=c11`  
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`  
- `-Wl,-z,muldefs`  
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`  
- `-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div`  
- `-qopt-prefetch -ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs -align array32byte`  
- `-auto -mbranches-within-32B-boundaries`

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 6238R)

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<th>SPECrate®2017_fp_base = 268</th>
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<td>SPECrate®2017_fp_peak = Not Run</td>
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**Base Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++ (continued):
- `-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:
- http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml

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