### Lenovo Global Technology

**ThinkSystem SR650**  
**(2.40 GHz, Intel Xeon Silver 4210R)**

<table>
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<th><strong>SPECrate®2017_fp_base</strong></th>
<th><strong>SPECrate®2017_fp_peak</strong></th>
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**Environment**

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

- **Software Availability:** Apr-2020  
- **Hardware Availability:** Mar-2020

**Test Date:** Jul-2020

#### Hardware

- **CPU Name:** Intel Xeon Silver 4210R  
  - **Max MHz:** 3200  
  - **Nominal:** 2400  
  - **Enabled:** 20 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

- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)

- **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++  
  - **Fortran:** Version 19.1.1.217 of Intel Fortran

- **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**

**Lenovo Global Technology**

ThinkSystem SR650  
(2.40 GHz, Intel Xeon Silver 4210R)

---

**SPECrate®2017_fp_base = 129**

**SPECrate®2017_fp_peak = Not Run**

---

### Results Table

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**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: Version 19.1.1.217 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:

```bash
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"

MALLOC_CONF = "retain:true"
```
**Lenovo Global Technology**

ThinkSystem SR650
(2.40 GHz, Intel Xeon Silver 4210R)

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<td>SPECrate®2017_fp_peak = Not Run</td>
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<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
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</tbody>
</table>

**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:
```bash
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.

**Platform Notes**

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy
DCU Streamer Prefetcher set to Disable
Stale AtoS set to Enable
LLC dead line alloc set to Disable
Patrol Scrub set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011
running on localhost.localdomain Wed Jul 1 09:30:00 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) Silver 4210R CPU @ 2.40GHz
  2 "physical id"s (chips)
  40 "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 : 10
siblings : 20
physical 0: cores 0 1 2 3 4 8 9 10 11 12
physical 1: cores 0 1 2 3 4 8 9 10 11 12
```

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.40 GHz, Intel Xeon Silver 4210R)

SPECrater®2017_fp_base = 129
SPECrater®2017_fp_peak = Not Run

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

Platform Notes (Continued)

From lscpu:
    Architecture: x86_64
    CPU op-mode(s): 32-bit, 64-bit
    Byte Order: Little Endian
    CPU(s): 40
    On-line CPU(s) list: 0-39
    Thread(s) per core: 2
    Core(s) per socket: 10
    Socket(s): 2
    NUMA node(s): 2
    Vendor ID: GenuineIntel
    CPU family: 6
    Model: 85
    Model name: Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
    Stepping: 7
    CPU MHz: 1806.324
    CPU max MHz: 3200.0000
    CPU min MHz: 1000.0000
    BogoMIPS: 4800.00
    Virtualization: VT-x
    L1d cache: 32K
    L1i cache: 32K
    L2 cache: 1024K
    L3 cache: 14080K
    NUMA node0 CPU(s): 0-9,20-29
    NUMA node1 CPU(s): 10-19,30-39
    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
    xctr 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_l3
    invpcid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
    flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
    cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
    avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
    cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
    arch_capabilities

    /proc/cpuinfo cache data
    cache size : 14080 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 20 21 22 23 24 25 26 27 28 29

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.40 GHz, Intel Xeon Silver 4210R)

SPEC®2017 Floating Point Rate Result

| SPEC®2017_fp_base = 129 |
| SPEC®2017_fp_peak = Not Run |

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

Platform Notes (Continued)

node 0 size: 386662 MB
node 0 free: 385991 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 387067 MB
node 1 free: 386328 MB
node distances:
  node 0 1
  0: 10 21
  1: 21 10

From /proc/meminfo
  MemTotal: 792299224 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  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
  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 Jul 1 09:17

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.40 GHz, Intel Xeon Silver 4210R)

SPECrate®2017_fp_base = 129
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CPU2017 License: 9017
Test Date: Jul-2020
Test Sponsor: Lenovo Global Technology
Hardware Availability: Mar-2020
Tested by: Lenovo Global Technology
Software Availability: Apr-2020

Platform Notes (Continued)
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

This system support 12 DIMMs per processor, total 24 DIMMs.
24 DIMM slots installed with 32 GB DIMM for this run,
and running at 2400 due to CPU limitation.

Compiler Version Notes
==============================================================================
C                   | 519.lbm_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.
==============================================================================
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
(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.40 GHz, Intel Xeon Silver 4210R)

SPECraten®2017_fp_base = 129
SPECraten®2017_fp_peak = Not Run

Compiler Version Notes (Continued)

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.

------------------------------------------------------------------
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.
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.

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

(Continued on next page)
Lenovo Global Technology  
ThinkSystem SR650  
(2.40 GHz, Intel Xeon Silver 4210R)  

SPECrater®2017_fp_base = 129  
SPECrater®2017_fp_peak = Not Run

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

Base Compiler Invocation (Continued)

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.ibm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.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

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-W1,-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 -W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -fuse-ld.gold -xCORE-AVX2 -Ofast -ffast-math -flto

(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jul-2020
Hardware Availability: Mar-2020
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Software Availability: Apr-2020

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-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/jemalloc64-5.0.1.1/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 -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
-L/usr/local/jemalloc64-5.0.1.1/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/jemalloc64-5.0.1.1/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
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-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1.1/lib -ljemalloc

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-CLX-1.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-1.xml
**Lenovo Global Technology**

ThinkSystem SR650  
(2.40 GHz, Intel Xeon Silver 4210R)

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<td>Mar-2020</td>
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<td>Software Availability</td>
<td>Apr-2020</td>
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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2020-06-30 21:30:00-0400.
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