## Lenovo Global Technology

ThinkSystem SR650  
(2.20 GHz, Intel Xeon Silver 4214)

### SPEC® CPU2017 Floating Point Speed Result

<table>
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- **CPU2017 License:** 9017  
- **Test Date:** May-2019  
- **Test Sponsor:** Lenovo Global Technology  
- **Hardware Availability:** Apr-2019  
- **Tested by:** Lenovo Global Technology  
- **Software Availability:** Nov-2018

### Threads

<table>
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<tr>
<th>Benchmark</th>
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<tr>
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<td>24</td>
<td>103</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
<td>72.9</td>
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<tr>
<td>619.lbm_s</td>
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<td>96.3</td>
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<tr>
<td>621.wrf_s</td>
<td>24</td>
<td>56.9</td>
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<tr>
<td>627.cam4_s</td>
<td>24</td>
<td>58.7</td>
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<td>24</td>
<td>71.0</td>
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<tr>
<td>644.nab_s</td>
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<td>70.6</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>24</td>
<td>87.3</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Silver 4214  
- **Max MHz.:** 3200  
- **Nominal:** 2200  
- **Enabled:** 24 cores, 2 chips  
- **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:** 16.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)  
- **Storage:** 1 x 800 GB SATA SSD  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux Server release 7.6 (Maipo)  
- **Kernel:** 3.10.0-957.el7.x86_64  
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++; Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran; Compiler Build 20181018 for Linux  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version IVE135R 2.10 released Feb-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None
**Lenovo Global Technology**

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LENNOVO GLOBAL TECHNOLOGY  

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

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**SPECspeed2017_fp_base =** 93.8  
**SPECspeed2017_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"

**General Notes**

Environment variables set by runcpu before the start of the run:

- KMP_AFFINITY = "granularity=fine,compact"
- LD_LIBRARY_PATH = "../home/cpu2017-1.0.5-ic19.0u1/lib/intel64"
- OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.5  
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.  
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a)  
is mitigated in the system as tested and documented.  
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4)  
is mitigated in the system as tested and documented.
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  

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**Platform Notes**

- BIOS configuration:
  - Choose Operating Mode set to Maximum Performance
  - Choose Operating Mode set to Custom Mode
  - C-states set to Legacy
  - Hyper-Threading set to Disable
  - Adjacent Cache Prefetch set to Disable
  - Stale AtoS set to Enable

- Sysinfo program: `/home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo`
- Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
- running on localhost.localdomain Tue May 7 15:18:22 2019

**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 4214 CPU @ 2.20GHz
  - 2 "physical id"s (chips)
  - 24 "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: 12
    - siblings: 12
    - physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
    - physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

- **From lscpu:**
  - Architecture: x86_64
  - CPU op-mode(s): 32-bit, 64-bit
  - Byte Order: Little Endian
  - CPU(s): 24
  - On-line CPU(s) list: 0-23
  - Thread(s) per core: 1
  - Core(s) per socket: 12
  - Socket(s): 2
  - NUMA node(s): 2
  - Vendor ID: GenuineIntel
  - CPU family: 6
  - Model: 85
  - Model name: Intel(R) Xeon(R) Silver 4214 CPU @ 2.20GHz
  - Stepping: 6
  - CPU MHz: 2200.000
  - BogoMIPS: 4400.00
  - Virtualization: VT-x
  - L1d cache: 32K
  - L1i cache: 32K
  - L2 cache: 1024K

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(Continued on next page)
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**Test Date:** May-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Nov-2018

#### Platform Notes (Continued)

- L3 cache: 16896K
- NUMA node0 CPU(s): 0-11
- NUMA node1 CPU(s): 12-23
- 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 apic cpuid mce pxrt msr aperfmrperf eagerfpu epererf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pclid cdca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_l3 cdp_l3 intel_pt ssbd mba ibrs ibpb stibp ibrs_enabled tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust bm1 hle avx2 smep bmi2 erna invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_1llc cqm_mbm_total cqm_mbm_local dtherm ida arat pls pku ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

/proc/cpuinfo cache data  
- cache size : 16896 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  
- node 0 size: 196281 MB  
- node 0 free: 191536 MB  
- node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23  
- node 1 size: 196608 MB  
- node 1 free: 191853 MB  
- node distances:  
  - node 0 1  
  - 0: 10 21  
  - 1: 21 10

From /proc/meminfo  
- MemTotal: 395879800 kB  
- HugePages_Total: 0  
- Hugepagesize: 2048 kB

From /etc/*release*/ /etc/*version*  
- os-release:  
  - NAME="Red Hat Enterprise Linux Server"  
  - VERSION="7.6 (Maipo)"  
  - ID=rhel  
  - ID_LIKE="fedora"  
  - VARIANT="Server"  
  - VARIANT_ID="server"  
  - VERSION_ID="7.6"  
  - PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"

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Platform Notes (Continued)

redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
uname -a:
  Linux localhost.localdomain 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown):          Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS
run-level 3 May 7 15:13

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      xfs   689G   14G  676G   2% /home

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.
  BIOS Lenovo -[IVE135R-2.10]- 02/27/2019
  Memory:
    24x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

FC  607.cactuBSSN_s(base)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

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**Compiler Version Notes (Continued)**

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Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
```
icc -m64 -std=c11
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```
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**Base Portability Flags**

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.hm_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 byte-recl
- 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:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

**Fortran benchmarks:**
- -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -nostandard-realloc-lhs

**Benchmarks using both Fortran and C:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -nostandard-realloc-lhs

**Benchmarks using Fortran, C, and C++:**
- -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -nostandard-realloc-lhs

The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/Lenovo-PlatformSPECcpu2017-Flags-V1.2-CLX-A.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/Lenovo-PlatformSPECcpu2017-Flags-V1.2-CLX-A.xml
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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.5 on 2019-05-07 03:18:21-0400.
Originally published on 2019-05-29.