## SPEC® CPU2017 Floating Point Rate Result

**Lenovo Global Technology**

**ThinkSystem SR650**

(2.20 GHz, Intel Xeon Silver 4209T)

---

**SPECrate2017_fp_base** = 94.5

**SPECrate2017_fp_peak** = Not Run

---

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS: Red Hat Enterprise Linux Server release 7.6 (Maipo)</td>
<td>CPU Name: Intel Xeon Silver 4209T</td>
</tr>
<tr>
<td>Kernel 3.10.0-957.el7.x86_64</td>
<td>Max MHz.: 3200</td>
</tr>
<tr>
<td>Compiler: C/C++: Version 19.0.1.144 of Intel C/C++</td>
<td>Nominal: 2200</td>
</tr>
<tr>
<td>Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran</td>
<td>Enabled: 16 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Compiler Build 20181018 for Linux</td>
<td>Orderable: 1.2 chips</td>
</tr>
<tr>
<td>Parallel: No</td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Firmware: Lenovo BIOS Version IVE135R 2.10 released Feb-2019</td>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>File System: xfs</td>
<td>L3: 11 MB I+D on chip per chip</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td>Other: None</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td>Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)</td>
</tr>
<tr>
<td>Peak Pointers: Not Applicable</td>
<td>Storage: 1 x 800 GB SATA SSD</td>
</tr>
<tr>
<td>Other: None</td>
<td></td>
</tr>
</tbody>
</table>

---

| 503.bwaves_r | 32 |
| 507.cactuBSSN_r | 32 |
| 508.namd_r | 32 |
| 510.parest_r | 32 |
| 511.povray_r | 32 |
| 519.lbm_r | 32 |
| 521.wrf_r | 32 |
| 526.blender_r | 32 |
| 527.cam4_r | 32 |
| 538.imagick_r | 32 |
| 544.nab_r | 32 |
| 549.fotonik3d_r | 32 |
| 554.roms_r | 32 |

---

**Test Date:** May-2019

**Hardware Availability:** Apr-2019

**Software Availability:** Nov-2018

---

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Hardware**

- **CPU Name:** Intel Xeon Silver 4209T
- **Max MHz.:** 3200
- **Nominal:** 2200
- **Enabled:** 16 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:** 11 MB I+D on chip per chip
- **Other:** None
- **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 Server release 7.6 (Maipo)
- **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
- **Parallel:** No
- **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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(2.20 GHz, Intel Xeon Silver 4209T)

### SPECrate2017_fp_base = 94.5

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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>32</td>
<td>1018</td>
<td>315</td>
<td>1019</td>
<td>315</td>
<td>1019</td>
<td>315</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>32</td>
<td>578</td>
<td>70.1</td>
<td>578</td>
<td>70.0</td>
<td>579</td>
<td>69.9</td>
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<tr>
<td>508.namd_r</td>
<td>32</td>
<td>520</td>
<td>58.4</td>
<td>521</td>
<td>58.4</td>
<td>520</td>
<td>58.5</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>32</td>
<td>1421</td>
<td>58.9</td>
<td>1422</td>
<td>58.9</td>
<td>1425</td>
<td>58.7</td>
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<tr>
<td>511.povray_r</td>
<td>32</td>
<td>806</td>
<td>92.7</td>
<td>810</td>
<td>92.3</td>
<td>805</td>
<td>92.8</td>
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<tr>
<td>519.lbm_r</td>
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<td>514</td>
<td>65.7</td>
<td>512</td>
<td>65.9</td>
<td>513</td>
<td>65.7</td>
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<tr>
<td>521.wrf_r</td>
<td>32</td>
<td>647</td>
<td>111</td>
<td>652</td>
<td>110</td>
<td>643</td>
<td>111</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>32</td>
<td>565</td>
<td>86.3</td>
<td>564</td>
<td>86.4</td>
<td>563</td>
<td>86.6</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>32</td>
<td>643</td>
<td>87.1</td>
<td>645</td>
<td>86.8</td>
<td>646</td>
<td>86.6</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>32</td>
<td>462</td>
<td>172</td>
<td>452</td>
<td>176</td>
<td>451</td>
<td>177</td>
</tr>
<tr>
<td>544.nab_r</td>
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<td>129</td>
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<td>129</td>
<td>417</td>
<td>129</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>32</td>
<td>1182</td>
<td>105</td>
<td>1184</td>
<td>105</td>
<td>1187</td>
<td>105</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>32</td>
<td>975</td>
<td>52.1</td>
<td>978</td>
<td>52.0</td>
<td>978</td>
<td>52.0</td>
</tr>
</tbody>
</table>

### 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"

### General Notes

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

LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"

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

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.

(Continued on next page)
Lenovo Global Technology
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<thead>
<tr>
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<tr>
<td>SPECrate2017_fp_peak = Not Run</td>
</tr>
</tbody>
</table>

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

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C-states set to Legacy
DCU Streamer Prefetcher set to Disable
Trusted Execution Technology set to Enable
Stale AtoS set to Enable
LLC dead line alloc set to Disable
Patrol Scrub set to Disable
Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on localhost.localdomain Wed May  8 16:58:23 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 4209T CPU @ 2.20GHz
  2 "physical id"s (chips)
  32 "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 : 8
siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2

(Continued on next page)
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SPECratre2017_fp_base = 94.5
SPECratre2017_fp_peak = Not Run

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

Platform Notes (Continued)

Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4209T CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2200.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0-7,16-23
NUMA node1 CPU(s): 8-15,24-31
Flags: fpu vme de pse tsc msr pae 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 ntop tsc aperfmpref eagerfpu 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 rdrnd rdtscp ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vnni f16c rdrnd rdtscp ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vnni f16c rdrnd rdtscp ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vnni f16c rdrnd rdtscp ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm m

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.

From /proc/cpusinfo

cache size: 11264 KB

(Continued on next page)
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Platform Notes (Continued)

MemTotal: 792180320 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)"
    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 8 16:49

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1

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 M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)
Lenovo Global Technology
ThinkSystem SR650
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: May-2019
Hardware Availability: Apr-2019
Software Availability: Nov-2018

Compiler Version Notes

==============================================================================
CC  519.lbm_r(base) 538.imagick_r(base) 544.nab_r(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.
------------------------------------------------------------------------------

==============================================================================
CXXC 508.namd_r(base) 510.parest_r(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.
------------------------------------------------------------------------------

==============================================================================
CC  511.povray_r(base) 526.blender_r(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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FC  507.cactuBSSN_r(base)
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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.
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.
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.
------------------------------------------------------------------------------

==============================================================================
FC  503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Compiler Version Notes (Continued)

==============================================================================
CC  521.wrf_r(base) 527.cam4_r(base)
==============================================================================

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.
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.

Base Compiler Invocation

C benchmarks:
icc  -m64 -std=c11

C++ benchmarks:
icpc  -m64

Fortran benchmarks:
ifort  -m64

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

Benchmarks using both C and C++:
icpc  -m64 icc  -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc  -m64 icc  -m64 -std=c11 ifort  -m64

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

(Continued on next page)
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### 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:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4

**C++ benchmarks:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4

**Fortran benchmarks:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4  
  -auto  
  -nostandard-realloc-lhs  
  -align array32byte

**Benchmarks using both Fortran and C:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4  
  -auto  
  -nostandard-realloc-lhs  
  -align array32byte

**Benchmarks using both C and C++:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4

**Benchmarks using Fortran, C, and C++:**
- -xCORE-AVX2  
  -ipo  
  -O3  
  -no-prec-div  
  -qopt-prefetch  
  -ffinite-math-only  
  -qopt-mem-layout-trans=4  
  -auto  
  -nostandard-realloc-lhs  
  -align array32byte

---

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-A.html

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-A.xml
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