# SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology

ThinkSystem ST650 V2
(2.80 GHz, Intel Xeon Silver 4309Y)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>141</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS: Red Hat Enterprise Linux 8.3 (Ootpa) Kernel 4.18.0-240.el8.x86_64</td>
<td>CPU Name: Intel Xeon Silver 4309Y Max MHz: 3600 Nominal: 2800</td>
</tr>
<tr>
<td>Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux</td>
<td>Enabled: 16 cores, 2 chips Orderable: 1,2 chips</td>
</tr>
<tr>
<td>Parallel: No</td>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>Firmware: Lenovo BIOS Version U8E113E 1.10 released Aug-2021</td>
<td>L2: 1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>File System: xfs</td>
<td>L3: 12 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: 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)</td>
</tr>
<tr>
<td>Peak Pointers: Not Applicable</td>
<td>Storage: 1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
<td>Other: None</td>
</tr>
<tr>
<td>Power Management: BIOS and OS set to prefer performance at the cost of additional power usage</td>
<td></td>
</tr>
</tbody>
</table>

## Copies

| 503.bwaves_r | 16 | 16 |
| 507.cactuBSSN_r | 16 | 16 |
| 508.namd_r | 16 | 16 |
| 510.parest_r | 16 | 16 |
| 511.povray_r | 16 | 16 |
| 519.lbm_r | 16 | 16 |
| 521.wrf_r | 16 | 16 |
| 526.blender_r | 16 | 16 |
| 527.cam4_r | 16 | 16 |
| 538.imagick_r | 16 | 16 |
| 544.nab_r | 16 | 16 |
| 549.fotonik3d_r | 16 | 16 |
| 554.roms_r | 16 | 16 |
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ThinkSystem ST650 V2  
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**SPECrate®2017_fp_base = 141**  
**SPECrate®2017_fp_peak = Not Run**

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### Results Table

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</tbody>
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### 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/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202
1.1-revB/je5.0.1-64"
MALLOCONF = "retain:true"
```

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1. Transparent Huge Pages enabled by default.

(Continued on next page)
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SPECrater®2017_fp_base = 141
SPECrater®2017_fp_peak = Not Run

CPU2017 License: 9017  
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Software Availability: Dec-2020

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
Hyper-Threading set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Mon Sep 6 18:05:04 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) Silver 4309Y CPU @ 2.80GHz
    2 "physical id"s (chips)
    16 "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: 8
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7

From lscpu from util-linux 2.32.1:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 16
  On-line CPU(s) list: 0-15

(Continued on next page)
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| SPECrate®2017fp_base = 141 | Test Date: Sep-2021 |
| SPECrate®2017fp_peak = Not Run | Hardware Availability: Jul-2021 |

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**Platform Notes (Continued)**

Thread(s) per core: 1  
Core(s) per socket: 8  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 106  
Model name: Intel(R) Xeon(R) Silver 4309Y CPU @ 2.80GHz  
Stepping: 6  
CPU MHz: 3400.000  
BogoMIPS: 5600.00  
Virtualization: VT-x  
L1d cache: 48K  
L1i cache: 32K  
L2 cache: 1280K  
L3 cache: 12288K  
NUMA node0 CPU(s): 0-7  
NUMA node0 CPU(s): 8-15  
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 aperfmpref pni pclmulqdq dtes64 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 avx1 avx2 rdtsc abm smm svm xSaving vmob tsc_adjust fmmul_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pmm ssbd mba ibpb ibrs ibrs_enhanced tpr_shadow vmx flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xcenceopt xsaved xgetbv1 xsaves cqm_12c cqm_occup_11c cqm_mbb_total cqm_global cqm_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512vbm umip pku ospe avx512_vbmi2 gfn i vaes vpcimulq dq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data  

cache size: 12288 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  
node 0 size: 510970 MB  
node 0 free: 515101 MB  
node 1 cpus: 8 9 10 11 12 13 14 15  
node 1 size: 511660 MB  
node 1 free: 515386 MB  
node distances:  
node 0: 0 1  
0: 10 20

(Continued on next page)
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SPECrates®
SPECrates®
SPEC CPU 2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

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CPU2017 License: 9017
Platform Notes (Continued)

1: 20 10

From /proc/meminfo
MemTotal: 1056499120 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: balanced

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga
uname -a:
Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
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 Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swaps barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Sep 6 18:02

(Continued on next page)
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SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda4      xfs   818G  108G  710G  14% /home

From /sys/devices/virtual/dmi/id
Vendor:         Lenovo
Product:        ThinkSystem ST650V2
Product Family: ThinkSystem
Serial:         1234567890

Memory:         32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor:    Lenovo
BIOS Version:   U8E113E-1.10
BIOS Date:      08/31/2021
BIOS Revision:  1.10
Firmware Revision: 1.41

(End of data from sysinfo program)

Compiler Version Notes
==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================
C++             | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
(Continued on next page)
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### Compiler Version Notes (Continued)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113  
Copyright (C) 1985–2020 Intel Corporation. All rights reserved.

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.

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### Base Compiler Invocation

C benchmarks:

```c
icx
```

(Continued on next page)
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**Base Compiler Invocation (Continued)**

**C++ benchmarks:**
- icpx

**Fortran benchmarks:**
- ifort

**Benchmarks using both Fortran and C:**
- ifort icx

**Benchmarks using both C and C++:**
- icpx icx

**Benchmarks using Fortran, C, and C++:**
- icpx icx 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
- 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:**
- -w -std=gnu11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
- -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -mbranch-inside-32B-boundaries -ljemalloc
- -L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST650 V2
(2.80 GHz, Intel Xeon Silver 4309Y)

SPECrade®2017_fp_base = 141
SPECrade®2017_fp_peak = Not Run

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

Base Optimization Flags (Continued)

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -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 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-nostandard-realloc-lhs
-align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

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-ICElake-F.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-ICElake-F.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
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