# SPEC CPU®2017 Floating Point Rate Result

## Lenovo Global Technology
ThinkSystem SR650
(3.40 GHz, Intel Xeon Gold 6246R)

<table>
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<th>CPU2017 License:</th>
<th>Lenovo Global Technology</th>
<th>Test Date:</th>
<th>Jul-2020</th>
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<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
<td>Hardware Availability:</td>
<td>Mar-2020</td>
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<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
<td>Software Availability:</td>
<td>Apr-2020</td>
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### SPECrate®2017_fp_base = 247
SPECrate®2017_fp_peak = Not Run

### Hardware

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<th>Copies</th>
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<td>507.cactuBSSN_r</td>
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<td>152</td>
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<td>510.parest_r</td>
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<td>511.povray_r</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
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<td>538.imagick_r</td>
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<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
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</tbody>
</table>

### Software

**OS:**
SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default

**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

---

**CPU Name:**
Intel Xeon Gold 6246R

**Max MHz:**
4100

**Nominal:**
3400

**Enabled:**
32 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:**
35.75 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

---

## Lenovo Global Technology

**ThinkSystem SR650**

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**Hardware**

- **CPU Name:** Intel Xeon Gold 6246R
- **Max MHz:** 4100
- **Nominal:** 3400
- **Enabled:** 32 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:** 35.75 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

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- **OS:** SUSE Linux Enterprise Server 15 SP1 (x86_64)
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Lenovo Global Technology
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(3.40 GHz, Intel Xeon Gold 6246R)

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

SPECr\textsuperscript{a}te\textsuperscript{\circ} 2017\textsuperscript{-}fp\textsuperscript{\_}base = 247
SPECr\textsuperscript{a}te\textsuperscript{\circ} 2017\textsuperscript{-}fp\textsuperscript{\_}peak = Not Run

Test Date: Jul-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Results Table

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</table>

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: 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:
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"
MALLOCC\_CONF = "retain:true"
### Lenovo Global Technology

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<tbody>
<tr>
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<td>Not Run</td>
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**General Notes**

- Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
- 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.


**Platform Notes**

- BIOS configuration:
  - Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
  - C-States set to Legacy
  - SNC set to Enable
- Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
  - Rev: r6365 of 2019-08-21 295195f888a3d7edbl1e6e46a485a0011
  - running on linux-xpyz Thu Jul 16 02:28:23 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 6246R CPU @ 3.40GHz
  - 2 "physical id"s (chips)
  - 64 "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 : 16
    - siblings : 32
    - physical 0: cores 1 2 3 5 6 9 10 12 13 16 18 20 21 24 27 29
    - physical 1: cores 1 2 3 6 9 12 13 16 17 18 19 20 21 26 27 29
- From lscpu:
  - Architecture: x86_64

(Continued on next page)
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</tbody>
</table>

### Platform Notes (Continued)

- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **Address sizes:** 46 bits physical, 48 bits virtual
- **CPU(s):** 64
- **On-line CPU(s) list:** 0-63
- **Thread(s) per core:** 2
- **Core(s) per socket:** 16
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
- **Stepping:** 7
- **CPU MHz:** 3400.000
- **CPU max MHz:** 4100.0000
- **CPU min MHz:** 1200.0000
- **BogoMIPS:** 6800.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 36608K
- **NUMA node0 CPU(s):** 0-2, 5, 6, 9, 10, 13, 32-34, 37, 38, 41, 42, 45
- **NUMA node1 CPU(s):** 3, 4, 7, 8, 11, 12, 14, 15, 35, 36, 39, 40, 43, 44, 46, 47
- **NUMA node2 CPU(s):** 16-18, 20, 23-25, 29, 48-50, 52, 55-57, 61
- **NUMA node3 CPU(s):** 19, 21, 22, 26-28, 30, 31, 51, 53, 54, 58-60, 62, 63
- **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 pdemems 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 xtrr 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 invvpcl_single intel_pni ssbd mba ibrs ibpb stibp ibrs_enable_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 xsaves xsavec xsavec qemucc qemuc copl llc qemum_mrbq qemum_mrbm_total qemum_mrbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

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 5 6 9 10 13 32 33 34 37 38 41 42 45

---

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECraten®2017_fp_base = 247
SPECraten®2017_fp_peak = Not Run
Lenovo Global Technology
ThinkSystem SR650
(3.40 GHz, Intel Xeon Gold 6246R)

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

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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

Platform Notes (Continued)

node 0 size: 193151 MB
node 0 free: 192880 MB
node 1 cpus: 3 4 7 8 11 12 14 15 35 36 39 40 43 44 46 47
node 1 size: 193503 MB
node 1 free: 19197 MB
node 2 cpus: 16 17 18 20 23 24 25 29 48 49 50 52 55 56 57 61
node 2 size: 193532 MB
node 2 free: 193087 MB
node 3 cpus: 19 21 22 26 27 28 30 31 51 53 54 58 59 60 62 63
node 3 size: 193531 MB
node 3 free: 193226 MB
node distances:
node 0 1 2 3
0: 10 11 21 21
1: 11 10 21 21
2: 21 21 10 11
3: 21 21 11 10

From /proc/meminfo
MemTotal: 792289276 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
  NAME="SLES"
  VERSION="15-SP1"
  VERSION_ID="15.1"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-xpyz 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional,

(Continued on next page)
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Platform Notes (Continued)

RSB filling

run-level 3 Jul 16 02:25

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

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda3      xfs   737G   63G  675G   9% /

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 sysinfo program)

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

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Compiler Version Notes (Continued)

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.

---

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.

---

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.

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Base Compiler Invocation

C benchmarks:
icc

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

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.libm_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
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xcORE-AVX512 -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

(Continued on next page)
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Base Optimization Flags (Continued)

C++ benchmarks (continued):
- -Wl, -z, multidefs -fuse-ld=gold -xCORE-AVX512 -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, multidefs
- -fuse-ld=gold -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
- -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, multidefs
- -fuse-ld=gold -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
- -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, multidefs
- -fuse-ld=gold -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
- -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, multidefs
- -fuse-ld=gold -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
- -L/usr/local/jemalloc64-5.0.1/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-I.html
### Lenovo Global Technology

**ThinkSystem SR650**  
(3.40 GHz, Intel Xeon Gold 6246R)

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**Tested by:** Lenovo Global Technology

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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](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml)

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