## CPU2017 Floating Point Rate Result

**Lenovo Global Technology**

**ThinkSystem SR630 V2**

(2.30 GHz, Intel Xeon Silver 4316)

---

**SPECrates**:  
SPECrates\textsuperscript{\textregistered}2017\textsubscript{fp}\_base = 289  
SPECrates\textsuperscript{\textregistered}2017\textsubscript{fp}\_peak = Not Run

---

**Copy**

<table>
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<th>Copies</th>
<th>SPECrate\textsuperscript{\textregistered}2017\textsubscript{fp}</th>
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<tr>
<td>503.bwaves_r</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>508.namd_r</td>
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<tr>
<td>510.parest_r</td>
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<td>511.povray_r</td>
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<tr>
<td>519.lbm_r</td>
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<tr>
<td>521.wrf_r</td>
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<td>80</td>
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<tr>
<td>526.blender_r</td>
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</tr>
<tr>
<td>554.roms_r</td>
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</tr>
</tbody>
</table>

---

**Hardware**

- **CPU Name**: Intel Xeon Silver 4316  
- **Max MHz**: 3400  
- **Nominal**: 2300  
- **Enabled**: 40 cores, 2 chips, 2 threads/core  
- **Orderable**: 1,2 chips  
- **Cache L1**: 32 KB I + 48 KB D on chip per core  
- **L2**: 1.25 MB I+D on chip per core  
- **L3**: 30 MB I+D on chip per chip  
- **Memory**: 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
- **Storage**: 1 x 960 GB SATA SSD  
- **Other**: None

---

**Software**

- **OS**: SUSE Linux Enterprise Server 15 SP2 (x86\_64)  
  Kernel 5.3.18-22-default  
- **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  
- **Parallel**: No  
- **Firmware**: Lenovo BIOS Version AFE111A 1.02 released May-2021  
- **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 and OS set to prefer performance at the cost of additional power usage
### Results Table

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<td>1012</td>
<td>126</td>
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</tbody>
</table>

**SPECrate®2017_fp_base = 289**

**SPECrate®2017_fp_peak = Not Run**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

---

**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 = 
MALLOCONF = "retain:true"
```

---

**General Notes**

Binaries compiled on a system with 1x Intel Core i9-7940X CPU + 64GB RAM memory using openSUSE Leap 15.2. Transparent Huge Pages enabled by default.
Lenovo Global Technology
ThinkSystem SR630 V2
(2.30 GHz, Intel Xeon Silver 4316)

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

SPECrates® 2017_fp_base = 289
SPECrates® 2017_fp_peak = Not Run

Test Date: Jul-2021
Hardware Availability: Jul-2021
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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
Intel Virtualization Technology set to Disabled
SNC set to Enabled
XPT Prefetcher set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revA-update1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost Tue Jul 6 01:58:15 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 4316 CPU @ 2.30GHz
 2 "physical id"s (chips)
 80 "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 : 20
siblings : 40
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

From lscpu from util-linux 2.33.1:
 Architecture: x86_64
 CPU op-mode(s): 32-bit, 64-bit

(Continued on next page)
## Lenovo Global Technology

ThinkSystem SR630 V2
(2.30 GHz, Intel Xeon Silver 4316)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>289</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
<td>Not Run</td>
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</table>

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

<table>
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<th>Jul-2021</th>
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</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2020</td>
</tr>
</tbody>
</table>

**Tested by:** Lenovo Global Technology

### Platform Notes (Continued)

- **Byte Order:** Little Endian
- **Address sizes:** 46 bits physical, 57 bits virtual
- **CPU(s):** 80
- **On-line CPU(s) list:** 0-79
- **Thread(s) per core:** 2
- **Core(s) per socket:** 20
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
- **Stepping:** 6
- **CPU MHz:** 2800.134
- **BogoMIPS:** 4600.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 30720K
- **NUMA node0 CPU(s):** 0-9,40-49
- **NUMA node1 CPU(s):** 10-19,50-59
- **NUMA node2 CPU(s):** 20-29,60-69
- **NUMA node3 CPU(s):** 30-39,70-79

**Flags:**  
```
fpu vme de pse ts cmov 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 rdtsscp
lm constant tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop tsc cpuid
aperfmpref 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 rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single ssbd
mqa ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
fsasbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f
avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni
avx512bw avx512vl xsaveopt xsavec xsavec xsavec xsaves cqm_llc cqm_occupy llc cqm_mbb_total
avx512_vfma212fp avx512_vfma212fs vpid avx512_vpopcntdq la57 rdrpid md_clear pconfig flush_l1d arch_capabilities
```

From numactl --hardware

**WARNING:** a numactl 'node' might or might not correspond to a physical chip.

<table>
<thead>
<tr>
<th>node</th>
<th>cpus:</th>
<th>size:</th>
<th>free:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 1 2 3 4 5 6 7 8 9 40 41 42 43 44 45 46 47 48 49</td>
<td>257633 MB</td>
<td>257307 MB</td>
</tr>
</tbody>
</table>
### Platform Notes (Continued)

```
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 50 51 52 53 54 55 56 57 58 59
node 1 size: 258043 MB
node 1 free: 257702 MB
node 2 cpus: 20 21 22 23 24 25 26 27 28 29 60 61 62 63 64 65 66 67 68 69
node 2 size: 258009 MB
node 2 free: 257625 MB
node 3 cpus: 30 31 32 33 34 35 36 37 38 39 70 71 72 73 74 75 76 77 78 79
node 3 size: 258039 MB
node 3 free: 257779 MB
node distances:
  node 0 1 2 3
  0: 10 11 20 20
  1: 11 10 20 20
  2: 20 20 10 11
  3: 20 20 11 10
```

From `/proc/meminfo`
- MemTotal: 1056487060 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

```
/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 15 SP2
```

```
From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP2"
    VERSION_ID="15.2"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15:sp2"
```

```
uname -a:
Linux localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) 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): Not affected
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V2
(2.30 GHz, Intel Xeon Silver 4316)

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

SPECratenumber = 289
SPECratenumber = Not Run

Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1):
Mitigation: usercopy/swapgs barriers and __user pointer sanitation

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Not affected

CVE-2019-11135 (TSX Asynchronous Abort):
Not affected

run-level 3 Jul 6 01:56

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revA-update1

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<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
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</thead>
<tbody>
<tr>
<td>/dev/sdc3</td>
<td>xfs</td>
<td>891G</td>
<td>33G</td>
<td>858G</td>
<td>4%</td>
<td>/</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR630 V2 MB
Product Family: ThinkSystem
Serial: 1234567890

Additional information from dmidecode 3.2 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:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: Lenovo
BIOS Version: AFE111A-1.02
BIOS Date: 05/07/2021
BIOS Revision: 1.2
Firmware Revision: 1.10

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| C               | 519.ibm_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.             |
==============================================================================

(Continued on next page)
### Compiler Version Notes (Continued)

<table>
<thead>
<tr>
<th>Language</th>
<th>Application</th>
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<tbody>
<tr>
<td>C++</td>
<td>508.namd_r(base) 510.parest_r(base)</td>
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</tbody>
</table>

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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<td>511.povray_r(base) 526.blender_r(base)</td>
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<table>
<thead>
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<tr>
<td>C++, C, Fortran</td>
<td>507.cactuBSSN_r(base)</td>
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<td>Fortran</td>
<td>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</td>
</tr>
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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<td>Fortran, C</td>
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V2
(2.30 GHz, Intel Xeon Silver 4316)

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

SPECrater®2017_fp_base = 289
SPECrater®2017_fp_peak = Not Run

Copyright 2017-2021 Standard Performance Evaluation Corporation

Base Compiler Invocation

C benchmarks:
icx

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.llvm_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

Compiler Version Notes (Continued)

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Intel (R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
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--------------------------------------------------------------------------------
# Lenovo Global Technology

**ThinkSystem SR630 V2**  
(2.30 GHz, Intel Xeon Silver 4316)

<table>
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<td>Lenovo Global Technology</td>
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<td>Tested by:</td>
<td>Lenovo Global Technology</td>
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<tr>
<td>Test Date:</td>
<td>Jul-2021</td>
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<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2020</td>
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</tbody>
</table>

## Base Optimization Flags

### C benchmarks:
- `-w` `-std=c11` `-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`

### 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`
- `-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`
- `-mbranches-within-32B-boundaries` `-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`
- `-flto` `-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`
- `-flto` `-mfpmath=sse` `-funroll-loops` `-qopt-mem-layout-trans=4` `-O3`
- `-no-prec-div` `-qopt-prefetch` `-ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles`
- `-mbranches-within-32B-boundaries` `-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:

# Lenovo Global Technology

**ThinkSystem SR630 V2** *(2.30 GHz, Intel Xeon Silver 4316)*

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**Test Sponsor:** Lenovo Global Technology  
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**Test Date:** Jul-2021  
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You can also download the XML flags sources by saving the following links:


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