Lenovo Global Technology
ThinkSystem SR630 V3
(2.90 GHz, Intel Xeon Gold 5415+)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
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<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
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<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Jan-2023</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Feb-2023</td>
</tr>
<tr>
<td>Software Availability:</td>
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| SPECrate®2017_fp_base = | 246 |
| SPECrate®2017_fp_peak = | Not Run |

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<tr>
<td>507.cactuBSSN_r</td>
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<tr>
<td>508.namd_r</td>
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<tr>
<td>510.parest_r</td>
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<tr>
<td>511.povray_r</td>
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<td>519.lbm_r</td>
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<td>521.wrf_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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### Hardware

<table>
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<tr>
<th>CPU Name:</th>
<th>Intel Xeon Gold 5415+</th>
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<tbody>
<tr>
<td>Max MHz:</td>
<td>4100</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2900</td>
</tr>
<tr>
<td>Enabled:</td>
<td>16 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1,2 chips</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>2 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>22.5 MB I+D on chip per chip</td>
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<td>Other:</td>
<td>None</td>
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<tr>
<td>Memory:</td>
<td>512 GB (16 x 32 GB 2Rx8 PC5-4800B-R, running at 4400)</td>
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<tr>
<td>Storage:</td>
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<td>Other:</td>
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### Software

<table>
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<tr>
<th>OS:</th>
<th>SUSE Linux Enterprise Server 15 SP4 (x86_64)</th>
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<tr>
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<td>C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;</td>
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<tr>
<td>File System:</td>
<td>xfs</td>
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<td>System State:</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Peak Pointers:</td>
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<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
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Lenovo Global Technology
ThinkSystem SR630 V3
(2.90 GHz, Intel Xeon Gold 5415+)

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

Results Table

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</tbody>
</table>

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 = "/home/cpu2017-1.1.8-ic2022.1/lib/intel64:/home/cpu2017-1.1.8-ic2022.1/j
e5.0.1-64"
MALLOCP_CONF = "retain:true"

General Notes
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4 Transparent Huge Pages enabled by default

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V3
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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
SNC set to SNC2
LLC Prefetch set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2022.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost Mon Jan 16 18:13:03 2023

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 5415+
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 /usr/bin/lscpu
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 46 bits physical, 57 bits virtual
Byte Order: Little Endian

(Continued on next page)
Lenovo Global Technology

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<tr>
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<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

**SPECrate®2017_fp_base = 246**
**SPECrate®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

- CPU(s): 32
- On-line CPU(s) list: 0-31
- Vendor ID: GenuineIntel
- Model name: Intel(R) Xeon(R) Gold 5415+
- CPU family: 6
- Model: 143
- Thread(s) per core: 2
- Core(s) per socket: 8
- Socket(s): 2
- Stepping: 8
- BogoMIPS: 5800.00
- 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 arch_perfmon pebs bts rep_good nopl x86tol xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq 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 f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3 invpcid_single intel_pni cdg_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmflex priority ept vpid ept_ad fsgsbase tsc_adjust bmi hle avx2 smep bmi2 3rms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsave xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect avx_vnni avx512 bf16 wbnoinvd dtherm ida arat pln pts avx512vbmi umip kpu ospke waiptkg avx512v2mi2 gfdi vaes vpcmldqavx512_vni avx512bitalg tme avx512 vpoptcntdq la57 rdpid bus_lock_detect cldemote movdir1 movdir64b enqcmd fasm md_clear serialize tsxldtrk pconfi arch_lbr avx512_fp16 amx_tilie flush_l1d arch_capabilities
- Virtualization: VT-x
- L1d cache: 768 KiB (16 instances)
- L1i cache: 512 KiB (16 instances)
- L2 cache: 32 MiB (16 instances)
- L3 cache: 45 MiB (2 instances)
- NUMA node(s): 4
- NUMA node0 CPU(s): 0-3,16-19
- NUMA node1 CPU(s): 4-7,20-23
- NUMA node2 CPU(s): 8-11,24-27
- NUMA node3 CPU(s): 12-15,28-31
- Vulnerability Itlb multihit: Not affected
- Vulnerability L1tf: Not affected
- Vulnerability Mds: Not affected
- Vulnerability Meltdown: Not affected
- Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
- Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
- Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V3
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECrade®2017_fp_base = 246
SPECrade®2017_fp_peak = Not Run

Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Jun-2022

Platform Notes (Continued)

Vulnerability Srbds: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 768K 12 Data 1 64 1 64
L1i 32K 512K 8 Instruction 1 64 1 64
L2 2M 32M 16 Unified 2 2048 1 64
L3 22.5M 45M 15 Unified 3 24576 1 64

/proc/cpuinfo cache data
cache size : 23040 KB

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 3 16 17 18 19
node 0 size: 128685 MB
node 0 free: 128086 MB
node 1 cpus: 4 5 6 7 20 21 22 23
node 1 size: 129021 MB
node 1 free: 128783 MB
node 2 cpus: 8 9 10 11 24 25 26 27
node 2 size: 129021 MB
node 2 free: 128776 MB
node 3 cpus: 12 13 14 15 28 29 30 31
node 3 size: 128967 MB
node 3 free: 128712 MB
node distances:
node 0 1 2 3
0: 10 12 21 21
1: 12 10 21 21
2: 21 21 10 12
3: 21 21 12 10

From /proc/meminfo
MemTotal: 528073604 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP4"
VERSION_ID="15.4"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
ID="sles"

(Continued on next page)
### Platform Notes (Continued)

```
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp4"
```

```
uname -a:
Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
UTC 2022 (49db222) 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 `seccomp`
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: usercopy/swapgs barriers and `__user` pointer sanitization
- **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

```
runt-level 3 Jan 16 18:11
```

```
SPEC is set to: /home/cpu2017-1.1.8-ic2022.1
```

```
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      xfs   894G   25G  870G   3% /
```

From `/sys/devices/virtual/dmi/id`

- **Vendor:** Lenovo
- **Product:** ThinkSystem SR630 V3 MB,EGS,DDR5,NY,1U
- **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:**
  - 2x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800, configured at 4400
  - 14x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800, configured at 4400

- **BIOS:**
  - **BIOS Vendor:** Lenovo

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**SPECratre®2017_fp_base = 246**

**SPECratre®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

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<tr>
<td>BIOS Revision:</td>
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<tr>
<td>Firmware Revision:</td>
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(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 2022.1.0 Build 20220316
Copyright (C) 1985-2022 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 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
```

```
C++, C | 511.povray_r(base) 526.blender_r(base)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
```

```
C++, C, Fortran | 507.cactuBSSN_r(base)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
```
Lenovo Global Technology
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SPECratenet®2017_fp_base = 246
SPECratenet®2017_fp_peak = Not Run

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

Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Jun-2022

Compiler Version Notes (Continued)

2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

==============================================================================
Fortran         | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
-----------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
-----------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifix

Benchmarks using both Fortran and C:
ifix icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx
### 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.lbmr: -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.fotonik3d_r: -DSPEC_LP64
- 549.roms_r: -DSPEC_LP64

### 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 -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 -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

**Fortran benchmarks:**
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte -auto -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`
- `-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 -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

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(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V3
(2.90 GHz, Intel Xeon Gold 5415+)

**SPECrate®2017_fp_base = 246**
**SPECrate®2017_fp_peak = Not Run**

**CPU2017 License:** 9017  
**Test Date:** Jan-2023  
**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** Feb-2023  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Jun-2022

### Base Optimization Flags (Continued)

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`  
- `-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:


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