## Lenovo Global Technology

**ThinkSystem SR850P**  
**(2.70 GHz, Intel Xeon Gold 5220S)**

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

### SPECspeed®2017_fp_base = 162

**SPECspeed®2017_fp_peak = Not Run**

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (162)</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>72</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>72</td>
</tr>
<tr>
<td>619.lbm_s</td>
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<tr>
<td>621.wrf_s</td>
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<tr>
<td>627.cam4_s</td>
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<tr>
<td>628.pop2_s</td>
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<tr>
<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>72</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>72</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 5220S  
- **Max MHz:** 3900  
- **Nominal:** 2700  
- **Enabled:** 72 cores, 4 chips  
- **Orderable:** 4 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 1 MB I+D on chip per core  
- **L3:** 24.75 MB I+D on chip per chip  
- **Memory:** 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP1 (x86_64)  
- **Kernel:** 4.12.14-195-default  
- **Compiler:** C/C++: Version 19.0.5.281 of Intel C/C++  
- **Compiler for Linux:** Compiler for Linux; Fortran: Version 19.0.5.281 of Intel Fortran  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version TEE156L 2.61 released May-2020  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

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SPECspeed®2017_fp_base = 162
SPECspeed®2017_fp_peak = Not Run

Test Date: Dec-2020
Hardware Availability: Jun-2020
Software Availability: Sep-2019

Results Table

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</table>

SPECspeed®2017_fp_base = 162
SPECspeed®2017_fp_peak = Not Run

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

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.0u5-2/lib/intel64"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
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
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.
Lenovo Global Technology
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(2.70 GHz, Intel Xeon Gold 5220S)

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enable
Hyper-Threading set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5-2/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1b1e6e46a485a0011
running on linux-z1c1 Wed Dec 9 23:03:02 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 5220S CPU @ 2.70GHz
    4 "physical id"s (chips)
    72 "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 : 18
    siblings : 18
    physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
    physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:

    Architecture: x86_64
    CPU op-mode(s): 32-bit, 64-bit
    Byte Order: Little Endian
    Address sizes: 46 bits physical, 48 bits virtual
    CPU(s): 72
    On-line CPU(s) list: 0-71
    Thread(s) per core: 1
    Core(s) per socket: 18
    Socket(s): 4
    NUMA node(s): 4
    Vendor ID: GenuineIntel
    CPU family: 6
    Model: 85
    Model name: Intel(R) Xeon(R) Gold 5220S CPU @ 2.70GHz
    Stepping: 7
    CPU MHz: 2700.000
    CPU max MHz: 3900.0000
    CPU min MHz: 1000.0000
    BogoMIPS: 5400.00
    Virtualization: VT-x

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**

**Lenovo Global Technology**

**ThinkSystem SR850P**

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

**Platform Notes (Continued)**

- **L1d cache:** 32K  
- **L1i cache:** 32K  
- **L2 cache:** 1024K  
- **L3 cache:** 25344K  
- **NUMA node0 CPU(s):** 0-17  
- **NUMA node1 CPU(s):** 18-35  
- **NUMA node2 CPU(s):** 36-53  
- **NUMA node3 CPU(s):** 54-71  
- **Flags:** fpu vme de pse tsc msr pae mce 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 aperfmperf pni pclmulqdq dts64 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 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_ppin ssbd mba ibrs ibpb ibrs_enhanced 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 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data  
**cache size :** 25344 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 4 5 6 7 8 9 10 11 12 13 14 15 16 17  
**node 0 size:** 386684 MB  
**node 0 free:** 386134 MB  
**node 1 cpus:** 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35  
**node 1 size:** 387068 MB  
**node 1 free:** 386786 MB  
**node 2 cpus:** 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53  
**node 2 size:** 387068 MB  
**node 2 free:** 386876 MB  
**node 3 cpus:** 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71  
**node 3 size:** 387037 MB  
**node 3 free:** 386700 MB  
**node distances:**  
**node 0 1 2 3**  
0: 10 21 21 31  
1: 21 10 31 21  
2: 21 31 10 21  
3: 31 21 21 10  

From `/proc/meminfo`

(Continued on next page)
Lenovo Global Technology

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SPECspeed®2017_fp_base = 162
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

MemTotal: 1585007584 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-z1c1 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,
    RSB filling

run-level 3 Dec 9 22:58

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5-2
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb3 xfs 892G 30G 863G 4% /

From /sys/devices/virtual/dmi/id
    BIOS: Lenovo -[TEE156L-2.61]- 05/20/2020
    Vendor: Lenovo
    Product: ThinkSystem SR850P -[7D2HCTO1WW]-
    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.
Platform Notes (Continued)

Memory:
48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
Memory on this system run at 2666 MHz due to CPU limitation.

Compiler Version Notes

C

| 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base) |

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++, C, Fortran | 607.cactuBSSN_s(base)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran

| 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base) |

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran, C

| 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base) |

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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(Continued on next page)
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**Compiler Version Notes (Continued)**

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### Base Compiler Invocation

**C benchmarks:**

- `icc`

**Fortran benchmarks:**

- `ifort`

**Benchmarks using both Fortran and C:**

- `ifort icc`

**Benchmarks using Fortran, C, and C++:**

- `icpc icc ifort`

---

### Base Portability Flags

- `603.bwaves_s: -DSPEC_LP64`
- `607.cactuBSSN_s: -DSPEC_LP64`
- `619.lbm_s: -DSPEC_LP64`
- `621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
- `627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl`
- `638.imagick_s: -DSPEC_LP64`
- `644.nab_s: -DSPEC_LP64`
- `649.fotonik3d_s: -DSPEC_LP64`
- `654.roms_s: -DSPEC_LP64`

---

### Base Optimization Flags

**C benchmarks:**

- `-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

**Fortran benchmarks:**

- `-m64 -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs`

(Continued on next page)
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<td>Software Availability: Sep-2019</td>
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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
```

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:

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