# Lenovo Global Technology

**ThinkSystem SR850P**  
(2.20 GHz, Intel Xeon Gold 5220)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>11.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_int_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Dec-2020</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jun-2020</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Aug-2020</td>
</tr>
</tbody>
</table>

### Threads

<table>
<thead>
<tr>
<th>Thread</th>
<th>SPECspeed®2017_int_base (11.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perbench_s</td>
<td>6.72</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>9.57</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>17.5</td>
</tr>
<tr>
<td>620.ommpp_s</td>
<td>9.76</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>13.7</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>15.7</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>5.70</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>4.82</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>16.5</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>23.4</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 5220  
  - **Max MHz:** 3900  
  - **Nominal:** 2200  
  - **Enabled:** 72 cores, 4 chips  
  - **Orderable:** 4 chips  
  - **Cache L1:** 32 KB I + 32 KB D on chip per core  
  - **Cache L2:** 1 MB I+D on chip per core  
  - **Cache L3:** 24.75 MB I+D on chip per chip  
  - **Other:** None  
- **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:** Red Hat Enterprise Linux 8.0 (Ootpa)  
  - **Kernel:** 4.18.0-80.el8.x86_64  
- **Compiler:** C/C++: Version 19.1.2.275 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.2.275 of Intel Fortran Compiler for Linux  
- **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:** jemalloc memory allocator V5.0.1  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
SPEC CPU®2017 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR850P
(2.20 GHz, Intel Xeon Gold 5220)

SPECSpeed®2017_int_base = 11.0
SPECSpeed®2017_int_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>72</td>
<td>264</td>
<td>6.72</td>
<td>264</td>
<td>6.72</td>
<td>266</td>
<td>6.68</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>72</td>
<td>413</td>
<td>9.64</td>
<td>420</td>
<td>9.49</td>
<td>416</td>
<td>9.57</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>72</td>
<td>270</td>
<td>17.5</td>
<td>270</td>
<td>17.5</td>
<td>270</td>
<td>17.5</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>72</td>
<td>168</td>
<td>9.72</td>
<td>166</td>
<td>9.82</td>
<td>167</td>
<td>9.76</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>72</td>
<td>104</td>
<td>13.7</td>
<td>103</td>
<td>13.8</td>
<td>103</td>
<td>13.7</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>72</td>
<td>112</td>
<td>15.7</td>
<td>112</td>
<td>15.8</td>
<td>112</td>
<td>15.7</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>72</td>
<td>251</td>
<td>5.70</td>
<td>252</td>
<td>5.70</td>
<td>252</td>
<td>5.70</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>72</td>
<td>354</td>
<td>4.82</td>
<td>354</td>
<td>4.82</td>
<td>354</td>
<td>4.82</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>72</td>
<td>178</td>
<td>16.5</td>
<td>179</td>
<td>16.4</td>
<td>178</td>
<td>16.5</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>72</td>
<td>264</td>
<td>23.4</td>
<td>268</td>
<td>23.1</td>
<td>264</td>
<td>23.4</td>
</tr>
</tbody>
</table>

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,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.1u2/lib/intel64:/home/cpu2017-1.1.0-ic19.1u2/j e5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE 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.

(Continued on next page)
## SPEC CPU®2017 Integer Speed Result

<table>
<thead>
<tr>
<th>Lenovo Global Technology</th>
<th>SPECspeed®2017_int_base =</th>
<th>SPECspeed®2017_int_peak =</th>
</tr>
</thead>
<tbody>
<tr>
<td>ThinkSystem SR850P</td>
<td>11.0</td>
<td>Not Run</td>
</tr>
<tr>
<td>(2.20 GHz, Intel Xeon Gold 5220)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General Notes (Continued)**

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 Enable
  - Hyper-Threading set to Disable
  - DCU Streamer Prefetcher set to Disable
  - Patrol Scrub set to Disable
  - LLC dead line alloc set to Disable

- Sysinfo program /home/cpu2017-1.1.0-ic19.1u2/bin/sysinfo
  - Rev: r6365 of 2019-08-21 295195f888a3d7ed8b1e646a4b5a001
  - running on localhost.localdomain Fri Dec 4 18:17:54 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 5220 CPU @ 2.20GHz
  - 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
  - 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

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR850P
(2.20 GHz, Intel Xeon Gold 5220)

SPECspeed®2017_int_base = 11.0
SPECspeed®2017_int_peak = Not Run

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

Platform Notes (Continued)

CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
Stepping: 6
CPU MHz: 1065.740
CPU max MHz: 3900.0000
CPU min MHz: 1000.0000
BogoMIPS: 4400.00
Virtualization: VT-x
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 mca cmov pat pse36 clflush dts acpica pci msx swp tsc hypo nonstop_tsc cpuid aperfmperf pni pclmulqdq dtscp mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl x87 pmovb mce cx8 rdtscp vs mcm xsave avx f16c rdrand de pti ms cmov stp mmmfsx rdtscp abm nst sse4_1 mtrr pbe syscall nx smm cmov xsaveopt avx512vb rdtscp pi xsave cap i羅 xsaveopt xsaves cgxvcll xcq cgx_weight cgx_local dtherm ida arat pls pku ospke avx512_vnni flush_lld 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: 386312 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: 386614 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: 386777 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: 387043 MB

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

```
node 3 free: 386072 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
```
MemTotal:       1585012572 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

From /etc/*release* /etc/*version*
```
os-release:
  NAME="Red Hat Enterprise Linux"
  VERSION="8.0 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.0"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="Red Hat Enterprise Linux 8.0 (Ootpa)"
  ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.0:ga
```

```
uname -a:
Linux localhost.localdomain 4.18.0-80.el8.x86_64 #1 SMP Wed Mar 13 12:02:46 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:
```
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: No status reported
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 4 18:15
```

```
SPEC is set to: /home/cpu2017-1.1.0-ic19.1u2
Filesystem Type  Size Used Avail Use% Mounted on
/dev/sda4 xfs  839G   65G  774G   8% /home
```

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR850P
(2.20 GHz, Intel Xeon Gold 5220)

**SPECSpeed®2017_int_base** = 11.0
**SPECSpeed®2017_int_peak** = Not Run

---

**Platform Notes (Continued)**

From /sys/devices/virtual/dmi/id
- BIOS: Lenovo -[TEE156L-2.61]- 05/20/2020
- Vendor: Lenovo
- Product: ThinkSystem SR850P -[7D2HCT01WW]-
- 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: 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**

```plaintext
C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base)
        | 625.x264_s(base) 657.xz_s(base)
Intel(R) C Compiler for applications running on Intel(R) 64, Version
19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

```plaintext
C++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
        | 641.leela_s(base)
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version
19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

```plaintext
Fortran | 648.exchange2_s(base)
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```
Lenovo Global Technology

ThinkSystem SR850P
(2.20 GHz, Intel Xeon Gold 5220)

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

SPECspeed®2017_int_base = 11.0
SPECspeed®2017_int_peak = Not Run

Test Date: Dec-2020
Hardware Availability: Jun-2020
Software Availability: Aug-2020

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leelam_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -fito -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -fito -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX512
-O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR850P
(2.20 GHz, Intel Xeon Gold 5220)

SPECspeak®2017_int_base = 11.0
SPECspeak®2017_int_peak = Not Run

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

Test Date: Dec-2020
Hardware Availability: Jun-2020
Software Availability: Aug-2020

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-mbranches-within-32B-boundaries

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

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml