Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

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

Threads
603.bwaves_s 36
607.cactuBSSN_s 36
619.lbm_s 36
621.wrf_s 36
627.cam4_s 36
628.pop2_s 36
638.imagick_s 36
644.nab_s 36
649.fotonik3d_s 36
654.roms_s 36

SPECspeed2017_fp_base = 122
SPECspeed2017_fp_peak = Not Run

Specspeed2017_fp_base (122)

Hardware
CPU Name: Intel Xeon Gold 5220
Max MHz.: 3900
Nominal: 2200
Enabled: 36 cores, 2 chips
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: 24.75 MB I+D on chip per chip
Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
Storage: 1 x 800 GB SATA SSD
Other: None

Software
OS: Red Hat Enterprise Linux Server release 7.6 (Maipo)
Kernel 3.10.0-957.el7.x86_64
Compiler: C/C++: Version 19.0.1.144 of Intel C/C++
{Compiler} {Build} for Linux;
Fortran: Version 19.0.1.144 of Intel Fortran
Compiler Build 20181018 for Linux
Parallel: Yes
Firmware: Lenovo BIOS Version IVE135R 2.10 released Feb-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
**SPEC CPU2017 Floating Point Speed Result**

Lenovo Global Technology

ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

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

**Test Date:** Apr-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Nov-2018

---

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>36</td>
<td>120</td>
<td>492</td>
<td>121</td>
<td>488</td>
<td>120</td>
<td>490</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>36</td>
<td>121</td>
<td>137</td>
<td>121</td>
<td>138</td>
<td>123</td>
<td>136</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>36</td>
<td>58.7</td>
<td>89.2</td>
<td>58.3</td>
<td>89.9</td>
<td>58.1</td>
<td>90.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>36</td>
<td>110</td>
<td>120</td>
<td>110</td>
<td>120</td>
<td>111</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>36</td>
<td>106</td>
<td>83.9</td>
<td>106</td>
<td>83.7</td>
<td>106</td>
<td>83.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>36</td>
<td>180</td>
<td>66.1</td>
<td>179</td>
<td>66.5</td>
<td>180</td>
<td>66.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>36</td>
<td>139</td>
<td>104</td>
<td>139</td>
<td>104</td>
<td>139</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>36</td>
<td>93.0</td>
<td>188</td>
<td>92.9</td>
<td>188</td>
<td>93.1</td>
<td>188</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>36</td>
<td>112</td>
<td>81.5</td>
<td>112</td>
<td>81.6</td>
<td>111</td>
<td>81.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>36</td>
<td>140</td>
<td>113</td>
<td>140</td>
<td>112</td>
<td>140</td>
<td>113</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SPECspeed2017_fp_base = 122**  
**SPECspeed2017_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"

---

**General Notes**

Environment variables set by runcpu before the start of the run:

- **KMP_AFFINITY** = "granularity=fine,compact"
- **LD_LIBRARY_PATH** = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"
- **OMP_STACKSIZE** = "192M"

- Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
- memory using Redhat Enterprise Linux 7.5
- 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
  ```

- Yes: 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.
- Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
- Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.
## Lenovo Global Technology

**ThinkSystem SR650**  
*(2.20 GHz, Intel Xeon Gold 5220)*

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>122</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Apr-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Apr-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Nov-2018</td>
</tr>
</tbody>
</table>

### Platform Notes

- BIOS configuration:
  - Choose Operating Mode set to Maximum Performance
  - Choose Operating Mode set to Custom Mode
  - C-states set to Legacy
  - Hyper-Threading set to Disable
  - Adjacent Cache Prefetch set to Disable
  - Stable AtoS set to Enable

- Sysinfo program `/home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo`
- Rev: r5974 of 2018-05-19 9bce8f2999c33d61f64985e45859ea9
- Running on localhost.localdomain Fri Apr 12 15:44:41 2019

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](https://www.spec.org/cpu2017/Docs/config.html#sysinfo)

From `/proc/cpuinfo`

```
model name : Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
  2 "physical id"s (chips)
  36 "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
```

From `lscpu`:

```
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              36
On-line CPU(s) list: 0-35
Thread(s) per core:  1
Core(s) per socket:  18
Socket(s):           2
NUMA node(s):        2
Vendor ID:           GenuineIntel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
Stepping:            6
CPU MHz:             2200.000
BogoMIPS:            4400.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
```

*(Continued on next page)*
Lenovo Global Technology

ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

| SPECspeed2017_fp_base = | 122 |
| SPECspeed2017_fp_peak = | Not Run |

Platform Notes (Continued)

L3 cache: 25344K
NUMA node0 CPU(s): 0-17
NUMA node1 CPU(s): 18-35
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 rdscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl apic cpuid nonstop_tsc
a20now perfrup eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbgy
fma cx16 x86pr pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsse avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_l3 cdp_l3 intel_pt ssbd mba
ibs ibpb stibp ibrs enhancesd tpr_shadow vni flexpriority ept vpid fsgsbbase
tsc_adjust bmi bmi2 wmm mtrr cmov cmovt cmovc cmovx cmovz cmova cmovb cmovc cmovd
cmq l1c cqmm l2l cqmm lmb_total cqmm lmb_local dtherm ida arat pln pts pkt ospe kvx
avx512 vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
node 0 size: 392888 MB
node 0 free: 338888 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: 339216 MB
node 1 free: 338422 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 792178752 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.6 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.6"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

SPECspeed2017_fp_base = 122
SPECspeed2017_fp_peak = Not Run

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

Platform Notes (Continued)

redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)

uname -a:
Linux localhost.localdomain 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS

run-level 3 Apr 12 15:42

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb2 xfs 689G 116G 573G 17% /home

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.

BIOS Lenovo -[IVE135R-2.10]- 02/27/2019
Memory:
24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

FC  607.cactuBSSN_s(base)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

SPECspeed2017_fp_base = 122
SPECspeed2017_fp_peak = Not Run

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

Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Nov-2018

Compiler Version Notes (Continued)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

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

SPECspeed2017_fp_base = 122
SPECspeed2017_fp_peak = Not Run

Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Nov-2018

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.hm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

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

Benchmarks using both Fortran and C:
-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++:
-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
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-A.html

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-A.xml
Lenovo Global Technology
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 122</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak = Not Run</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: Apr-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Apr-2019</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Nov-2018</td>
</tr>
</tbody>
</table>

SPEC is a registered trademark of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.5 on 2019-04-12 03:44:40-0400.