Lenovo Global Technology
ThinkSystem ST550
(1.90 GHz, Intel Xeon Gold 5220T)

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

603.bwaves_s 36 100
607.cactuBSSN_s 36 80.1
619.lbm_s 36 117
621.wrf_s 36 81.2
627.cam4_s 36 100
628.pop2_s 36 62.8
638.imagick_s 36 480
644.nab_s 36 183
649.fotonik3d_s 36 120
654.roms_s 36 105

Hardware

CPU Name: Intel Xeon Gold 5220T
Max MHz: 3900
Nominal: 1900
Enabled: 36 cores, 2 chips, 2 threads/core
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: 192 GB (12 x 16 GB 2Rx8 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 20181018 for Linux;
Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
Parallel: Yes
Firmware: Lenovo BIOS Version 00E142D 2.30 released Aug-2019 tested as 00E141D 2.30 Jul-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --
**Lenovo Global Technology**
ThinkSystem ST550
(1.90 GHz, Intel Xeon Gold 5220T)

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

**Test Date:** Aug-2019
**Hardware Availability:** Jul-2019
**Software Availability:** Nov-2018

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds Peak</th>
<th>Ratio Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>36</td>
<td>125</td>
<td>127</td>
<td>126</td>
<td>467</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>36</td>
<td>130</td>
<td>129</td>
<td>129</td>
<td>130</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>36</td>
<td>60.3</td>
<td>86.9</td>
<td>60.4</td>
<td>86.7</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>36</td>
<td>112</td>
<td>118</td>
<td>113</td>
<td>117</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>36</td>
<td><strong>109</strong></td>
<td><strong>81.2</strong></td>
<td>109</td>
<td>81.2</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>36</td>
<td>193</td>
<td>61.5</td>
<td>188</td>
<td>63.2</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>36</td>
<td>145</td>
<td>99.3</td>
<td><strong>144</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>36</td>
<td>95.6</td>
<td>183</td>
<td><strong>95.6</strong></td>
<td><strong>183</strong></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>36</td>
<td>113</td>
<td>80.5</td>
<td><strong>114</strong></td>
<td><strong>80.1</strong></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>36</td>
<td>150</td>
<td>105</td>
<td>149</td>
<td>106</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 117**
**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"

### General Notes

Environment variables set by runcpu before the start of the run:
- KMP_AFFINITY = "granularity=fine,compact,1,0"
- 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
```

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.
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.
Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
CPU P-state Control set to Cooperative
C-States set to legacy
Adjacent Cache Prefetcher set to Disable
DCU Streamer Prefetcher set to Disable
DCA set to Disable
Uncore Frequency Scaling set to Disable

Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on localhost.localdomain Mon Aug 26 18:20:43 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

From /proc/cpuinfo
model name : Intel(R) Xeon(R) Gold 5220T CPU @ 1.90GHz
  2 "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 : 36
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): 72
On-line CPU(s) list: 0-71
Thread(s) per core: 2
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 5220T CPU @ 1.90GHz
Stepping: 7
CPU MHz: 1900.000
BogoMIPS: 3800.00
Virtualization: VT-x
L1d cache: 32K

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST550
(1.90 GHz, Intel Xeon Gold 5220T)

SPECspeed®2017_fp_base = 117
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Aug-2019
Hardware Availability: Jul-2019
Tested by: Lenovo Global Technology
Software Availability: Nov-2018
Test Sponsor: Lenovo Global Technology

Platform Notes (Continued)

L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-17, 36-53
NUMA node1 CPU(s): 18-35, 54-71
Flags:
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 pge 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 art arch_perfmon pebs bts rep_good nopl pge mce cx8 apic sep mtrr pge mca cmov

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 36 37 38 39 40 41 42 43 44 45
46 47 48 49 50 51 52 53
node 0 size: 97976 MB
node 0 free: 95042 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 54 55 56 57 58 59 60
61 62 63 64 65 66 67 68 69 70 71
node 1 size: 98304 MB
node 1 free: 95679 MB
node distances:
node 0 1
  0:  10 21
  1:  21 10

From /proc/meminfo
MemTotal: 197697824 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"

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST550
(1.90 GHz, Intel Xeon Gold 5220T)

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

**Platform Notes (Continued)**

```plaintext
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.6"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"
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 Aug 26 18:18

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

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sdc3      xfs   691G   31G  661G   5% /

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 -[O0E141D-2.30]- 07/03/2019
Memory:
12x SK Hynix HMA82GR7CJ88N-WM 16 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)

---

### Compiler Version Notes

```
<table>
<thead>
<tr>
<th>C</th>
<th>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</th>
</tr>
</thead>
</table>
```

---

```
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.

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

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST550
(1.90 GHz, Intel Xeon Gold 5220T)

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

Test Date: Aug-2019
Hardware Availability: Jul-2019
Software Availability: Nov-2018

SPECspeed®2017_fp_base = 117
SPECspeed®2017_fp_peak = Not Run

Compiler Version Notes (Continued)

<table>
<thead>
<tr>
<th>Compiler Invocation</th>
<th>Fortran</th>
<th>Fortran, C</th>
</tr>
</thead>
<tbody>
<tr>
<td>C benchmarks</td>
<td>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</td>
<td>621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)</td>
</tr>
<tr>
<td>Fortran benchmarks</td>
<td>64 Compiler for applications running on Intel(R)</td>
<td>64 Compiler for applications running on Intel(R)</td>
</tr>
<tr>
<td>Bases using both Fortran and C</td>
<td>1985-2018 Intel Corporation. All rights reserved.</td>
<td>1985-2018 Intel Corporation. All rights reserved.</td>
</tr>
<tr>
<td>C++ Compiler invocation</td>
<td>icc -m64 -std=c11</td>
<td>icpc -m64 icc -m64 -std=c11 ifort -m64</td>
</tr>
</tbody>
</table>
## Lenovo Global Technology

ThinkSystem ST550  
(1.90 GHz, Intel Xeon Gold 5220T)

<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>SPECspeed®2017_fp_base</td>
<td>117</td>
</tr>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**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 -assume byterecl
- 627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 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-F.html](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-F.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-F.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-F.xml)
## Lenovo Global Technology

**ThinkSystem ST550**  
(1.90 GHz, Intel Xeon Gold 5220T)

<table>
<thead>
<tr>
<th>SPECspeed(^{2017_fp_base}) =</th>
<th>117</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed(^{2017_fp_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>Aug-2019</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Nov-2018</td>
</tr>
</tbody>
</table>

---

SPEC CPU and SPECspeed are registered trademarks 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 CPU\(^{2017}\) v1.0.5 on 2019-08-26 06:20:42-0400.  