## Lenovo Global Technology

### ThinkSystem SR590
(2.20 GHz, Intel Xeon Gold 5120T)

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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</thead>
<tbody>
<tr>
<td>28</td>
<td>86.8</td>
<td>88.2</td>
</tr>
</tbody>
</table>

### Software
- **OS**: SUSE Linux Enterprise Server 12 SP3 (x86_64)  
  Kernel 4.4.114-94.11-default
- **Compiler**: C/C++: Version 18.0.0.128 of Intel C/C++  
  Compiler for Linux:
  Fortran: Version 18.0.0.128 of Intel Fortran
- **Parallel**: Yes
- **Firmware**: Lenovo BIOS Version TEE119R 1.22 released Feb-2018
- **File System**: btrfs
- **System State**: Run level 3 (multi-user)
- **Base Pointers**: 64-bit
- **Peak Pointers**: 64-bit
- **Other**: None

### Hardware
- **CPU Name**: Intel Xeon Gold 5120T  
  Max MHz.: 3200  
  Nominal: 2200
- **Enabled**: 28 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**: 19.25 MB I+D on chip per chip
- **Other**: None
- **Memory**: 384 GB (12 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)
- **Storage**: 1 x 800 GB SAS SSD
- **Other**: None
**SPEC CPU2017 Floating Point Speed Result**

**Lenovo Global Technology**

ThinkSystem SR590

(2.20 GHz, Intel Xeon Gold 5120T)

---

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>603.bwaves_s</td>
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<td>143</td>
<td>413</td>
<td>142</td>
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<td>143</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>28</td>
<td>147</td>
<td>113</td>
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<td>113</td>
<td>28</td>
<td>145</td>
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<td>60.2</td>
<td>147</td>
<td>60.2</td>
<td>147</td>
<td>60.3</td>
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<td>148</td>
<td>60.0</td>
<td>147</td>
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<td>628.pop2_s</td>
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<td>50.6</td>
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<td>223</td>
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<td>75.6</td>
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<td>75.4</td>
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<td>160</td>
<td>98.5</td>
<td>159</td>
</tr>
</tbody>
</table>

**SPECspeed2017_fp_base = 86.8**

**SPECspeed2017_fp_peak = 88.2**

---

**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:

```
LD_LIBRARY_PATH = "/home/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/je5.0.1-64"
OMP_STACKSIZE = "192M"
```

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4

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.

---

**Platform Notes**

BIOS configuration:

Choose Operating Mode set to Maximum Performance

Hyper-Threading set to Disable

(Continued on next page)
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SPECspeed2017_fp_base = 86.8
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Platform Notes (Continued)

Adjacent Cache Prefetch set to Disable
DCA set to Enable
Uncore Frequency Scaling set to Disable
MONITORMWAIT set to Enable
Per Core P-state set to Disable
LLC dead line alloc set to Disable
Patrol Scrub set to Disable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on SR590-2 Fri Apr 20 06:03:32 2018

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 5120T CPU @ 2.20GHz
  2 "physical id"s (chips)
  28 "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 : 14
    siblings : 14
    physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
    physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

From lscpu:
  Architecture:          x86_64
  CPU op-mode(s):        32-bit, 64-bit
  Byte Order:            Little Endian
  CPU(s):                28
  On-line CPU(s) list:   0-27
  Thread(s) per core:    1
  Core(s) per socket:    14
  Socket(s):             2
  NUMA node(s):          2
  Vendor ID:             GenuineIntel
  CPU family:            6
  Model:                 85
  Model name:            Intel(R) Xeon(R) Gold 5120T CPU @ 2.20GHz
  Stepping:              4
  CPU MHz:               2194.832
  BogoMIPS:              4389.66
  Virtualization:        VT-x
  L1d cache:             32K
  L1i cache:             32K
  L2 cache:              1024K

(Continued on next page)
Platform Notes (Continued)

L3 cache: 19712K
NUMA node0 CPU(s): 0-13
NUMA node1 CPU(s): 14-27
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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmpref eagerfpu pni pclmulqdq dtes64 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 3dnowprefetch ida arat epb invpcid_single pln pts
dtherm intel_pt rsb_ctxsw spec_ctrl retpoline kaiser tpr_shadow vmx flexpriority
ept vpid fsgsbase tsc_adjust bni hle avx2 smep bmi2 erms invpcid rtm cqm mpx
avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsavesopt
xsavec xgetbv1 cqm_llc cqm_occup_llc pku ospke

/proc/cpuinfo cache data
  cache size : 19712 KB

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
    node 0 size: 192985 MB
    node 0 free: 191602 MB
    node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27
    node 1 size: 193517 MB
    node 1 free: 191761 MB
    node distances:
      node 0 1
      0: 10 21
      1: 21 10

From /proc/meminfo
  MemTotal: 395778664 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  SuSE-release:
    SUSE Linux Enterprise Server 12 (x86_64)
    VERSION = 12
    PATCHLEVEL = 3
    # This file is deprecated and will be removed in a future service pack or release.
    # Please check /etc/os-release for details about this release.
  os-release:
    NAME="SLES"
    VERSION="12-SP3"
    VERSION_ID="12.3"

(Continued on next page)
**SPEC CPU2017 Floating Point Speed Result**

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<th>SPECspeed2017_fp_peak</th>
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<td>88.2</td>
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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Apr-2018

**Hardware Availability:** Nov-2017

**Software Availability:** Feb-2018

**Platform Notes (Continued)**

PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:
   Linux SR590-2 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)
   x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Apr 19 21:22

SPEC is set to: /home/cpu2017.1.0.2.ic18.0

Filesystem  Type  Size  Used  Avail  Use%  Mounted on
/dev/sdb2  btrfs  744G  113G  631G  16%  /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 -[TEE119R-1.22]- 02/06/2018

Memory:
   12x Hynix HMA84GR7AFR4N-VK 32 GB 2 rank 2666, configured at 2400
   4x NO DIMM NO DIMM

(End of data from sysinfo program)

**Compiler Version Notes**

==============================================================================
<table>
<thead>
<tr>
<th>CC  619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc (ICC) 18.0.0 20170811</td>
</tr>
<tr>
<td>Copyright (C) 1985-2017 Intel Corporation. All rights reserved.</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
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SPECspeed2017_fp_base = 86.8
SPECspeed2017_fp_peak = 88.2

Compiler Version Notes (Continued)

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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC 607.cactuBSSN_s(peak)

icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(peak) 649.fotonik3d_s(peak) 654.roms_s(peak)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(peak) 628.pop2_s(peak)

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Software Availability: Feb-2018

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
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-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte

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**Lenovo Global Technology**
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<tbody>
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<td>SPECspeed2017_fp_base</td>
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</table>

### Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
- `-xCORE-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

Benchmarks using Fortran, C, and C++:
- `-xCORE-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

### Base Other Flags

**C benchmarks:**
- `-m64`  
- `-std=c11`

**Fortran benchmarks:**
- `-m64`

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

Benchmarks using Fortran, C, and C++:
- `-m64`  
- `-std=c11`

### Peak 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`
**SPEC CPU2017 Floating Point Speed Result**

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**Tested by:** Lenovo Global Technology  

**Test Date:** Apr-2018  
**Hardware Availability:** Nov-2017  
**Software Availability:** Feb-2018

**Peak Portability Flags**

Same as Base Portability Flags

**Peak Optimization Flags**

**C benchmarks:**

- 619.lbm_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 
  -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div 
  -qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopnenmp 
  -DSPEC_OPENMP

- 638.imagick_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch 
  -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp 
  -DSPEC_OPENMP

- 644.nab_s: Same as 638.imagick_s

**Fortran benchmarks:**

-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP 
-DSPEC_OPENMP -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3 
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp 
-nostandard-realloc-lhs -align array32byte

**Benchmarks using both Fortran and C:**

- 621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 
  -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div 
  -qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp 
  -DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

- 627.cam4_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch 
  -ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp 
  -DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte

- 628.pop2_s: Same as 621.wrf_s

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

-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2 -qopt-prefetch 
-ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs 
-align array32byte
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CPU2017 License: 9017
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Tested by: Lenovo Global Technology
Software Availability: Feb-2018

Peak Other Flags

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

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

Benchmarks using Fortran, C, and C++:
-m64 -std=c11

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-C.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-C.xml

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Tested with SPEC CPU2017 v1.0.2 on 2018-04-19 18:03:32-0400.
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