## Lenovo Global Technology

**ThinkSystem SN550**  
(2.20 GHz, Intel Xeon Gold 5120)

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
<th>Hardware Availability</th>
<th>Software Availability</th>
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<tbody>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
<td>Aug-2017</td>
<td>Sep-2017</td>
</tr>
</tbody>
</table>

### SPECspeed2017_fp_base = 88.0

### SPECspeed2017_fp_peak = 89.5

#### CPU2017 License: 9017

#### Test Date: Jan-2018

#### Hardware

- **CPU Name:** Intel Xeon Gold 5120
- **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 core
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)
- **Storage:** 1 x 800 GB SAS SSD
- **Other:** None

#### Software

- **OS:** SUSE Linux Enterprise Server 12 SP2 (x86_64)  
  Kernel 4.4.21-69-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  
  Compiler for Linux
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version IVE111I 1.01 released Aug-2017
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
## Lenovo Global Technology

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**SPECspeed2017_fp_base** = 88.0

**SPECspeed2017_fp_peak** = 89.5

### Results Table

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<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>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>28</td>
<td>138</td>
<td>428</td>
<td>137</td>
<td>429</td>
<td>138</td>
<td>427</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>147</td>
<td>113</td>
<td>147</td>
<td>113</td>
<td>147</td>
<td>113</td>
<td>147</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>28</td>
<td>138</td>
<td>38.1</td>
<td>137</td>
<td>38.2</td>
<td>137</td>
<td>38.2</td>
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<tr>
<td>621.wrf_s</td>
<td>28</td>
<td>201</td>
<td>65.7</td>
<td>202</td>
<td>65.6</td>
<td>198</td>
<td>66.7</td>
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<tr>
<td>627.cam4_s</td>
<td>28</td>
<td>149</td>
<td>59.5</td>
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<td>59.2</td>
<td>147</td>
<td>60.4</td>
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<td>628.pop2_s</td>
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<td>227</td>
<td>52.2</td>
<td>229</td>
<td>51.8</td>
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<tr>
<td>638.imagick_s</td>
<td>28</td>
<td>192</td>
<td>75.2</td>
<td>195</td>
<td>74.1</td>
<td>189</td>
<td>76.5</td>
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<tr>
<td>644.nab_s</td>
<td>28</td>
<td>126</td>
<td>138</td>
<td>127</td>
<td>138</td>
<td>127</td>
<td>138</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>28</td>
<td>125</td>
<td>73.1</td>
<td>125</td>
<td>72.7</td>
<td>124</td>
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<td>654.roms_s</td>
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<td>163</td>
<td>96.6</td>
<td>162</td>
<td>96.9</td>
<td>154</td>
<td>102</td>
</tr>
</tbody>
</table>

### 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
  ```

- No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
- No: 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.
- No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly

(Continued on next page)
Lenovo Global Technology

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(2.20 GHz, Intel Xeon Gold 5120)

SPEC CPU2017 Floating Point Speed Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

SPECspeed2017_fp_peak = 89.5
SPECspeed2017_fp_base = 88.0

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

Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

General Notes (Continued)

Generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disable
DCU Streamer Prefetcher set to Disable
MONITORMWAIT set to Enable
XPT Prefetcher set to Enable
DCA set to Enable
Stale AtoS set to Enable
LLC Deadline Alloc set to Disable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on SN550 Wed Jan 31 14:59:35 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 5120 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

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

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core(s) per socket</td>
<td>14</td>
</tr>
<tr>
<td>Socket(s)</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node(s)</td>
<td>2</td>
</tr>
<tr>
<td>Vendor ID</td>
<td>GenuineIntel</td>
</tr>
<tr>
<td>CPU family</td>
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<tr>
<td>Model</td>
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</tr>
<tr>
<td>Model name</td>
<td>Intel(R) Xeon(R) Gold 5120 CPU @ 2.20GHz</td>
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<td>Stepping</td>
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<td>CPU MHz</td>
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<td>BogoMIPS</td>
<td>4389.69</td>
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<td>VT-x</td>
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<tr>
<td>L1d cache</td>
<td>32K</td>
</tr>
<tr>
<td>L1i cache</td>
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<tr>
<td>L2 cache</td>
<td>1024K</td>
</tr>
<tr>
<td>L3 cache</td>
<td>19712K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s)</td>
<td>0-13</td>
</tr>
<tr>
<td>NUMA node1 CPU(s)</td>
<td>14-27</td>
</tr>
<tr>
<td>Flags</td>
<td>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 rdtsscp 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 xtrn pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel_pt tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 eterms invpctid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512v1 xsaveopt xsavec xgetbv1 cqm_11c cqm_occup LLC</td>
</tr>
</tbody>
</table>

From `numactl --hardware`  
WARNING: a numactl 'node' might or might not correspond to a physical chip.

| Available nodes                  | 2                      |
| Available CPUs                  | 0-13                   |
| Available size                  | 386637 MB              |
| Available free                  | 385100 MB              |
| Node 1 CPUs                     | 14 15 16 17 18 19 20 21 22 23 24 25 26 27 |
| Node 1 size                     | 387040 MB              |
| Node 1 free                     | 385260 MB              |
| Node distances                  |                        |
| Node 0                          | 0 1                    |
| 0                               | 10 21                  |
| 1                               | 21 10                  |

From `/proc/meminfo`  
MemTotal: 792245524 kB  
HugePages_Total: 0

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**SPEC CPU2017 Floating Point Speed Result**

**Lenovo Global Technology**  
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**Platform Notes (Continued)**

Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*  
SuSE-release:  
  SUSE Linux Enterprise Server 12 (x86_64)  
  VERSION = 12  
  PATCHLEVEL = 2  
  # 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-SP2"  
    VERSION_ID="12.2"  
    PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"  
    ID="sles"  
    ANSI_COLOR="0;32"  
    CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:  
  Linux SN550 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67) x86_64  
  x86_64 x86_64 GNU/Linux  
  run-level 3 Jan 31 11:01  
  SPEC is set to: /home/cpu2017.1.0.2.ic18.0  
  Filesystem Type Size Used Avail Use% Mounted on  
  /dev/sda4 xfs 687G 136G 552G 20% /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 -[IVE111I-1.01]- 08/11/2017  
  Memory:  
    24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

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**Compiler Version Notes**

==============================================================================  
<table>
<thead>
<tr>
<th>CC</th>
<th>619.lbm_s(base)</th>
<th>638.imagick_s(base, peak)</th>
<th>644.nab_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc (ICC)</td>
<td>18.0.0</td>
<td>20170811</td>
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</tr>
<tr>
<td>Copyright (C)</td>
<td>1985-2017 Intel Corporation. All rights reserved.</td>
<td></td>
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</tr>
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<td>Lenovo Global Technology</td>
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**SPECspeed2017_fp_base = 88.0**

**SPECspeed2017_fp_peak = 89.5**

**Compiler Version Notes (Continued)**

```
CC   619.lbm_s(peak)

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

FC  607.cactuBSSN_s(base)

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   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)
```

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ThinkSystem SN550
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SPECspeed2017_fp_base = 88.0
SPECspeed2017_fp_peak = 89.5

Compiler Version Notes (Continued)

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.

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
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SPECspeed2017_fp_base = 88.0
SPECspeed2017_fp_peak = 89.5

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

Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

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

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

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

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

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**CPU2017 License:** 9017  
**Test Date:** Jan-2018  
**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** Aug-2017  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Sep-2017

---

#### Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:

```bash
ifort icc
```

Benchmarks using Fortran, C, and C++:

```bash
icpc icc ifort
```

#### Peak Portability Flags

Same as Base Portability Flags

#### Peak Optimization Flags

**C benchmarks:**

```bash
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 -qopenmp -DSPEC_OPENMP
```

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

```bash
644.nab_s: Same as 638.imagick_s
```

**Fortran benchmarks:**

```bash
-wrf_s: -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:

```bash
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
```

```bash
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
```

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SPECspeed2017_fp_base = 88.0
SPECspeed2017_fp_peak = 89.5

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

CPU2017 License: 9017
Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

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

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

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-A.xml

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