Lenovo Global Technology
ThinkSystem SN850
(3.30 GHz, Intel Xeon Gold 6234)

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

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### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>32</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>32</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>32</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
</tr>
</tbody>
</table>

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**Software**

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux Server release 7.6 (Maipo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 19.0.4.227 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler for Linux:</td>
<td></td>
</tr>
<tr>
<td>Fortran:</td>
<td>Version 19.0.4.227 of Intel Fortran</td>
</tr>
<tr>
<td>Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 2.30 Jul-2019</td>
</tr>
<tr>
<td>File System:</td>
<td>tmpfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Power Management:</td>
<td>--</td>
</tr>
</tbody>
</table>

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**Hardware**

| CPU Name: | Intel Xeon Gold 6234 |
| Max MHz: | 4000 |
| Nominal: | 3300 |
| Enabled: | 32 cores, 4 chips, 2 threads/core |
| Orderable: | 2.4 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: | 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R) |
| Storage: | 800 GB tmpfs |
| Other: | None |
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**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</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>32</td>
<td>80.9</td>
<td>729</td>
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<td>80.9</td>
<td>729</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>117</td>
<td>142</td>
<td></td>
<td>117</td>
<td>143</td>
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<tr>
<td>619.lbm_s</td>
<td>32</td>
<td>38.2</td>
<td>137</td>
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<td>38.1</td>
<td>137</td>
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<tr>
<td>621.wrf_s</td>
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<td>97.5</td>
<td>136</td>
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<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>93.1</td>
<td>95.2</td>
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<td>92.7</td>
<td>95.6</td>
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</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>184</td>
<td>64.5</td>
<td></td>
<td>184</td>
<td>64.4</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32</td>
<td>121</td>
<td>119</td>
<td></td>
<td>121</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
<td>78.0</td>
<td>224</td>
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<td>78.2</td>
<td>224</td>
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</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>80.7</td>
<td>113</td>
<td></td>
<td>80.2</td>
<td>114</td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
<td>66.8</td>
<td>236</td>
<td></td>
<td>66.6</td>
<td>236</td>
<td></td>
</tr>
</tbody>
</table>

**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"
Tmpfs filesystem can be set with:
  mount -t tmpfs -o size=800g tmpfs /home
Process tuning setting:
  echo 50000 > /proc/sys/kernel/sched_cfs_bandwidth_slice_us

**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-ic19.0u4/lib/intel64"
  OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-799X 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.
## Lenovo Global Technology

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(3.30 GHz, Intel Xeon Gold 6234)

### SPEC CPU®2017 Floating Point Speed Result

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 156</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = Not Run</td>
</tr>
</tbody>
</table>

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

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### General Notes (Continued)

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
  - Memory Power Management set to Automatic
  - MONITOR/MWAIT set to Enable
  - Trusted Execution Technology set to Enable
  - Stale AtoS set to Enable

- Sysinfo program: /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
  - Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
  - running on localhost.localdomain Wed Sep 25 16:08:45 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 6234 CPU @ 3.30GHz
  - 4 "physical id"s (chips)
  - 64 "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 : 8
    - siblings : 16
    - physical 0: cores 2 3 9 11 24 25 27
    - physical 1: cores 2 4 9 17 19 24 26 27
    - physical 2: cores 2 3 16 18 20 24 25 27
    - physical 3: cores 2 3 9 11 17 20 24 27

- From lscpu:
  - Architecture: x86_64
  - CPU op-mode(s): 32-bit, 64-bit
  - Byte Order: Little Endian
  - CPU(s): 64
  - On-line CPU(s) list: 0-63
  - Thread(s) per core: 2
  - Core(s) per socket: 8
  - Socket(s): 4
  - NUMA node(s): 4
  - Vendor ID: GenuineIntel
  - CPU family: 6
  - Model: 85

(Continued on next page)
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SPECSpeed®2017_fp_base = 156
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Tested by: Lenovo Global Technology

Test Date: Sep-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Model name: Intel(R) Xeon(R) Gold 6234 CPU @ 3.30GHz
Stepping: 7
CPU MHz: 3300.000
BogoMIPS: 6600.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-7,32-39
NUMA node1 CPU(s): 8-15,40-47
NUMA node2 CPU(s): 16-23,48-55
NUMA node3 CPU(s): 24-31,56-63
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 nx pdpe32+ms

/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 32 33 34 35 36 37 38 39
   node 0 size: 392885 MB
   node 0 free: 379793 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
   node 1 size: 393216 MB
   node 1 free: 384017 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
   node 2 size: 393216 MB
   node 2 free: 376102 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
   node 3 size: 393216 MB
   node 3 free: 384460 MB
   node distances:
   node 0 1 2 3
   0: 10 21 21 21
   1: 21 10 21 21

(Continued on next page)
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SPECspeed®2017_fp_base = 156
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Hardware Availability: Jul-2019
Software Availability: May-2019

Platform Notes (Continued)

2:  21  21  21  21
3:  21  21  10  21

From /proc/meminfo
MemTotal:    1584959312 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)"
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 Sep 25 15:16
SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
   Filesystem  Type   Size  Used Avail Use% Mounted on
   tmpfs      tmpfs   800G  8.3G  792G   2%  /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 -[I4E141E-2.30]- 07/02/2019
   Memory:
      48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
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</tr>
</thead>
<tbody>
<tr>
<td>156</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

CPU2017 License: 9017
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Compiler Version Notes

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<table>
<thead>
<tr>
<th>Compiler</th>
<th>benchmarks</th>
<th>Version</th>
<th>Build</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)</td>
<td>19.0.4.227</td>
<td>20190416</td>
<td>Sep-2019</td>
</tr>
<tr>
<td>C++, C, Fortran</td>
<td>607.cactuBSSN_s(base)</td>
<td>19.0.4.227</td>
<td>20190416</td>
<td>Sep-2019</td>
</tr>
<tr>
<td>Fortran</td>
<td>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</td>
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<td>Sep-2019</td>
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</tbody>
</table>

Base Compiler Invocation

(Coverage on next page)
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Base Compiler Invocation (Continued)

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

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-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
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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-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

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

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Tested with SPEC CPU®2017 v1.0.5 on 2019-09-25 04:08:44-0400.