## Lenovo Global Technology

**ThinkSystem SR950**
(2.50 GHz, Intel Xeon Gold 6248)

### CPU2017 License:
9017

### Test Sponsor:
Lenovo Global Technology

### Tested by:
Lenovo Global Technology

---

### Hardware

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base (188)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>80</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>80</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>80</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>80</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>80</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>80</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>80</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>80</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>80</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>80</td>
</tr>
</tbody>
</table>

### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64)
- **Kernel:** 4.12.14-25.13-default
- **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 PSE121I 1.50 released Mar-2019
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** None
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Threads</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>80</td>
<td>62.9</td>
<td>938</td>
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<td>930</td>
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<td>607.cactuBSSN_s</td>
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<td>81.6</td>
<td>204</td>
<td>80.2</td>
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<td></td>
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<tr>
<td>619.lbm_s</td>
<td>80</td>
<td>34.3</td>
<td>152</td>
<td>29.3</td>
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<td>122</td>
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<tr>
<td>621.wrf_s</td>
<td>80</td>
<td>92.1</td>
<td>144</td>
<td>92.1</td>
<td>144</td>
<td>91.9</td>
<td>144</td>
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<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>80</td>
<td>59.3</td>
<td>149</td>
<td>58.8</td>
<td>151</td>
<td>59.2</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>80</td>
<td>250</td>
<td>47.5</td>
<td>254</td>
<td>46.7</td>
<td>258</td>
<td>46.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>80</td>
<td>66.9</td>
<td>216</td>
<td>68.0</td>
<td>212</td>
<td>68.3</td>
<td>211</td>
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<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>80</td>
<td>43.8</td>
<td>399</td>
<td>43.8</td>
<td>399</td>
<td>43.8</td>
<td>399</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>80</td>
<td>106</td>
<td>85.7</td>
<td>105</td>
<td>86.6</td>
<td>109</td>
<td>83.6</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>80</td>
<td>61.9</td>
<td>254</td>
<td>59.3</td>
<td>265</td>
<td>59.6</td>
<td>264</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 188
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

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.
**Lenovo Global Technology**

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<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>188</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>9017</th>
<th>Test Date:</th>
<th>May-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor</td>
<td>Lenovo Global Technology</td>
<td>Hardware Availability:</td>
<td>Apr-2019</td>
</tr>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
<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  
CPU P-state Control set to Autonomous  
Hyper-Threading set to Disable  
Trusted Execution Technology set to Enable  
DCU Streamer Prefetcher set to Disable  
MONITOR/MWAIT set to Enable

Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
running on linux-jdx4 Tue May 28 16:47:23 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 6248 CPU @ 2.50GHz  
4 "physical id"s (chips)  
80 "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 : 20  
siblings : 20  
physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28  
physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28  
physical 2: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28  
physical 3: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

From lscpu:

Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 80  
On-line CPU(s) list: 0-79  
Thread(s) per core: 1  
Core(s) per socket: 20  
Socket(s): 4  
NUMA node(s): 4  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Gold 6248 CPU @ 2.50GHz  
Stepping: 6  
CPU MHz: 2500.000  
BogoMIPS: 5000.00  
Virtualization: VT-x

(Continued on next page)
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### ThinkSystem SR950 (2.50 GHz, Intel Xeon Gold 6248)

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

### Platform Notes (Continued)

```
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 28160K
NUMA node0 CPU(s): 0-19
NUMA node1 CPU(s): 20-39
NUMA node2 CPU(s): 40-59
NUMA node3 CPU(s): 60-79
Flags: fpu vme de pse tsc msr pae mce 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 cpuid
aperfmpref 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 3nowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single ssbd mba ibrs ibpb stibp tpr_shadow vnni flexpriority ept vpid
fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 3dnow invpcid rtm cqm mpx rbdt_a avx512f
avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsavesopt xsavec xgetbv1 xsaves cqm_llc cqm_occud_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pin pts hwp_epp pku ospke avx512_vnni flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 28160 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 8 9 10 11 12 13 14 15 16 17 18 19
node 0 size: 193074 MB
node 0 free: 189793 MB
node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
node 1 size: 193515 MB
node 1 free: 192567 MB
node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
node 2 size: 193515 MB
node 2 free: 192833 MB
node 3 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
node 3 size: 193512 MB
node 3 free: 193286 MB
node distances:
node 0 1 2 3
  0: 10 21 21 21
  1: 21 10 21 21
  2: 21 21 10 21
  3: 21 21 21 10
```

From `/proc/meminfo`

```
MemTotal: 792184704 kB
```

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HugePages_Total:</td>
<td>0</td>
</tr>
<tr>
<td>Hugepagesize:</td>
<td>2048 kB</td>
</tr>
<tr>
<td>From /etc/<em>release</em> /etc/<em>version</em></td>
<td></td>
</tr>
<tr>
<td>os-release:</td>
<td></td>
</tr>
<tr>
<td>NAME=&quot;SLES&quot;</td>
<td></td>
</tr>
<tr>
<td>VERSION=&quot;15&quot;</td>
<td></td>
</tr>
<tr>
<td>VERSION_ID=&quot;15&quot;</td>
<td></td>
</tr>
<tr>
<td>PRETTY_NAME=&quot;SUSE Linux Enterprise Server 15&quot;</td>
<td></td>
</tr>
<tr>
<td>ID=&quot;sles&quot;</td>
<td></td>
</tr>
<tr>
<td>ID_LIKE=&quot;suse&quot;</td>
<td></td>
</tr>
<tr>
<td>ANSI_COLOR=&quot;0;32&quot;</td>
<td></td>
</tr>
<tr>
<td>CPE_NAME=&quot;cpe:/o:suse:sles:15&quot;</td>
<td></td>
</tr>
<tr>
<td>uname -a:</td>
<td></td>
</tr>
<tr>
<td>x86_64 x86_64 x86_64 x86_64 GNU/Linux</td>
<td></td>
</tr>
<tr>
<td>Kernel self-reported vulnerability status:</td>
<td></td>
</tr>
<tr>
<td>CVE-2017-5754 (Meltdown):</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2017-5753 (Spectre variant 1): Mitigation: ___user pointer sanitization</td>
<td></td>
</tr>
<tr>
<td>CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW</td>
<td></td>
</tr>
<tr>
<td>run-level 3 May 28 14:29</td>
<td></td>
</tr>
<tr>
<td>SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1</td>
<td></td>
</tr>
<tr>
<td>Filesystem Type Size Used Avail Use% Mounted on</td>
<td></td>
</tr>
<tr>
<td>/dev/sda2 xfs 744G 22G 723G 3% /</td>
<td></td>
</tr>
<tr>
<td>Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is &quot;intended to allow hardware to be accurately determined&quot;, but the intent may not be met, as there are frequent changes to hardware, firmware, and the &quot;DMTF SMBIOS&quot; standard. BIOS Lenovo -[PSE121I-1.50]- 03/01/2019</td>
<td></td>
</tr>
<tr>
<td>Memory: 48x NO DIMM NO DIMM 48x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933</td>
<td></td>
</tr>
<tr>
<td>(End of data from sysinfo program)</td>
<td></td>
</tr>
</tbody>
</table>

**Compiler Version Notes**

==============================================================================
CC  619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)

(Continued on next page)
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SPECspeed2017_fp_base = 188
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Hardware Availability: Apr-2019
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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.

------------------------------------------------------------------------------
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.
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.

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

------------------------------------------------------------------------------
CC 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
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) 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.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

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

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Base Compiler Invocation (Continued)

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
-nostandard-realloc-lhs
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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

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Tested with SPEC CPU2017 v1.0.5 on 2019-05-28 04:47:22-0400.
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