Lenovo Global Technology
ThinkSystem SR850 V2
(2.30 GHz, Intel Xeon Gold 6348H)

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

Hardware
CPU Name: Intel Xeon Gold 6348H
Max MHz: 4200
Nominal: 2300
Enabled: 96 cores, 4 chips
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: 33 MB I+D on chip per chip
Other: None
Memory: 1536 GB (48 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)
Storage: 1 x 960 GB SATA SSD
Other: None

Software
OS: Red Hat Enterprise Linux 8.2 (Ootpa)
Kernel 4.18.0-193.el8.x86_64
Compiler: C/C++: Version 19.0.5.281 of Intel
Compiler for Linux:
Parallel: Yes
Firmware: Lenovo BIOS Version M5E107I 1.01 released Nov-2020
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage
## Lenovo Global Technology

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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>96</td>
<td>67.3</td>
<td>877</td>
<td>68.1</td>
<td>867</td>
<td>67.3</td>
<td>877</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>96</td>
<td>75.1</td>
<td>222</td>
<td>75.1</td>
<td>222</td>
<td>74.6</td>
<td>223</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>96</td>
<td>31.6</td>
<td>166</td>
<td>34.2</td>
<td>153</td>
<td>32.2</td>
<td>163</td>
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<tr>
<td>621.wrf_s</td>
<td>96</td>
<td>87.9</td>
<td>151</td>
<td>87.5</td>
<td>151</td>
<td>87.6</td>
<td>151</td>
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<tr>
<td>627.cam4_s</td>
<td>96</td>
<td>49.4</td>
<td>180</td>
<td>48.5</td>
<td>183</td>
<td>48.8</td>
<td>182</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>96</td>
<td>171</td>
<td>69.6</td>
<td>175</td>
<td>67.9</td>
<td>175</td>
<td>68.0</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>96</td>
<td>59.8</td>
<td>241</td>
<td>60.0</td>
<td>241</td>
<td>60.0</td>
<td>240</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>96</td>
<td>39.4</td>
<td>444</td>
<td>39.8</td>
<td>439</td>
<td>39.9</td>
<td>438</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>96</td>
<td>74.8</td>
<td>122</td>
<td>74.8</td>
<td>122</td>
<td>74.9</td>
<td>122</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>96</td>
<td>39.7</td>
<td>397</td>
<td>39.5</td>
<td>398</td>
<td>39.5</td>
<td>399</td>
</tr>
</tbody>
</table>

---

**SPECspeed®2017_fp_base = 223**

**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"

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:

- KMP_AFFINITY = "granularity=fine,compact"
- LD_LIBRARY_PATH = "*/home/cpu2017-1.1.0-ic19.0u5-2/lib/intel64"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

Transparent Huge Pages disabled by default

- echo never > /sys/kernel/mm/transparent_hugepage/enabled
- echo never > /sys/kernel/mm/transparent_hugepage/defrag

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.
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Dec-2020
Hardware Availability: Nov-2020
Software Availability: Apr-2020

### Platform Notes

**BIOS configuration:**
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
Hyper-Threading set to Disabled
Adjacent Cache Prefetch set to Disabled

Sysinfo program /home/cpu2017-1.1.0-ic19.0u5-2/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f88a3d7ed16e646a485a0011
running on localhost.localdomain Mon Dec 28 15:27:44 2020

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:
```plaintext
model name : Intel(R) Xeon(R) Gold 6348H CPU @ 2.30GHz
4 "physical id"s (chips)
96 "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 : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

From lscpu:
```plaintext
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6348H CPU @ 2.30GHz
Stepping: 11
CPU MHz: 1869.818
CPU max MHz: 4200.0000
CPU min MHz: 1000.0000
BogoMIPS: 4600.00
Virtualization: VT-x
```

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**

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**Lenovo Global Technology**

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**Tested by:** Lenovo Global Technology

**Test Date:** Dec-2020  
**Hardware Availability:** Nov-2020  
**Software Availability:** Apr-2020

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### Platform Notes (Continued)

| L1d cache: | 32K |
| L1i cache: | 32K |
| L2 cache:  | 1024K |
| L3 cache:  | 33792K |
| NUMA node0 CPU(s): | 0–23 |
| NUMA node1 CPU(s): | 24–47 |
| NUMA node2 CPU(s): | 48–71 |
| NUMA node3 CPU(s): | 72–95 |

**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
- rdtsscp
- lm
- constant_tsc
- art
- arch_perfmon
- pebs
- bts
- rep_good
- nopl
- xtopology
- nonstop_tsc
- cpuid
- aperfmperf
- pni
- pclmulqdq
- dtes64
- monitor
- ds_cpl
- vmx
- smx
- est
- tm2
- ssse3
- sdbg
- fma
- cx16
- xtrp
- 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
- intel_ppin
- ssbd
- mba
- ibrs
- ibpb
- ibrs_enhanced
- tpr_shadow
- vnmi
- flexpriority
- ept
- vpid
- fsgsbase
- tsc_adjust
- bmis
- smep
- bmi2
- erms
- invpcid
- rtm
- cqm
- mpx
- rdt_a
- avx512f
- avx512dq
- rdseed
- adx
- smap
- clflushopt
- clwb
- intel_pt
- avx512cd
- avx512bw
- avx512vl
- xsaveopt
- xsavec
- xgetbv1
- xsaves
- cqm_llc
- cqm_occum_llc
- cqm_mbm_total
- cqm_mbm_local
- avx512_bf16
- dtherm
- ida
- arat
- pin
- pts
- pku
- ospke
- avx512_vnni
- md_clear
- flush_l1d
- arch_capabilities

From /proc/cpuinfo cache data

- cache size : 33792 KB

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

<table>
<thead>
<tr>
<th>available: 4 nodes (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>node 0 cpus:  0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23</td>
</tr>
<tr>
<td>node 0 size: 386655 MB</td>
</tr>
<tr>
<td>node 0 free: 386365 MB</td>
</tr>
<tr>
<td>node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47</td>
</tr>
<tr>
<td>node 1 size: 387038 MB</td>
</tr>
<tr>
<td>node 1 free: 386389 MB</td>
</tr>
<tr>
<td>node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71</td>
</tr>
<tr>
<td>node 2 size: 387066 MB</td>
</tr>
<tr>
<td>node 2 free: 386858 MB</td>
</tr>
<tr>
<td>node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95</td>
</tr>
<tr>
<td>node 3 size: 387065 MB</td>
</tr>
<tr>
<td>node 3 free: 386866 MB</td>
</tr>
<tr>
<td>node distances:</td>
</tr>
<tr>
<td>node 0 1 2 3</td>
</tr>
<tr>
<td>0: 10 20 20 20</td>
</tr>
<tr>
<td>1: 20 10 20 20</td>
</tr>
<tr>
<td>2: 20 20 10 20</td>
</tr>
<tr>
<td>3: 20 20 20 10</td>
</tr>
</tbody>
</table>

From /proc/meminfo

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(Continued on next page)
## Lenovo Global Technology

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<tr>
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<td>Not Run</td>
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### CPU2017 License: 9017  
**Test Date:** Dec-2020  
**Hardware Availability:** Nov-2020  
**Software Availability:** Apr-2020

**Test Sponsor:** Lenovo Global Technology  
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**Platform Notes (Continued)**

- **MemTotal:** 1584974876 kB  
- **HugePages_Total:** 0  
- **Hugepagesize:** 2048 kB

From /etc/*release* /etc/*version*

```
 os-release:
  NAME="Red Hat Enterprise Linux"
  VERSION="8.2 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.2"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
  ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga
```

uname -a:  
```
Linux localhost.localdomain 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **itlb_multihit:** Not affected  
- **CVE-2018-3620 (L1 Terminal Fault):** Not affected  
- **Microarchitectural Data Sampling:** Not affected  
- **CVE-2017-5754 (Meltdown):** Not affected  
- **CVE-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp  
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: usercopy/swapgs barriers and __user pointer sanitization  
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling  
- **tsx_async_abort:** Not affected  

run-level 3 Dec 28 15:24  
```
SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5-2
```

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 838G 35G 803G 5% /home
```

From /sys/devices/virtual/dmi/id

- **BIOS:** Lenovo M5E107I-1.01 11/02/2020  
- **Vendor:** Lenovo  
- **Product:** ThinkSystem SR850 V2  
- **Product Family:** ThinkSystem

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(Continued on next page)
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SPECspeed®2017_fp_base = 223
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

Serial: 1234567890

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.
Memory:
  48x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

(End of data from sysinfo program)
Memory on this system run at 2933 MHz due to CPU limitation.

Compiler Version Notes

C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
-----------------|-----------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++, C, Fortran | 607.cactuBSSN_s(base)
-----------------|-----------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran         | 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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran, C     | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
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(Continued on next page)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
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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.cactusBSSN_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:
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

(Continued on next page)
### Base Optimization Flags (Continued)

C benchmarks (continued):
- `ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp` `-DSPEC_OPENMP`

Fortran benchmarks:
- `m64` `-DSPEC_OPENMP` `-xCORE-AVX512` `-ipo` `-O3` `-no-prec-div`
- `qopt-prefetch` `ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp`
- `nostandard-realloc-lhs`

Benmarks using both Fortran and C:
- `m64` `-std=c11` `-xCORE-AVX512` `-ipo` `-O3` `-no-prec-div` `-qopt-prefetch`
- `ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp` `-DSPEC_OPENMP`
- `nostandard-realloc-lhs`

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

You can also download the XML flags sources by saving the following links: