Lenovo Global Technology
ThinkSystem SR850 V2
(3.00 GHz, Intel Xeon Platinum 8360HL)

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

Hardware
CPU Name: Intel Xeon Platinum 8360HL
Max MHz: 4200
Nominal: 3000
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)
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
C/C++ Compiler for Linux;
Fortran: Version 19.0.5.281 of
Intel Fortran
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

**ThinkSystem SR850 V2**  
(3.00 GHz, Intel Xeon Platinum 8360HL)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>SPECspeed®2017_fp_base</th>
<th></th>
<th>SPECspeed®2017_fp_peak</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>96</td>
<td>62.6</td>
<td>942</td>
<td>63.5</td>
<td>929</td>
<td>908</td>
<td></td>
<td>Not Run</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>96</td>
<td>68.5</td>
<td>243</td>
<td>67.6</td>
<td>247</td>
<td>244</td>
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<td>Not Run</td>
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<tr>
<td>619.lbm_s</td>
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<td>29.6</td>
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<td>Not Run</td>
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<tr>
<td>621.wrf_s</td>
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<td>85.2</td>
<td>155</td>
<td>84.2</td>
<td>157</td>
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<tr>
<td>627.cam4_s</td>
<td>96</td>
<td>45.9</td>
<td>193</td>
<td>45.3</td>
<td>196</td>
<td>196</td>
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<td></td>
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<tr>
<td>628.pop2_s</td>
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<td>168</td>
<td>70.5</td>
<td>167</td>
<td>71.1</td>
<td>169</td>
<td></td>
<td>Not Run</td>
<td></td>
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<tr>
<td>638.imagick_s</td>
<td>96</td>
<td>53.1</td>
<td>271</td>
<td>53.7</td>
<td>268</td>
<td>268</td>
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<td>Not Run</td>
<td></td>
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<tr>
<td>644.nab_s</td>
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<td>32.7</td>
<td>535</td>
<td>32.8</td>
<td>533</td>
<td>525</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>69.1</td>
<td>132</td>
<td>69.7</td>
<td>131</td>
<td>131</td>
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<td>Not Run</td>
<td></td>
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<tr>
<td>654.roms_s</td>
<td>96</td>
<td>37.1</td>
<td>424</td>
<td>37.0</td>
<td>426</td>
<td>426</td>
<td></td>
<td>Not Run</td>
<td></td>
</tr>
</tbody>
</table>

### 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.
SPEC CPU®2017 Floating Point Speed Result

Lenovo Global Technology
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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

SPECspeed®2017_fp_base = 242
SPECspeed®2017_fp_peak = Not Run

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 295195f888a3d7ed1e6e46a485a0011
running on localhost.localdomain Wed Dec 23 23:04:05 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
model name : Intel(R) Xeon(R) Platinum 8360HL CPU @ 3.00GHz
  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:
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) Platinum 8360HL CPU @ 3.00GHz
Stepping: 11
CPU MHz: 2441.197
CPU max MHz: 4200.0000
CPU min MHz: 1200.0000
BogoMIPS: 6000.00
Virtualization: VT-x

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR850 V2
(3.00 GHz, Intel Xeon Platinum 8360HL)

SPECspeak®2017_fp_base = 242
SPECspeak®2017_fp_peak = Not Run

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 (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 mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpes gb dtscp
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_13 cd p13
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnum
flexpriority ept vpid fsbvbase tsc_adjust bni hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsavesopt xsavex xgetbv1 xsavec cqm_llc cqm_occu llc cqm_mbm_total
cqm_mbm_local avx512_bf16 dtherm ida arat pin pts pku ospke avx512_vnni md_clear
flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size: 33792 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 20 21 22 23
  node 0 size: 386655 MB
  node 0 free: 386298 MB
  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
  node 1 size: 387066 MB
  node 1 free: 386755 MB
  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
  node 2 size: 387038 MB
  node 2 free: 386848 MB
  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
  node 3 size: 387065 MB
  node 3 free: 386569 MB
  node distances:
    node 0 1 2 3
    0: 10 20 20 20
    1: 20 10 20 20
    2: 20 20 10 20
    3: 20 20 10 20

From /proc/meminfo

(Continued on next page)
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SPECspeed®2017_fp_base = 242
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Hardware Availability: Nov-2020
Software Availability: Apr-2020

Platform Notes (Continued)

MemTotal: 1584974576 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/swaps 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 23 23:02

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u5-2
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/sda2 xfs 838G 74G 764G 9% /home

From /sys/devices/virtual/dmi/id
    BIOS: Lenovo M5E107I-1.01 11/02/2020
    Vendor: Lenovo
    Product: ThinkSystem SR850 V2
    Product Family: ThinkSystem

(Continued on next page)
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Test Date: Dec-2020
Hardware Availability: Nov-2020
Software Availability: Apr-2020

Platform Notes (Continued)

Serial: none

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)

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)
------------------------------------------------------------------------------
(Continued on next page)
Lenovo Global Technology
ThinkSystem SR850 V2
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SPEC®2017 fp_base = 242
SPEC®2017 fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Hardware Availability: Nov-2020
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Compiler Version Notes (Continued)

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.
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.

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=gnu11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
  -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC/OpenMP

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SR850 V2**  
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<td>Lenovo Global Technology</td>
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### Base Optimization Flags (Continued)

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

**Benchmarks using both Fortran and C:**
- `-m64`  
- `-std=c11`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-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++:**
- `-m64`  
- `-std=c11`  
- `-xCORE-AVX512`  
- `-ipo`  
- `-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:


http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Cooperlake-A.xml

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