# Lenovo Global Technology

## ThinkSystem SN850

(2.40 GHz, Intel Xeon Platinum 8260)

<table>
<thead>
<tr>
<th>Model</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>96</td>
<td>Not Run</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>

## Hardware

### CPU Name:
Intel Xeon Platinum 8260

### Max MHz:
3900

### Nominal:
2400

### Enabled:
96 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:
35.75 MB I+D on chip per chip

### Other:
None

### Memory:
768 GB (48 x 16 GB 2Rx8 PC4-2933Y-R)

### Storage:
800 GB tmpfs

### Other:
None

## Software

### OS:
Red Hat Enterprise Linux Server release 7.6 (Maipo)

### Compiler:
C/C++: Version 19.0.4.227 of Intel C/C++

### Compiler for Linux:

### Fortran:
Version 19.0.4.227 of Intel Fortran

### Compiler for Linux:

### Parallel:
Yes

### Firmware:
Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 2.30 Jul-2019

### File System:
tmpfs

### System State:
Run level 3 (multi-user)

### Base Pointers:
64-bit

### Peak Pointers:
Not Applicable

### Other:
None

### Power Management:
Disable
Lenovo Global Technology
ThinkSystem SN850
(2.40 GHz, Intel Xeon Platinum 8260)

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

Results Table

<table>
<thead>
<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>
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<td>63.6</td>
<td>927</td>
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<td>231</td>
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<td>34.8</td>
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<td>133</td>
<td>97.8</td>
<td>135</td>
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<td>54.6</td>
<td>162</td>
<td>55.0</td>
<td>161</td>
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<tr>
<td>628.pop2_s</td>
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<td>186</td>
<td>63.8</td>
<td>180</td>
<td>65.9</td>
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<td>58.9</td>
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<td>59.1</td>
<td>244</td>
<td>58.7</td>
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<tr>
<td>644.nab_s</td>
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<td>415</td>
<td>42.2</td>
<td>414</td>
<td>42.3</td>
<td>413</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>117</td>
<td>76.4</td>
<td>119</td>
<td>76.9</td>
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<tr>
<td>654.roms_s</td>
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<td>61.7</td>
<td>255</td>
<td>55.6</td>
<td>283</td>
<td>57.4</td>
<td>274</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 208
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"
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

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact,1,0"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.0u4/lib/intel64"
OMP_STACKSIZE = "192M"

General Notes

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)
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ThinkSystem SN850
(2.40 GHz, Intel Xeon Platinum 8260)

SPECSpeed®2017_fp_base = 208
SPECSpeed®2017_fp_peak = Not Run

General Notes (Continued)

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.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it 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/cpu2017-1.1.0-ic19.0u4/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl6e6e46a485a001
running on localhost.localdomain Sat Oct 26 08:52:03 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) Platinum 8260 CPU @ 2.40GHz
  4 "physical id"s (chips)
 192 "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 : 48
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 16 17 18 19 20 21 22 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 192
On-line CPU(s) list: 0-191
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 4
NUMA node(s): 4

(Continued on next page)
Lenovo Global Technology
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SPECspeed®2017_fp_base = 208
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Oct-2019
Tested by: Lenovo Global Technology
Hardware Availability: Apr-2019
Software Availability: Aug-2019

Platform Notes (Continued)

Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8260 CPU @ 2.40GHz
Stepping: 6
CPU MHz: 2400.000
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0-23,96-119
NUMA node1 CPU(s): 24-47,120-143
NUMA node2 CPU(s): 48-71,144-167
NUMA node3 CPU(s): 72-95,168-191
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 xtopology nonstop_tsc
aperfmpref eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpre pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx fl64 rdrand lahf_lm abm 3nowprefetch epb cat_13 cdp_13 intel_p8in
intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmx flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rd_a
avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt
xsaves xsavec xgetbv1 cqmmq cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln
pts pku ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

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 96 97 98 99
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119
node 0 size: 196277 MB
node 0 free: 191467 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
120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141
142 143
node 1 size: 196608 MB
node 1 free: 182914 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
144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165
166 167
node 2 size: 196608 MB

(Continued on next page)
Lenovo Global Technology

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SPECspeed®2017_fp_base = 208
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Test Date: Oct-2019
Hardware Availability: Apr-2019
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Platform Notes (Continued)

node 2 free: 191982 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
168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189
190 191
node 3 size: 196608 MB
node 3 free: 187772 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: 792236452 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-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: No status reported
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: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

run-level 3 Oct 26 08:50
SPEC is set to: /home/cpu2017-1.1.0-ic19.0u4
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 800G 8.3G 792G 2% /home

From /sys/devices/virtual/dmi/id
BIOS: Lenovo -[IVE141E-2.30]- 07/02/2019
Vendor: Lenovo
Product: Lenovo ThinkSystem SN850 -[7X15NVz000]-
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 M393A2K43CB2-CVF 16 GB 2 rank 2933

(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 19.0.4.227 Build 20190416
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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================

(Continued on next page)
Lenovo Global Technology
ThinkSystem SN850
(2.40 GHz, Intel Xeon Platinum 8260)

SPECSpeed®2017_fp_base = 208
SPECSpeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Oct-2019
Hardware Availability: Apr-2019
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Compiler Version Notes (Continued)

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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran, C
| 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

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

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

Lenovo Global Technology
ThinkSystem SN850
(2.40 GHz, Intel Xeon Platinum 8260)

SPECspeed®2017_fp_base = 208
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Oct-2019
Tested by: Lenovo Global Technology
Hardware Availability: Apr-2019
Software Availability: Aug-2019

Base Portability Flags (Continued)

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

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 v1.1.0 on 2019-10-25 20:52:02-0400.
Originally published on 2019-11-12.