# SPEC CPU®2017 Floating Point Speed Result

## Lenovo Global Technology

**ThinkSystem SR850**  
(2.70 GHz, Intel Xeon Platinum 8280M)

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**CPU2017 License:** 9017  
**Test Date:** Oct-2018

**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** Apr-2019

**Tested by:** Lenovo Global Technology  
**Software Availability:** May-2019

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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_fp_base = 225</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>112</td>
<td>216</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>112</td>
<td>155</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>112</td>
<td>141</td>
</tr>
<tr>
<td>621.wrf_s</td>
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<td>174</td>
</tr>
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<td>627.cam4_s</td>
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<td>269</td>
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<td>508</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>112</td>
<td>125</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>112</td>
<td>431</td>
</tr>
</tbody>
</table>

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### Hardware

- **CPU Name:** Intel Xeon Platinum 8280M  
- **Max MHz:** 4000  
- **Nominal:** 2700  
- **Enabled:** 112 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:** 38.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 768 GB (48 x 16 GB 2Rx8 PC4-2933Y-R)  
- **Storage:** 1 x 800 GB SATA SSD  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 12 SP4 (x86_64)  
- **Kernel:** 4.12.14-94.41-default  
- **Compiler:**  
  - C/C++: Version 19.0.4.227 of Intel  
  - Fortran: Version 19.0.4.227 of Intel Fortran  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version TEE142E 2.30 released Aug-2019 tested as TEE141E 2.30 Jul-2019  
- **File System:** btrfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** --
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**SPECspeed®2017_fp_base = 225**

**SPECspeed®2017_fp_peak = Not Run**

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
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<td>430</td>
<td>36.6</td>
<td>431</td>
</tr>
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</table>

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-ic19.0u4/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 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.
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.
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#### Platform Notes

**BIOS configuration:**
- Choose Operating Mode set to Maximum Performance
- Choose Operating Mode set to Custom Mode
- Hyper-Threading set to Disable
- Adjacent Cache Prefetch set to Disable

**MONITOR/MWAIT** set to Enable

- Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
- Rev: r5974 of 2018-05-19 9bcd8f2999c33d61f64985e45859ea9
- running on linux-hxhl Tue Oct 2 03:24:01 2018

**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 8280M CPU @ 2.70GHz
- 4 "physical id"s (chips)
- 112 "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 : 28
  - siblings : 28
  - physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  - physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  - physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  - physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 112
- On-line CPU(s) list: 0-111
- Thread(s) per core: 1
- Core(s) per socket: 28
- Socket(s): 4
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz
- Stepping: 6
- CPU MHz: 2700.000

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

```plaintext
CPU max MHz:           4000.0000  
CPU min MHz:           1000.0000  
BogoMIPS:               5400.00  
Virtualization:        VT-x  
L1d cache:              32K  
L1i cache:              32K  
L2 cache:               1024K  
L3 cache:               39424K  
NUMA node0 CPU(s):     0-27  
NUMA node1 CPU(s):     28-55  
NUMA node2 CPU(s):     56-83  
NUMA node3 CPU(s):     84-111  
Flags:                  fpu vme de pse tsc msr pae mce cx8 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 arch_perfmon pebs rep_good nopl xtopology nonstop_tsc cpuid  
                        aperf perfctr pni pclmulqdq dtst64 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 ablp 3nowprefetch cpuid_fault epb cat_l3 cdp_l3  
                        invpcid_single intel_papin ssbd mba ibrs ibpb tpr_shadow vmmi flexpriority ept  
                        vpid fsbgbase tsc_adjust bmi1 hle avx2 smep bmi2  
                        erms invpcid rtm cqm mpx rdt_a  
                        avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl  
                        xsaveopt xsave xexmov xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mmb_total cqm_mmb_local  
                        dtherm ida arat pls pkt ospe avx512_vnni flush_lld arch_capabilities
```

/proc/cpuinfo cache data  
```plaintext
cache size : 39424 KB
```

From numactl --hardware  
WARNING: a numactl 'node' might or might not correspond to a physical chip.
```plaintext
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  24  25  26  27  
node 0 size:  193098 MB  
node 0 free:  192068 MB  
node 1 cpus:  28  29  30  31  32  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54  55  
node 1 size:  193520 MB  
node 1 free:  192472 MB  
node 2 cpus:  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83  
node 2 size:  193520 MB  
node 2 free:  193317 MB  
node 3 cpus:  84  85  86  87  88  89  90  91  92  93  94  95  96  97  98  99  100  101  102  103  104  105  106  107  108  109  110  111  
node 3 size:  193517 MB  
node 3 free:  193323 MB
```

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

0: 10 21 21 31  
1: 21 10 31 21  
2: 21 31 10 21  
3: 31 21 21 10

From /proc/meminfo
MemTotal: 792225040 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64) 
VERSION = 12
PATCHLEVEL = 4
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.

os-release:
NAME="SLES"
VERSION="12-SP4"
VERSION_ID="12.4"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Oct 2 02:33

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 744G 40G 705G 6% /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.

(Continued on next page)
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SPECspeed®2017_fp_base = 225
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Platform Notes (Continued)

BIOS Lenovo -[TEE141E-2.30]- 07/02/2019
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.cactusBSSN_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.
-----------------------------------------------

Fortran | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
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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)
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Compiler Version Notes (Continued)
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
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

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Base Optimization Flags (Continued)

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-D.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-D.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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