Lenovo Global Technology

ThinkSystem SD650 V2
(2.80 GHz, Intel Xeon Platinum 8362)

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

<table>
<thead>
<tr>
<th>Software</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>OS:</td>
<td>Red Hat Enterprise Linux 8.3 (Ootpa)</td>
</tr>
<tr>
<td></td>
<td>Kernel 4.18.0-240.el8.x86_64</td>
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<tr>
<td>Compiler:</td>
<td>Fortran: Version 2021.1 of Intel Fortran Compiler</td>
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<td>Classic Build 20201112 for Linux;</td>
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<td>C/C++: Version 2021.1 of Intel C/C++ Compiler</td>
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<td>Classic Build 20201112 for Linux</td>
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<td>Firmware:</td>
<td>Lenovo BIOS Version U8E111A 1.02 released May-2021</td>
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<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers:</td>
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<tr>
<td>Peak Pointers:</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
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</tr>
<tr>
<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Platinum 8362  
- **Max MHz:** 3600  
- **Nominal:** 2800  
- **Enabled:** 64 cores, 2 chips  
- **Orderable:** 2 chips  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 1.25 MB I+D on chip per core  
- **L3:** 48 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)  
- **Storage:** 1 x 480 GB SATA SSD  
- **Other:** None

---

**Threads**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base (229)</th>
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<tbody>
<tr>
<td>Threads</td>
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<tr>
<td>603.bwaves_s</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
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<tr>
<td>619.lbm_s</td>
</tr>
<tr>
<td>621.wrf_s</td>
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<tr>
<td>627.cam4_s</td>
</tr>
<tr>
<td>628.pop2_s</td>
</tr>
<tr>
<td>638.imagick_s</td>
</tr>
<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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<tr>
<td>654.roms_s</td>
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**Test Date:** Jun-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020
Results Table

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</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/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic2021.1-revB/jem5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
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.
Lenovo Global Technology

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General Notes (Continued)

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy
LLC Prefetch set to Enable
Hyper-Threading set to Disabled
Adjacent Cache Prefetch set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Fri Jun 25 10:50:44 2021

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 8362 CPU @ 2.80GHz
  2 "physical id"s (chips)
  64 "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 : 32
siblings : 32
  physical 0: cores 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 28 29 30 31
  physical 1: cores 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 28 29 30 31

From lscpu from util-linux 2.32.1:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 64
  On-line CPU(s) list: 0-63
  Thread(s) per core: 1
  Core(s) per socket: 32
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: GenuineIntel
  CPU family: 6

(Continued on next page)
## Lenovo Global Technology

ThinkSystem SD650 V2  
(2.80 GHz, Intel Xeon Platinum 8362)

| SPECspeed\(^\text{®2017}\) fp\(_\text{base}\) | 229 |
| SPECspeed\(^\text{®2017}\) fp\(_\text{peak}\) | Not Run |

| CPU2017 License: | 9017 |
| Test Sponsor: | Lenovo Global Technology |
| Tested by: | Lenovo Global Technology |
| Test Date: | Jun-2021 |
| Hardware Availability: | Jul-2021 |
| Software Availability: | Dec-2020 |

### Platform Notes (Continued)

- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Platinum 8362 CPU @ 2.80GHz
- **Stepping:** 6
- **CPU MHz:** 800.140
- **BogoMIPS:** 5600.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 49152K
- **NUMA node0 CPU(s):** 0-31
- **NUMA node1 CPU(s):** 32-63
- **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 aperfmperf 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 invpcid_single intel_pinn ssbd mba ibrs ibbp stibp ibrs_enabled tpr_shadow vnmi fpxprec fsp ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rd_t a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoinvd dtherm isa arat pln pts hwp_epp avx512vbm bmi umip pku ospke avx512_vmbmi2 gfnl vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconf cflush_l1d arch_capabilities

/proc/cpuinfo cache data

- **cache size:** 49152 KB

From `numactl --hardware`

**WARNING:** a `numactl 'node'` might or might not correspond to a physical chip.

- **available:** 2 nodes (0-1)
  - 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 28 29 30 31
  - node 0 size: 243861 MB
  - node 0 free: 256365 MB
  - node 1 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
  - node 1 size: 243138 MB
  - node 1 free: 257440 MB

- **node distances:**
  - node 0: 10 20
  - node 1: 20 10

From `/proc/meminfo`

- **MemTotal:** 528007216 KB

(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECSpeed®2017_fp_base = 229
SPECSpeed®2017_fp_peak = Not Run

Platform Notes (Continued)

HugePages_Total:       0
Hugepagesize:       2048 kB

/sbin/tuned-adm active
   No current active profile.

/usr/bin/lsb_release -d
   Red Hat Enterprise Linux release 8.3 (Ootpa)

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.3 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.3"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
   Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (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
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected
run-level 3 Jun 25 10:49

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

(Continued on next page)
Lenovo Global Technology
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SPECspeed®2017_fp_base = 229
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Platform Notes (Continued)

<table>
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<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda4</td>
<td>xfs</td>
<td>372G</td>
<td>125G</td>
<td>247G</td>
<td>34%</td>
<td>/home</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SD650 V2
Product Family: ThinkSystem
Serial: 1234567890

Additional information from dmidecode 3.2 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:
16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: U8E111A-1.02
BIOS Date: 05/07/2021
BIOS Revision: 1.2
Firmware Revision: 1.40

(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 Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C++, C, Fortran | 607.cactuBSSN_s(base)

Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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## Lenovo Global Technology

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### SPECspeed®2017_fp_base = 229

### SPECspeed®2017_fp_peak = Not Run

### Compiler Version Notes (Continued)

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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<th>Fortran</th>
<th>603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)</th>
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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<th>621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)</th>
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</table>

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

(Continued on next page)

### 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.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

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

## Lenovo Global Technology

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### Base Portability Flags (Continued)

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-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPC_OPENMP  
mbranches-within-32B-boundaries

**Fortran benchmarks:**

- m64 -Wl,-z,muldefs -DSPC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp  
nostandard-realloc-lhs mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

**Benchmarks using both Fortran and C:**

- m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp  
-DSPEC_OPENMP mbranches-within-32B-boundaries -nostandard-realloc-lhs  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

**Benchmarks using Fortran, C, and C++:**

- m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp  
-DSPEC_OPENMP mbranches-within-32B-boundaries -nostandard-realloc-lhs  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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-ICElake-E.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-ICElake-E.xml  
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
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<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2020</td>
</tr>
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Tested with SPEC CPU\(^{\circ2017}\) v1.1.8 on 2021-06-24 22:50:43-0400.

Report generated on 2021-07-21 15:47:00 by CPU2017 PDF formatter v6442.

Originally published on 2021-07-20.