Lenovo Global Technology
ThinkSystem SD650 V2
(2.60 GHz, Intel Xeon Platinum 8358)

SPECrater®2017_fp_base = 428
SPECrater®2017_fp_peak = Not Run

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

Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Hardware

CPU Name: Intel Xeon Platinum 8358
Max MHz: 3400
Nominal: 2600
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

Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 8.3
Kernel 4.18.0-240.el8.x86_64
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++
Compiler Build 20201113 for Linux;
Fortran: Version 2021.1 of Intel Fortran Compiler
Classic Build 20201112 for Linux;
C/C++: Version 2021.1 of Intel C/C++ Compiler
Classic Build 20201112 for Linux

Firmware: Lenovo BIOS Version U8E109PT1 1.01 released Apr-2021
Parallel: No
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS set to prefer performance at the cost of additional power usage
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes
The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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:
LD_LIBRARY_PATH = "'/home/cpu2017-1.1.5-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.5-ic202 1.1-revB/jre5.0.1-64"
MALLOCONF = "retain:true"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
Transparent Huge Pages enabled by default

(Continued on next page)
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General Notes (Continued)

Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>/proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
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.
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
Hyper-Threading set to Disabled
CPU Frequency Limits set to Restrict maximum frequency
Patrol Scrub set to Disabled
SNC set to Enabled

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on ip10-245-59-38.labs.lenovo.com Fri May 7 18:02:40 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 8358 CPU @ 2.60GHz
  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

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SD650 V2**  
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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
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</tbody>
</table>

### Platform Notes (Continued)

From `lscpu`:
- **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):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Platinum 8358 CPU @ 2.60GHz
- **Stepping:** 6
- **CPU MHz:** 1540.222
- **BogoMIPS:** 5200.00

**Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 49152K
- **NUMA node0 CPU(s):** 0-15
- **NUMA node1 CPU(s):** 16-31
- **NUMA node2 CPU(s):** 32-47
- **NUMA node3 CPU(s):** 48-63

**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 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 f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsave vppcpdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdrpid md_clear pconfig flush_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:** 4 nodes (0-3)  
  - node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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

Lenovo Global Technology
ThinkSystem SD650 V2
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SPECRate®2017_fp_peak = Not Run

CPU2017 License: 9017
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Platform Notes (Continued)

node 0 size: 126236 MB
def 0 free: 128257 MB
dnode 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
dnode 1 size: 126780 MB
def 1 free: 128162 MB
dnode 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
dnode 2 size: 127390 MB
def 2 free: 128620 MB
dnode 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
dnode 3 size: 127382 MB
def 3 free: 128697 MB
dnode distances:
node 0 1 2 3
0: 10 11 20 20
1: 11 10 20 20
2: 20 20 10 11
3: 20 20 11 10

From /proc/meminfo
MemTotal: 528005980 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
/sbin/tuned-adm active
Current active profile: throughput-performance
/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=rheil
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 ip10-245-59-38.labs.lenovo.com 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

(Continued on next page)
Lenovo Global Technology
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Test Sponsor: Lenovo Global Technology
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Test Date: May-2021
Hardware Availability: Jul-2021
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Platform Notes (Continued)

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/swapgs 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 May 7 17:57

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB
/procfilesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 372G 21G 351G 6% /home

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SD650 V2
Product Family: ThinkSystem
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:
16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: UBE109PT1-1.01
BIOS Date: 04/28/2021
BIOS Revision: 1.1
Firmware Revision: 1.40

(End of data from sysinfo program)
Lenovo Global Technology
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SPECratenot run.

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

Test Date: May-2021
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Compiler Version Notes

<table>
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<tr>
<th>Language</th>
<th>Test</th>
<th>Version</th>
<th>Notes</th>
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<tr>
<td>C</td>
<td>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</td>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
</tr>
<tr>
<td>C++</td>
<td>508.namd_r(base) 510.parest_r(base)</td>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
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<tr>
<td>C++, C</td>
<td>511.povray_r(base) 526.blender_r(base)</td>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
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<tr>
<td>C++, C, Fortran</td>
<td>507.cactuBSSN_r(base)</td>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
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<tr>
<td>C++, C, Fortran</td>
<td>513.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</td>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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**Compiler Version Notes (Continued)**

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For Fortran, C  
| 521.wrf_r(base) | 527.cam4_r(base) |

---

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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Base Compiler Invocation**

- **C benchmarks:**
  - icx

- **C++ benchmarks:**
  - icpx

- **Fortran benchmarks:**
  - ifort

- **Benchmarks using both Fortran and C:**
  - ifort icx

- **Benchmarks using both C and C++:**
  - icpx icx

- **Benchmarks using Fortran, C, and C++:**
  - icpx icx ifort

---

**Base Portability Flags**

- 503.bwaves_r: -DSPEC_LP64
- 507.cactuBSSN_r: -DSPEC_LP64
- 508.namd_r: -DSPEC_LP64
- 510.parest_r: -DSPEC_LP64
- 511.povray_r: -DSPEC_LP64
- 519.lbm_r: -DSPEC_LP64
- 521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char

(Continued on next page)
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Base Portability Flags (Continued)
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldef -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldef -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldef -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldef -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldef -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldef -xCORE-AVX512 -Ofast -ffast-math

(Continued on next page)
### Lenovo Global Technology

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#### SPECrate®2017 fp_base = 428

#### SPECrate®2017 fp_peak = Not Run

**Base Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++ (continued):
- -flto
- -mfpmath=sse
- -funroll-loops
- -qopt-mem-layout-trans=4
- -O3
- -no-prec-div
- -qopt-prefetch
- -ffinite-math-only
- -qopt-multiple-gather-scatter-by-shuffles
- -mbranches-within-32B-boundaries
- -nostandard-realloc-lhs
- -align array32byte
- -auto
- -ljemalloc
- -L/usr/local/jemalloc64-5.0.1/lib

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-ICElake-D.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml)