Lenovo Global Technology
ThinkSystem SR655
3.10 GHz, AMD EPYC 7252

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

SPECrate®2017_int_base = 59.7
SPECrate®2017_int_peak = 62.8

Test Date: Mar-2020
Hardware Availability: Jan-2020
Software Availability: Dec-2019

Hardware
CPU Name: AMD EPYC 7252
Max MHz: 3200
Nominal: 3100
Enabled: 8 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 512 KB I+D on chip per core
L3: 64 MB I+D on chip per chip, 16 MB shared / 2 cores
Other: None
Memory: 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software
OS: SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default
Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version CFE1070 released Dec-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc: jemalloc memory allocator library v5.2.0
Power Management: BIOS set to prefer performance at the cost of additional power usage
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Results Table

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

Submit Notes

The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu
dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)
Lenovo Global Technology

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**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH =
    "/home/cpu2017-1.1.0-amd-rome-aoocc200-C3/amd_rate_aoocc200_rome_C_lib/64;
    "/home/cpu2017-1.1.0-amd-rome-aoocc200-C3/amd_rate_aoocc200_rome_C_lib/32:";
MALLOC_CONF = "retain:true"
```

**General Notes**

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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.

jemalloc: configured and built with GCC v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2

**Platform Notes**

BIOS settings:
Set Operating Mode set to Maximum Performance
NUMA nodes per socket set to NPS4

Sysinfo program /home/cpu2017-1.1.0-amd-rome-aoocc200-C3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
running on linux-01om Sun Mar 22 00:04:25 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 : AMD EPYC 7252 8-Core Processor
  1 "physical id"s (chips)
  16 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
```

(Continued on next page)
### SPEC CPU®2017 Integer Rate Result

**Lenovo Global Technology**

ThinkSystem SR655  
3.10 GHz, AMD EPYC 7252

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---

### Platform Notes (Continued)

```
cpu cores : 8  
siblings : 16  
physical 0: cores 0 1 4 5 8 9 12 13
```

From `lscpu`:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
Address sizes:         43 bits physical, 48 bits virtual
CPU(s):                16
On-line CPU(s) list:   0-15
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):             1
NUMA node(s):          1
Vendor ID:             AuthenticAMD
CPU family:            23
Model:                 49
Model name:            AMD EPYC 7252 8-Core Processor
Stepping:              0
CPU MHz:               3100.000
CPU max MHz:           3100.0000
CPU min MHz:           1500.0000
BogoMIPS:              6187.80
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             32K
L2 cache:              512K
L3 cache:              16384K
NUMA node0 CPU(s):     0-15
```

Flags: `fpu vme de pse tsc msr pae mce cmov cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl xtopology nonstop_tsc copuid extd_apicid aperfmpref pni pmulldq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx fl16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpe xt perfctr_l2 mwaitx cpb cat_l3 cd pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cmqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv1 xsaves cmqm_llc cmqm_occup_llc cmqm_mbb_total cmqm_mbb_local clzero irperf xsaveerptr arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyassist decodeassist psfilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

/proc/cpuinfo cache data

cache size : 512 KB

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.

(Continued on next page)
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Platform Notes (Continued)

available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 257766 MB
node 0 free: 256999 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 263952908 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-01om 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

run-level 3 Mar 22 00:02

SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C3
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 893G 71G 822G 8% /

From /sys/devices/virtual/dmi/id

(Continued on next page)
Lenovo Global Technology
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**Platform Notes (Continued)**

BIOS: Lenovo
Vendor: Lenovo
Product: ThinkSystem SR655 -[7Y00000000]-
Product Family: ThinkSystem
Serial: 0123456789

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:
8x Samsung M393A4K40DB2-CWE 32 kB 2 rank 3200
8x Unknown Unknown

(End of data from sysinfo program)

**Compiler Version Notes**

=================================

C       | 502.gcc_r(peak)
--------

AOCC.LLV.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLV.2.0.0.B191.2019_07_19)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

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(Continued on next page)
## Lenovo Global Technology

### SPEC CPU²⁰¹⁷ Integer Rate Result

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**Base Compiler Invocation**

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

**Base Portability Flags**

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
Lenovo Global Technology
ThinkSystem SR655
3.10 GHz, AMD EPYC 7252

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Mar-2020

Specrate®2017_int_base = 59.7
Specrate®2017_int_peak = 62.8

Tested by: Lenovo Global Technology
Hardware Availability: Jan-2020
Software Availability: Dec-2019

### Base Optimization Flags

**C benchmarks:**
- `-flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math`
- `-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50`
- `-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist`
- `-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp`
- `-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000`
- `-flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc -lflang`

**C++ benchmarks:**
- `-flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3`
- `-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2`
- `-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC`
- `-mllvm -unroll-threshold=100 -flv-function-specialization`
- `-mllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm -ljemalloc -lflang`

**Fortran benchmarks:**
- `-flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3 -ffast-math`
- `-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsl-in-nested-loop`
- `-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops`

### Peak Compiler Invocation

**C benchmarks:**
- `clang`

**C++ benchmarks:**
- `clang++`

**Fortran benchmarks:**
- `flang`
## Lenovo Global Technology
### ThinkSystem SR655
3.10 GHz, AMD EPYC 7252

<table>
<thead>
<tr>
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### SPECrate®2017_int_base = 59.7

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### Peak Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>-DSPEC_LINUX_X64 -DSPEC_LP64</td>
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<tr>
<td>502.gcc_r</td>
<td>-D_FILE_OFFSET_BITS=64</td>
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<tr>
<td>505.mcf_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>-DSPEC_LINUX -D_FILE_OFFSET_BITS=64</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>-DSPEC_LP64</td>
</tr>
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<td>531.deepsjeng_r</td>
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</tr>
<tr>
<td>557.xz_r</td>
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</tr>
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</table>

### Peak Optimization Flags

**C benchmarks:**

<table>
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<tr>
<th>Benchmark</th>
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</table>

(Continued on next page)
Peak Optimization Flags (Continued)

505.mcf_r: -flto -Wl, -mllvm -Wl, -function-specialize
- Wl, -mllvm -Wl, -region-vectorize
- Wl, -mllvm -Wl, -vector-library=LIBMVEC
- Wl, -mllvm -Wl, -reduce-array-computations=3 -Ofast
- march=znver2 -mno-sse4a -fstruct-layout=5
- mllvm -vectorize-memory-aggressively
- mllvm -function-specialize -mllvm -enable-gvn-hoist
- mllvm -unroll-threshold=50 -fremap-arrays
- mllvm -vector-library=LIBMVEC
- mllvm -reduce-array-computations=3
- mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
- flv-function-specialization -lmvec -lamdlibm -ljemalloc
- lflang

525.x264_r: Same as 500.perlbench_r

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -flto -Wl, -mllvm -Wl, -function-specialize
- Wl, -mllvm -Wl, -region-vectorize
- Wl, -mllvm -Wl, -vector-library=LIBMVEC
- Wl, -mllvm -Wl, -reduce-array-computations=3 -Ofast
- march=znver2 -flv-function-specialization
- mllvm -unroll-threshold=100
- mllvm -enable-partial-unswitch
- mllvm -loop-unswitch-threshold=200000
- mllvm -vector-library=LIBMVEC
- mllvm -inline-threshold=1000 -ljemalloc

531.deepsjeng_r: -flto -Wl, -mllvm -Wl, -function-specialize
- Wl, -mllvm -Wl, -region-vectorize
- Wl, -mllvm -Wl, -vector-library=LIBMVEC
- Wl, -mllvm -Wl, -reduce-array-computations=3 -Ofast
- march=znver2 -flv-function-specialization
- mllvm -unroll-threshold=100
- mllvm -enable-partial-unswitch
- mllvm -loop-unswitch-threshold=200000
- mllvm -vector-library=LIBMVEC
- mllvm -inline-threshold=1000 -lmvec -lamdlibm -ljemalloc
- lflang

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### Lenovo Global Technology
ThinkSystem SR655
3.10 GHz, AMD EPYC 7252

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#### SPECrate®2017_int_base = 59.7

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**Peak Optimization Flags (Continued)**

541.leela_r: basepeak = yes

Fortran benchmarks:
548.exchange2_r: basepeak = yes

---

**Peak Other Flags**

C benchmarks:
502.gcc_r: -L/sppo/dev/cpu2017/v110/amd_rate_aocc200_rome_C_lib/32

C++ benchmarks:
523.xalancbmk_r: -L/sppo/dev/cpu2017/v110/amd_rate_aocc200_rome_C_lib/32

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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:

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