### Lenovo Global Technology

**ThinkSystem SR635**

2.90 GHz, AMD EPYC 7272

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Dec-2019

<table>
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<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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<tr>
<td>503.bwaves_r</td>
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<tr>
<td>554.roms_r</td>
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</table>

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### Hardware

- **CPU Name:** AMD EPYC 7272  
  - **Max MHz:** 3200  
  - **Nominal:** 2900  
  - **Enabled:** 12 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 core, 16 MB shared / 3 cores  
  - **Other:** None  
- **Memory:** 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

**OS:** SUSE Linux Enterprise Server 12 SP5 (x86_64)  
**Compiler:** C/C++/Fortran: Version 2.0.0 of AOCC  
**Parallel:** No  
**Firmware:** Lenovo BIOS Version CFE107O released Dec-2019  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 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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<td>921</td>
<td>41.4</td>
</tr>
</tbody>
</table>

**Results Table**


**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

(Continued on next page)
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SPECrate®2017_fp_base = 89.7
SPECrate®2017_fp_peak = 90.4

Operating System Notes (Continued)
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)

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/home/cpu2017-1.1.0-amd-rome-aocc200-C1/amd_rate_aocc200_rome_C_lib/64; /home/cpu2017-1.1.0-amd-rome-aocc200-C1/amd_rate_aocc200_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 NPS1

Sysinfo program /home/cpu2017-1.1.0-amd-rome-aocc200-C1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe6e46a485a0011
running on linux-4au0 Sun Mar 8 06:44:01 2020

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see

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

From `/proc/cpuinfo`

```
model name : AMD EPYC 7272 12-Core Processor
  1 "physical id"s (chips)
  24 "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 : 12
siblings : 24
physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14
```

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):              24
On-line CPU(s) list: 0-23
Thread(s) per core:  2
Core(s) per socket:  12
Socket(s):           1
NUMA node(s):        1
Vendor ID:           AuthenticAMD
CPU family:          23
Model:               49
Model name:          AMD EPYC 7272 12-Core Processor
Stepping:            0
CPU MHz:             2900.000
CPU max MHz:         2900.0000
CPU min MHz:         1500.0000
BogoMIPS:            5788.99
Virtualization:      AMD-V
L1d cache:           32K
L1i cache:           32K
L2 cache:            512K
L3 cache:            16384K
NUMA node0 CPU(s):   0-23
Flags:               fpu vme de pse tsc msr pae mce cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bptext perfctr_l2 mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmcvalll fsghost base bni1 avx2 smep bmi2 cvm rdt_a rdsrd adx smap clflushopt clwb sha ni xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaveerptr wbnoinvd
```

(Continued on next page)
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SPECrate®2017_fp_base = 89.7
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Platform Notes (Continued)

arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter 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.
    available: 1 nodes (0)
    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
    node 0 size: 257760 MB
    node 0 free: 257018 MB
    node distances:
        node 0
          0: 10

From /proc/meminfo
    MemTotal: 263946832 kB
    HugePages_Total: 0
    Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
    SuSE-release:
        SUSE Linux Enterprise Server 12 (x86_64)
        VERSION = 12
        PATCHLEVEL = 5
        # 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-SP5"
        VERSION_ID="12.5"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP5"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp5"

    uname -a:
        Linux linux-4au0 4.12.14-120-default #1 SMP Thu Nov 7 16:39:09 UTC 2019 (fd9dc36)
        x86_64 x86_64 x86_64 GNU/Linux

    Kernel self-reported vulnerability status:

        itlb_multihit: Not affected
        CVE-2018-3620 (L1 Terminal Fault): Not affected
        Microarchitectural Data Sampling: Not affected

    (Continued on next page)
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SPECrater®2017_fp_base = 89.7
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CPU2017 License: 9017
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Tested by: Lenovo Global Technology

Platform Notes (Continued)

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: Full AMD retpoline, IBBP: conditional, IBRS_FW, STIBP: conditional, RSB filling

tsx_async_abort: Not affected

run-level 3 Mar 7 20:16

SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 893G 31G 862G 4% /

From /sys/devices/virtual/dmi/id
BIOS: Lenovo CFE107O 12/28/2019
Vendor: Lenovo
Product: ThinkSystem SR635 -[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 | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak) |
| AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
==============================================================================

(Continued on next page)
## Compiler Version Notes (Continued)

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<th>508.namd_r(base, peak) 510.parest_r(base, peak)</th>
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<td>AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins) AOCC_2_0_0-Build#191 (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19) Target: x86_64-unknown-linux-gnu Thread model: posix InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin</td>
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Test Date: Mar-2020
Hardware Availability: Jan-2020
Software Availability: Dec-2019

Compiler Version Notes (Continued)
| 554.roms_r(base, peak) |
---|---
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak) |
---|---
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang
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SPECrate®2017_fp_base = 89.7
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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_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -D__BOOL_DEFINED -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
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:
-ffast-math
-march=znver2
-std=gnu99

C++ benchmarks:
-std=gnu++98

Fortran benchmarks:

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

Benchmarks using both Fortran and C:
- 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 -funroll-loops -Mrecursive -z muldefs
- -Kieee -fno-finite-math-only -lmvec -ljamddenx -ljamalloc -lflang

Benchmarks using both C and C++:
- -std=c++98 -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
- -fstruct-layout=3 -mllvm -unroll-threshold=50 -fremap-arrays
- -mllvm -function-specialize -mllvm -enable-gvn-hoist
- -mllvm -reduce-array-computations=3 -mllvm -inline-threshold=1000
- -flv-function-specialization -mllvm -loop-unschedule-threshold=200000
- -mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs
- -lmvec -ljamddenx -ljamalloc -lflang

Benchmarks using Fortran, C, and C++:
- -std=c++98 -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
- -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 -mllvm -loop-unschedule-threshold=200000
- -mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
- -funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
- -lmvec -ljamddenx -ljamalloc -lflang

Peak Compiler Invocation

C benchmarks:
clang

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR635
2.90 GHz, AMD EPYC 7272

SPEC CPU®2017 Floating Point Rate Result

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SPECrate®2017_fp_base = 89.7
SPECrate®2017_fp_peak = 90.4

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

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

Peak Compiler Invocation (Continued)

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
538.imagick_r: Same as 519.lbm_r
544.nab_r: basepeak = yes

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

C++ benchmarks:

508.namd_r: basepeak = yes
510.parest_r: basepeak = yes

Fortran benchmarks:


549.fotonik3d_r: basepeak = yes


Benchmarks using both Fortran and C:


Benchmarks using both C and C++:


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

511.povray_r (continued):
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000 -lmvec -lamdlibm
-ljemalloc -lflang

526.blender_r.basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r.basepeak = yes

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-Rome-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-Rome-E.xml

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

Tested with SPEC CPU®2017 v1.1.0 on 2020-03-07 17:44:00-0500.
Report generated on 2020-03-31 14:58:06 by CPU2017 PDF formatter v6255.
Originally published on 2020-03-31.