Lenovo Global Technology
ThinkSystem SR655
3.10 GHz, AMD EPYC 7232P

<table>
<thead>
<tr>
<th>Software</th>
<th>SPECspeed\textsuperscript{\textcopyright}2017_fp_base = 42.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License:</td>
<td>9017</td>
</tr>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Mar-2020</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Jan-2020</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Aug-2019</td>
</tr>
</tbody>
</table>

| Hardware | | SPECspeed\textsuperscript{\textcopyright}2017\_fp\_peak = 42.6 |
|----------|-----------------|
| CPU Name: | AMD EPYC 7232P |
| Max MHz: | 3200 |
| Nominal: | 3100 |
| Enabled: | 8 cores, 1 chip |
| 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: | 32 MB I+D on chip per chip, 8 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 |

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<tr>
<td>Parallel:</td>
<td>Yes</td>
</tr>
<tr>
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<tr>
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<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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## Lenovo Global Technology

**ThinkSystem SR655**  
3.10 GHz, AMD EPYC 7232P

### SPECspeed®2017_fp_base = 42.5

### SPECspeed®2017_fp_peak = 42.6

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Mar-2020  
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### Results Table

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<th>Benchmark</th>
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<th>Seconds</th>
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<th>Seconds</th>
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<tr>
<td>638.imagick_s</td>
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<td>369</td>
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<td>370</td>
<td>39.0</td>
<td>370</td>
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<td>649.fotonik3d_s</td>
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<td>40.5</td>
<td>389</td>
<td>40.5</td>
<td>383</td>
<td>41.1</td>
</tr>
</tbody>
</table>

**Results**  
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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<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.5</td>
<td>42.6</td>
</tr>
</tbody>
</table>

### 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 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2
### SPEC CPU®2017 Floating Point Speed Result

**Lenovo Global Technology**

**ThinkSystem SR655**

**3.10 GHz, AMD EPYC 7232P**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_peak</th>
<th>42.6</th>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_base</td>
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**CPU2017 License:** 9017  
**Test Date:** Mar-2020  
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**Software Availability:** Aug-2019

### Platform Notes

BIOS settings:
Set Operating Mode set to Maximum Performance  
SMT Mode set to Disabled

Sysinfo program /home/cpu2017-1.1.0-amd-rome-aocc200-C3/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011  
running on linux-01om Tue Mar  3 09:40:44 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 7232P 8-Core Processor  
 1 "physical id"s (chips)  
 8 "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 : 8  
siblings : 8  
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): 8  
On-line CPU(s) list: 0-7  
Thread(s) per core: 1  
Core(s) per socket: 8  
Socket(s): 1  
NUMA node(s): 1  
Vendor ID: AuthenticAMD  
CPU family: 23  
Model: 49  
Model name: AMD EPYC 7232P 8-Core Processor  
Stepping: 0  
CPU MHz: 3100.000  
CPU max MHz: 3100.0000  
CPU min MHz: 1500.0000  
BogoMIPS: 6188.15  
Virtualization: AMD-V  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 512K  
L3 cache: 8192K
```

(Continued on next page)
Lenovo Global Technology
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SPEC®2017 fp_base = 42.5
SPEC®2017 fp_peak = 42.6

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

Platform Notes (Continued)

NUMA node0 CPU(s): 0-7
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca 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 cpuid extd_apicid aperfmpref pni
pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb
cpu_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsqgsbase bmi2 avx2 smep
bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv1 xsaves
cqm_llc cqm_occup_llc cqm_mmb_total cqm_mmb_local clzero irperf xsaveerptr arat npt
lbrv svm_lock nrip_save tscp_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

From /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
  node 0 size: 257767 MB
  node 0 free: 257014 MB
  node distances:
    node 0
    0: 10

From /proc/meminfo
  MemTotal: 263953444 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
  os-release:
    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:

(Continued on next page)
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Platform Notes (Continued)

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 retropoline, IBBP: conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Mar 3 03:56

SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C3

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

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

Compiler Version Notes

==============================================================================
<table>
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<th>C</th>
<th>619.lbm_s(base, peak) 638.imagick_s(base, peak)</th>
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-----------------------------------------------------------------------------
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)
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#### Compiler Version Notes (Continued)

**C++, C, Fortran | 607.cactuBSSN_s(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 | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(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 | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(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
```

---

### SPEC CPU®2017 Floating Point Speed Result

![spec](spec)  
**SPECspeed®2017_fp_base = 42.5**  
**SPECspeed®2017_fp_peak = 42.6**
SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

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### Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

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

### Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64

621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
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:
-fflto -Wl,-mllvm -Wl,-function-specialize
-llflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-llflto -Wl,-mllvm -Wl,-reduce-array-computations=3 -03 -ffast-math
-march=zenvr2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremskip -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-binary=LIBMVEC -mllvm -inline-threshold=1000
-ffunction-specialization -z muldefs -DSPEC_OPENMP -fpopenmp
-fopenmp -ffast-math -fopenmp -llflto -fopenmp -flto -Wl,-mllvm -Wl,-function-specialize
-llflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC

Fortran benchmarks:
-llflto -Wl,-mllvm -Wl,-function-specialize
-llflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC

(Continued on next page)
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SPECspeed®2017_fp_base = 42.5
SPECspeed®2017_fp_peak = 42.6

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-ml1vm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-ml1vm -Wl,-funroll-loops -Mrecursive -ml1vm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamlalibm -ljemalloc -lflang

Base Other Flags

C benchmarks:
- Wno-return-type

Fortran benchmarks:
- Wno-return-type

Benchmarks using both Fortran and C:
- Wl,-fno-return-type
- Wl,-fno-return-type

Benchmarks using Fortran, C, and C++:
- std=c++98 -Wl,-fno-return-type

Base Other Flags

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**  
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**Lenovo Global Technology**  
ThinkSystem SR655  
3.10 GHz, AMD EPYC 7232P  

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
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<tbody>
<tr>
<td>42.5</td>
<td>42.6</td>
</tr>
</tbody>
</table>

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

| Test Date: | Mar-2020 |
| Test Sponsor: | Lenovo Global Technology |
| Hardware Availability: | Jan-2020 |
| Software Availability: | Aug-2019 |

**Base Other Flags (Continued)**

Benchmarks using Fortran, C, and C++:  
-Wno-return-type

**Peak Compiler Invocation**

C benchmarks:  
clang

Fortran benchmarks:  
flang

Benchmarks using both Fortran and C:  
flang clang

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

**Peak Portability Flags**

Same as Base Portability Flags

**Peak Optimization Flags**

C benchmarks:

```c
619.lbm_s: basepeak = yes
```

```c
```

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

638.imagick_s (continued):
   -ljemalloc -lflang

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: -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
   -march=znver2 -funroll-loops -Mrecursive
   -mllvm -vector-library=LIBMVEC -Kieee
   -fno-finite-math-only -DSPEC_OPENMP -fopenmp
   -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
   -ljemalloc -lflang

654.roms_s: -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,-enable-X86-prefetching -O3 -march=znver2
   -funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC
   -Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp
   -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
   -ljemalloc -lflang

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

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 -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

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**Peak Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++ (continued):
- `flv-function-specialization`
- `mllvm -unroll-threshold=100`
- `mllvm -enable-partial-unswitch`
- `mllvm -loop-unswitch-threshold=200000`
- `-O3 -funroll-loops -Mrecursive -Kieee -fno-finite-math-only`
- `-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec`
- `-lamdlibm -ljemalloc -lflang`

**Peak Other Flags**

C benchmarks:
- `-Wno-return-type`

Fortran benchmarks:
- `-Wno-return-type`

Benchmarks using both Fortran and C:
- `-Wno-return-type`

Benchmarks using Fortran, C, and C++:
- `-Wno-return-type`

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