## SPEC CPU®2017 Floating Point Rate Result

**Altos Computing Inc.**

**BrainSphere R385 F4 (AMD EPYC 7252)**

### CPU2017 License: 97
Test Sponsor: Altos Computing Inc.
Tested by: Altos Computing Inc.

Hardware Availability: Dec-2019
Software Availability: Dec-2019

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_peak</th>
<th>SPECrate®2017_fp_base</th>
</tr>
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<tbody>
<tr>
<td>149</td>
<td>148</td>
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**Test Date:** Dec-2020

<table>
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<th>Copies</th>
<th>SPECrate®2017_fp_peak</th>
<th>SPECrate®2017_fp_base</th>
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</thead>
<tbody>
<tr>
<td>32</td>
<td>156</td>
<td>328</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** AMD EPYC 7252
- **Max MHz:** 3200
- **Nominal:** 3100
- **Enabled:** 16 cores, 2 chips, 2 threads/core
- **Orderable:** 1,2 chips
- **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 / 2 cores
- **Other:** None
- **Memory:** 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
- **Storage:** 1 x 1.6 TB SATA SSD
- **Other:** None

### Software

- **OS:** Ubuntu 19.04
- **Kernel:** 5.0.0-38-generic
- **Compiler:** C/C++/Fortran: Version 2.0.0 of AOCC
- **Parallel:** No
- **Firmware:** Version R27 released Aug-2020
- **File System:** ext4
- **System State:** Run level 5 (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
SPEC CPU®2017 Floating Point Rate Result

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Altos Computing Inc.
BrainSphere R385 F4 (AMD EPYC 7252)

SPECrate®2017_fp_base = 148
SPECrate®2017_fp_peak = 149

Results Table

<table>
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</tbody>
</table>

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

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SPECraten2017_fp_base = 148
SPECraten2017_fp_peak = 149

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/amd_rate_aocc200_rome_C_lib/64;/home/cpu2017/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.

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:
Power Policy Quick Settings set to Best Performance
NUMA Nodes Per Socket set to NPS4

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011
running on ubuntu Wed Dec 16 12:35:28 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

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

model name : AMD EPYC 7252 8-Core Processor

2 "physical id"s (chips)
32 "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 : 16
physical 0: cores 0 1 4 5 8 9 12 13
physical 1: 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): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 8
NUMA node(s): 2
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7252 8-Core Processor
Stepping: 0
CPU MHz: 1499.660
CPU max MHz: 3100.0000
CPU min MHz: 1500.0000
BogoMIPS: 6200.08
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-7,16-23
NUMA node1 CPU(s): 8-15,24-31
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 xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes 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 bpeext perfctr_llc mwwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cgmx rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsaves xsavec xgetbv1 xsave cqm_llc cqm_occcup_llc cqm_mbb_total cqm_mbb_local clzero iperf xsaveerptr wbnoinvd arat npt lbrv svm_lock nirp_save tscc scale vmcb_clean flushbyasid
```
### Platform Notes (Continued)

```plaintext
decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid
overflow_recover 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.

```plaintext
available: 2 nodes (0-1)
  node 0 cpus: 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23
  node 0 size: 257910 MB
  node 0 free: 257220 MB
  node 1 cpus: 8 9 10 11 12 13 14 15 24 25 26 27 28 29 30 31
  node 1 size: 258019 MB
  node 1 free: 257548 MB
node distances: 
  node  0   1
  0:  10  32
  1:  32  10
```

From `/proc/meminfo`
```
MemTotal:       528312244 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

```
/usr/bin/lsb_release -d
  Ubuntu 19.04
```

From `/etc/*release* /etc/*version*
```
debian_version: buster/sid
os-release:
  NAME="Ubuntu"
  VERSION="19.04 (Disco Dingo)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 19.04"
  VERSION_ID="19.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"
```

```
uname -a:
  Linux ubuntu 5.0.0-38-generic #41-Ubuntu SMP Tue Dec 3 00:27:35 UTC 2019 x86_64 x86_64
  x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:
```
  itlb_multihit: Not affected
```

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Test Sponsor: Altos Computing Inc.  
Tested by: Altos Computing Inc.

| SPECrate®2017_fp_base | 148 |
| SPECrate®2017_fp_peak | 149 |
| Test Date: Dec-2020 |
| Hardware Availability: Dec-2019 |
| Software Availability: Dec-2019 |

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: usercopy/swapgs barriers and __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retropoline, IBPP: conditional, IBRS_FW, STIBP: conditional, RSB filling
- tsx_async_abort: Not affected

run-level 5 Dec 16 05:33

SPEC is set to: /home/cpu2017

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      ext4  1.5T   47G  1.4T   4% /

From /sys/devices/virtual/dmi/id
  BIOS:    GIGABYTE R27 08/21/2020
  Vendor:  Altos
  Product: BrainSphere R385 F4
  Product Family: Server
  Serial:  GJG4P8612A0015

 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 kB 2 rank 3200
    16x 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

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SPECrate®2017_fp_base = 148
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Compiler Version Notes (Continued)

------------------------------------------------------------------------------
| C++                     | 508.namd_r(base, peak) 510.parest_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)
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Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
------------------------------------------------------------------------------

------------------------------------------------------------------------------
| C++, C                  | 511.povray_r(base, peak) 526.blender_r(base, peak) |
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
------------------------------------------------------------------------------

------------------------------------------------------------------------------
| C++, C, Fortran          | 507.cactuBSSN_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)
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Thread model: posix
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
------------------------------------------------------------------------------

(Continued on next page)
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 = 148
SPECrate®2017_fp_peak = 149

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.ibm_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:
-fflto -Wl,-mllvm -Wl,-function-specialize
-fflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-fflto -Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-fflto -Wl,-mllvm -Wl,-unroll-threshold=50
-fflto -Wl,-mllvm -function-specialize -mllvm -enable-gvn-hoist
-fflto -Wl,-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-fflto -Wl,-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-fflto -Wl,-funroll-loops -mllvm -function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
-fflto -Wl,-fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

C++ benchmarks:
-std=c++98 -fflto -Wl,-mllvm -Wl,-function-specialize
-fflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-fflto -Wl,-mllvm -Wl,-reduce-array-computations=3
-fflto -Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fflto -Wl,-loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-fflto -Wl,-unroll-threshold=1000 -flv-function-specialization
-fflto -Wl,-enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-fflto -Wl,-fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

Fortran benchmarks:
-fflto -Wl,-mllvm -Wl,-function-specialize
-fflto -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-fflto -Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-fflto -Wl,-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-fflto -Wl,-fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

(Continued on next page)
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 -lamdlibm -ljemalloc -llflang

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 -global-vectorize-slp
- mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
- flv-function-specialization -mllvm -loop-unswitch-threshold=200000
- mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs
- lmvec -lamdlibm -ljemalloc -llflang

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-unswitch-threshold=200000
- mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
- -funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
- lmvec -lamdlibm -ljemalloc -llflang

Peak Compiler Invocation

C benchmarks:
clang

(Continued on next page)
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:

519.lbm_r: basepeak = yes


544.nab_r: basepeak = yes

(Continued on next page)
Altos Computing Inc.

BrainSphere R385 F4 (AMD EPYC 7252)

CPU2017 License: 97
Test Sponsor: Altos Computing Inc.
Tested by: Altos Computing Inc.

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

Peak Optimization Flags (Continued)

C++ benchmarks:

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

Fortran benchmarks:

503.bwaves_r: basepeak = yes
549.fotonik3d_r: basepeak = yes


Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes
527.cam4_r: basepeak = yes

Benchmarks using both C and C++:


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

**Altos Computing Inc.**

**BrainSphere R385 F4 (AMD EPYC 7252)**

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#### Peak Optimization Flags (Continued)

- 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:


You can also download the XML flags sources by saving the following links:


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