**Altos Computing Inc.**

**BrainSphere W2050h-W275h F5 (AMD EPYC 7252)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 120</th>
<th>SPECrate®2017_int_peak = 125</th>
</tr>
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<td>Test Date: Dec-2020</td>
</tr>
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<td>Hardware Availability: Jul-2020</td>
</tr>
<tr>
<td>Tested by: Altos Computing Inc.</td>
<td>Software Availability: Dec-2019</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 chip, 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
- Compiler: Kernel 5.0.0-38-generic
- Parallel: No
- Firmware: Version R15 released Jun-2020
- File System: ext4
- System State: Run level 5 (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

### SPEC CPU 2017 Integer Rate Result

<table>
<thead>
<tr>
<th>Test</th>
<th>Copies</th>
<th>SPECrate®2017_int_base</th>
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<tr>
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<td>32</td>
<td>88.8</td>
<td>116</td>
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<tr>
<td>gcc_r</td>
<td>32</td>
<td>135</td>
<td>184</td>
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<tr>
<td>mcf_r</td>
<td>32</td>
<td>63.8</td>
<td>115</td>
</tr>
<tr>
<td>omnetpp_r</td>
<td>32</td>
<td>132</td>
<td>201</td>
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<tr>
<td>xalancbmk_r</td>
<td>32</td>
<td>242</td>
<td>247</td>
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<tr>
<td>x264_r</td>
<td>32</td>
<td>98.5</td>
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<td>deepsjeng_r</td>
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<td>leela_r</td>
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<tr>
<td>exchange2_r</td>
<td>32</td>
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SPECrate®2017_int_base (120) --- SPECrate®2017_int_peak (125)
Altos Computing Inc.  

**SPEC CPU®2017 Integer Rate Result**  

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<td>520.omnetpp_r</td>
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<tr>
<td>548.exchange2_r</td>
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<td>557.xz_r</td>
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<td>71.8</td>
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<td>71.9</td>
</tr>
</tbody>
</table>

**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)
### SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**

**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 295195f888a3d7edble6e46a485a0011
running on ubuntu Mon Dec 28 09:31:54 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
  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
```

(Continued on next page)
Altos Computing Inc.

BrainSphere W2050h-W275h F5 (AMD EPYC 7252)

SPEC CPU®2017 Integer Rate Result

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CPU2017 License: 97
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Platform Notes (Continued)

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
Socket(s): 2
NUMA node(s): 2
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7252 8-Core Processor
Stepping: 0
CPU MHz: 1382.678
CPU max MHz: 3100.0000
CPU min MHz: 1500.0000
BogoMIPS: 6200.18
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 cx8 apic sep mtrr pge mca cmov pmct pdcm cmov apic vt dmb
From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

/proc/cpuinfo cache data

cache size : 512 KB

Page 4 Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/
# SPEC CPU®2017 Integer Rate Result

## Altos Computing Inc. 

### SPEC CPU®2017 Integer Rate Result

**SPEC CPU®2017 int_base = 120**

**SPEC CPU®2017 int_peak = 125**

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<td>Altos Computing Inc.</td>
</tr>
</tbody>
</table>

### Platform Notes (Continued)

- **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:** 257886 MB
- **node 0 free:** 257352 MB
- **node 1 cpus:** 8 9 10 11 12 13 14 15 24 25 26 27 28 29 30 31
- **node 1 size:** 258043 MB
- **node 1 free:** 257485 MB
- **node distances:**
  - 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 GNU/Linux**

**Kernel self-reported vulnerability status:**
- **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: userscopy/swaps barriers and __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Full AMD retpoline, IBPB:

(Continued on next page)
Altos Computing Inc.

BrainSphere W2050h-W275h F5 (AMD EPYC 7252)

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SPECratenet_int_base = 120
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Platform Notes (Continued)

conditional, IBRS_FW, STIBP: conditional, RSB filling
Not affected

tsx_async_abort:

run-level 5 Dec 25 17:57

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 R15 06/19/2020
Vendor: Altos
Product: BrainSphere W2050h-W275h F5
Product Family: Server
Serial: DG9P89A21A0012

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

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 502.gcc_r(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: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
==============================================================================

==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
       | 525.x264_r(base, peak) 557.xz_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
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(Continued on next page)
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### Compiler Version Notes (Continued)

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------------------------------------------------------------------------------

C++ |
| 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) |
| 531.deepsjeng_r(base, peak) 541.leela_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

------------------------------------------------------------------------------

Fortran |
| 548.exchange2_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

Base Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64

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

Altos Computing Inc.

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Tested by: Altos Computing Inc.
Hardware Availability: Jul-2020
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Base Portability Flags (Continued)

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

Base Optimization Flags

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

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

Fortran benchmarks:
- flto -Wl,-mlc -Wl,-function-specialize
- Wl,-mlc -Wl,-region-vectorize -Wl,-mlc -Wl,-vector-library=LIBMVEC
- Wl,-mlc -Wl,-reduce-array-computations=3 -ffast-math
- Wl,-mlc -Wl,-inline-recursion=4 -Wl,-mlc -Wl,-lsl-in-nested-loop
- Wl,-mlc -Wl,-enable-lv-split -O3 -march=znver2 -funroll-loops
- Mrecursive -mlc -vector-library=LIBMVEC -z muldefs
- mlc -disable-indvar-simplify -mlc -unroll-aggressive
- mlc -unroll-threshold=150 -lmvec -lamdlibm -ljemalloc -lflang
# SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**

**BrainSphere W2050h-W275h F5 (AMD EPYC 7252)**

**SPECrate®2017_int_base = 120**

**SPECrate®2017_int_peak = 125**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Value</th>
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<tr>
<td>CPU2017 License</td>
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<td>Test Sponsor</td>
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<td>Altos Computing Inc.</td>
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<td>Test Date</td>
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<td>Hardware Availability</td>
<td>Jul-2020</td>
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<tr>
<td>Software Availability</td>
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</tr>
</tbody>
</table>

## Peak Compiler Invocation

### C benchmarks:
- clang

### C++ benchmarks:
- clang++

### Fortran benchmarks:
- flang

## Peak Portability Flags

- 500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
- 502.gcc_r: -D_FILE_OFFSET_BITS=64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbmk_r: -DSPEC_LINUX -D_FILE_OFFSET_BITS=64
- 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

## Peak Optimization Flags

### C benchmarks:
- 500.perlbench_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
- -fprofile-instr-generate(pass 1)
- -fprofile-instr-use(pass 2) -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

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

502.gcc_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 -mno-sse4a -flstruct-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 -fgnu89-inline -ljemalloc

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 -flstruct-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: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalanbmk_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

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Altos Computing Inc.

BrainSphere W2050h-W275h F5 (AMD EPYC 7252)

SPECrate®2017_int_base = 120
SPECrate®2017_int_peak = 125

Peak Optimization Flags (Continued)

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

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

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Altos-Platform-Settings-V1.0-revC.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Altos-Platform-Settings-V1.0-revC.xml

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

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