Altos Computing Inc.

BrainSphere T110 F5 (Intel Xeon E-2224)

SPECRate®2017_fp_base = 32.7
SPECRate®2017_fp_peak = 31.7

CPU2017 License: 97
Test Sponsor: Altos Computing Inc.
Tested by: Altos Computing Inc.
Test Date: Aug-2021
Hardware Availability: Jan-2020
Software Availability: Aug-2020

<table>
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<tr>
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<tr>
<td>554.roms_r</td>
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<td>15.1</td>
<td>15.1</td>
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</tbody>
</table>

Hardware

CPU Name: Intel Xeon E-2224
Max MHz: 4600
Nominal: 3400
Enabled: 4 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 256 KB I+D on chip per core
L3: 8 MB I+D on chip per chip
Other: None
Memory: 64 GB (4 x 16 GB 2Rx4 PC4-2666V-U)
Storage: 1 x 240 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.1 (Ootpa)
Compiler: C/C++: Version 19.1.2.275 of Intel C/C++ Compiler Build 20200604 for Linux;
Fortran: Version 19.1.2.275 of Intel Fortran Compiler Build 20200623 for Linux
Parallel: No
Firmware: Version 1.0b.V2 released Aug-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS set to prefer performance at the cost of additional power usage
Altos Computing Inc.

BrainSphere T110 F5 (Intel Xeon E-2224)

SPEC CPU®2017 Floating Point Rate Result

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SPECrate®2017_fp_base = 32.7

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Results Table

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</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 32.7

SPECrate®2017_fp_peak = 31.7

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset commands to bind each copy to a specific processor. For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/spec2017/lib/intel64:/home/spec2017/je5.0.1-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:

(Continued on next page)
Altos Computing Inc.

| SPECrate®2017_fp_base = 32.7 |
| SPECrate®2017_fp_peak = 31.7 |

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

General Notes (Continued)

sync; echo 3> /proc/sys/vm/drop_caches

Yes: 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.


Platform Notes

BIOS Configuration:
Boot Performance Mode set to Turbo Performance
C states set to Disabled

Sysinfo program /home/spec2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acac64d
running on t110f5 Fri Aug 27 07:56:51 2021

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 : Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
  1 "physical id"s (chips)
  4 "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 : 4
  siblings : 4
  physical 0: cores 0 1 2 3

From lscpu from util-linux 2.32.1:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel

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

Altos Computing Inc.
BrainSphere T110 F5 (Intel Xeon E-2224)

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

Platform Notes (Continued)

CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
Stepping: 10
CPU MHz: 4278.935
CPU max MHz: 4600.0000
CPU min MHz: 800.0000
BogoMIPS: 6816.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-3

Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpte1gb rdtscp lm constant_tsc arch_perfmon pebs tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_eoi md_clear flush_l1d

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
node 0 size: 64066 MB
node 0 free: 51287 MB
node distances:
node 0
0: 10

From /proc/meminfo

MemTotal: 65604528 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has

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Altos Computing Inc.  
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Hardware Availability: Jan-2020  
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Platform Notes (Continued)

performance

From /etc/*release* /etc/*version*

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
Linux t110f5 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (ITLB Multihit): No status reported
CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion; VMX: conditional cache flushes, SMT disabled

Microarchitectural Data Sampling:

CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp

CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full generic retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): No status reported
CVE-2019-11135 (TSX Asynchronous Abort): No status reported

run-level 3 Aug 27 11:06

SPEC is set to: /home/spec2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 151G 13G 138G 9% /home

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Altos Computing Inc.
BrainSphere T110 F5 (Intel Xeon E-2224)

SPECrate®2017_fp_base = 32.7
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Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
Vendor: Altos
Product: BrainSphere T110 F5
Product Family: BrainSphere
Serial: USRJYTA001929000090V00

Additional information from dmidecode 3.2 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:
4x 017A 76.D102G.D890B 16 GB 2 rank 2667

Compiler Version Notes

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Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200604
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Compiler Version Notes (Continued)

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Intel(R) C Compiler for applications running on Intel(R) 64, Version
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-------------------------------------------------------------
C++, C          | 511.povray_r(peak)

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version
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-------------------------------------------------------------
C++, C          | 511.povray_r(base) 526.blender_r(base, peak)

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-------------------------------------------------------------
C++, C, Fortran | 507.cactuBSSN_r(base, peak)

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Intel (R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
               | 554.roms_r(base, peak)
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Fortran, C      | 521.wrf_r(base) 527.cam4_r(base, peak)

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Fortran, C      | 521.wrf_r(peak)

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Fortran, C      | 521.wrf_r(base) 527.cam4_r(base, peak)

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.2.275 Build 20200623  
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------------------------------------------------------------------------------  

Base Compiler Invocation  

C benchmarks:  
icc  

C++ benchmarks:  
icpc  

Fortran benchmarks:  
ifort  

Benchmarks using both Fortran and C:  
ifort icc  

Benchmarks using both C and C++:  
icpc icc  

Benchmarks using Fortran, C, and C++:  
icpc icc ifort  

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_LP64 -DSPEC_CASE_FLAG -convert big_endian  
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char  
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG  

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

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:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Benchmarks using both Fortran and C:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Benchmarks using both C and C++:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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Altos Computing Inc.

BrainSphere T110 F5 (Intel Xeon E-2224)

**SPEC CPU®2017 Floating Point Rate Result**

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_peak</th>
<th>31.7</th>
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<tbody>
<tr>
<td>SPECrate®2017_fp_base</td>
<td>32.7</td>
</tr>
</tbody>
</table>

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

### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
- `-m64 -m64 -qnextgen -std=c11`
- `-Wl,-plugin-opt=--x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops`
- `-qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles`
- `-nostandard-realloc-lhs -align array32byte -auto`
- `-mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib`
- `-ljemalloc`

### Peak Compiler Invocation

**C benchmarks:**
`icc`

**C++ benchmarks:**
`icpc`

**Fortran benchmarks:**
`ifort`

Benchmarks using both Fortran and C:
`ifort icc`

Benchmarks using both C and C++:
`icpc icc`

Benchmarks using Fortran, C, and C++:
`icpc icc ifort`

### Peak Portability Flags

Same as Base Portability Flags

### Peak Optimization Flags

**C benchmarks:**

`519.lbm_r: basepeak = yes`

(Continued on next page)
Altos Computing Inc.

BrainSphere T110 F5 (Intel Xeon E-2224)

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**Peak Optimization Flags (Continued)**

538.imagick_r: basepeak = yes

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: -m64 -qnextgen
   -W1,-plugin-opt=-x86-branches-within-32B-boundaries
   -W1,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math -ftlo
   -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
   -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

503.bwaves_r: -m64 -W1,-plugin-opt=-x86-branches-within-32B-boundaries
   -W1,-z,muldefs -xCORE-AVX2 -O3 -ipo -no-prec-div
   -qopt-prefetch -ffinite-math-only
   -qopt-multiple-gather-scatter-by-shuffles
   -qopt-mem-layout-trans=4 -nostandard-realloc-lhs
   -align array32byte -auto -mbranches-within-32B-boundaries
   -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
   -no-prec-div -qopt-prefetch -ffinite-math-only
   -qopt-multiple-gather-scatter-by-shuffles
   -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
   -nostandard-realloc-lhs -align array32byte -auto
   -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
   -no-prec-div -qopt-prefetch -ffinite-math-only
   -qopt-multiple-gather-scatter-by-shuffles
   -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
   -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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## SPEC CPU®2017 Floating Point Rate Result

**Altos Computing Inc.**  
**BrainSphere T110 F5 (Intel Xeon E-2224)**  

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| SPECrate®2017_fp_base = 32.7 | SPECrate®2017_fp_peak = 31.7 |

### 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: