# SPEC CPU®2017 Integer Rate Result

## Altos Computing Inc.

**BrainSphere T110 F5 (Intel Xeon E-2224)**

**SPECrace®2017_int_base = 30.7**

**SPECrace®2017_int_peak = 31.4**

**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

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### Copies

<table>
<thead>
<tr>
<th>Specbench</th>
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<tr>
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<tr>
<td>557.xz_r</td>
<td>4</td>
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</tbody>
</table>

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### 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  
**Cache L2:** 256 KB I+D on chip per core  
**Cache 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)  
4.18.0-147.el8.x86_64  
**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:** 32/64-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 Integer Rate Result**

<table>
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</tbody>
</table>

**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/lib/ia32:/home/spec2017/je5.0.1-32"

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:

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

(Continued on next page)
Altos Computing Inc.
BrainSphere T110 F5 (Intel Xeon E-2224)

SPECrate®2017_int_base = 30.7
SPECrate®2017_int_peak = 31.4

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

General Notes (Continued)
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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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 982a61ec0915b55891ef0e16acafc64d
running on t110f5 Fri Aug 27 04:16:34 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
CPU family: 6
Altos Computing Inc.

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Test Date: Aug-2021
Hardware Availability: Jan-2020
Software Availability: Aug-2020

Platform Notes (Continued)

Model: 158
Model name: Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
Stepping: 10
CPU MHz: 4460.875
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 cx8 apic sep mtrr pge mca cmov
  pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
  lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
  tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
  epb invecid_single pti ssbd ibrs ibp bts x2apic movbe popcnt tsc_deadline_timer
  aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invecid_single
pti ssbd ibrs ibp bts x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
lahf_lm abm 3dnowprefetch cpuid_fault epb invecid_single pti ssbd ibrs ibp bts x2apic
movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch
cpuid_fault epb invecid_single pti ssbd ibrs ibp bts x2apic movbe popcnt tsc_deadline_timer

/proc/cpuinfo cache data
  cache size : 8192 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
  node 0 size: 64066 MB
  node 0 free: 58488 MB
  node distances:
    node 00 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 performance

(Continued on next page)
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Platform Notes (Continued)

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
    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:
    Mitigation: Clear CPU buffers; SMT disabled

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/swapgs barriers and __user pointer sanitation

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 5.6G 145G 4% /home

(Continued on next page)
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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

BIOS:
BIOS Vendor: American Megatrends Inc.
BIOS Version: 1.0b.V2
BIOS Date: 08/23/2019
BIOS Revision: 5.13

(End of data from sysinfo program)

Compiler Version Notes

******************************************************************************
C | 502.gcc_r(peak)
******************************************************************************
Intel(R) C Compiler for applications running on IA-32, Version 19.1.2.275
Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
******************************************************************************

******************************************************************************
C | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
  | 525.x264_r(base, peak) 557.xz_r(base)
******************************************************************************
Intel(R) C Compiler for applications running on Intel(R) 64, Version
19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
******************************************************************************

******************************************************************************
C | 500.perlbench_r(peak) 557.xz_r(peak)
******************************************************************************
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
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**Compiler Version Notes (Continued)**

---

```c
C       | 502.gcc_r(peak)

Intel(R) C Compiler for applications running on IA-32, Version 19.1.2.275
Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```c
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
| 525.x264_r(base, peak) 557.xz_r(base)

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```c
C       | 500.perlbench_r(peak) 557.xz_r(peak)

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```c
C       | 502.gcc_r(peak)

Intel(R) C Compiler for applications running on IA-32, Version 19.1.2.275
Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```c
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
| 525.x264_r(base, peak) 557.xz_r(base)

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```c
C       | 500.perlbench_r(peak) 557.xz_r(peak)
```

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#### Compiler Version Notes (Continued)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

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

---

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

Fortran | 548.exchange2_r(base, peak)

---

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

### Base Compiler Invocation

C benchmarks:
- `icc`

C++ benchmarks:
- `icpc`

Fortran benchmarks:
- `ifort`

### Base Portability Flags

- `500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64`
- `502.gcc_r: -DSPEC_LP64`
- `505.mcf_r: -DSPEC_LP64`
- `520.omnetpp_r: -DSPEC_LP64`
- `523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX`
- `525.x264_r: -DSPEC_LP64`
- `531.deepsjeng_r: -DSPEC_LP64`
- `541.leela_r: -DSPEC_LP64`

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Base Portability Flags (Continued)

548.exchange2_r: -DSPEC_LP64
557.xz_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 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
- -qopt-mem-layout-trans=4
- -L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
  -lqkmalloc

C++ benchmarks:
- -m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
- -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
  -lqkmalloc

Fortran benchmarks:
- -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
- -nostandard-realloc-lhs -align array32byte -auto
- -mbranches-within-32B-boundaries
- -L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
  -lqkmalloc

Peak Compiler Invocation

C benchmarks:
- icc

C++ benchmarks:
- icpc

Fortran benchmarks:
- ifort
SPEC CPU®2017 Integer Rate Result

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### Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leea_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

### Peak Optimization Flags

**C benchmarks:**

500.perlbench_r: -W1, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/ia32_lin
-std=gnu89
-W1, -plugin-opt=-x86-branches-within-32B-boundaries
-W1, -z, muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast(pass 1) -O3 -ffast-math -qnextgen
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -m64 -qnextgen -std=c11
-W1, -plugin-opt=-x86-branches-within-32B-boundaries
-W1, -z, muldefs -xCORE-AVX2 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -W1, -z, muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin

(Continued on next page)
Altos Computing Inc.

BrainSphere T110 F5 (Intel Xeon E-2224)

**SPEC CPU 2017 Integer Rate Result**

**Copyright 2017-2021 Standard Performance Evaluation Corporation**

**SPECrate**: 2017_int_base = 30.7

**SPECrate**: 2017_int_peak = 31.4

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<th>CPU2017 License:</th>
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**Peak Optimization Flags (Continued)**

557.xz_r (continued):
- lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: basepeak = yes
541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_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:

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.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 v1.1.8 on 2021-08-27 04:16:33-0400.
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