Altos Computing Inc.

BrainSphere R389 F4 (Intel Xeon Silver 4208)

**SPECrate®2017_int_base = 89.6**

**SPECrate®2017_int_peak = 92.7**

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<tr>
<td>32</td>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Silver 4208
- **Max MHz:** 3200
- **Nominal:** 2100
- **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:** 1 MB I+D on chip per core
- **L3:** 11 MB I+D on chip per chip
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933V-R, running at 2400)
- **Storage:** 1 x 1.6 TB 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 19.1.1.217 of Intel C/C++ Compiler Build 20200306 for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler Build 20200306 for Linux
- **Parallel:** No
- **Firmware:** Version R12 released Jul-2020
- **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 R389 F4 (Intel Xeon Silver 4208)  

SPEC CPU®2017 Integer Rate Result  

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

SPECrate®2017_int_base = 89.6  
SPECrate®2017_int_peak = 92.7

Results Table

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<td>54.3</td>
<td><strong>636</strong></td>
<td><strong>54.3</strong></td>
<td>635</td>
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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 inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux. The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux.

Submit Notes

The `numactl` mechanism was used to bind copies to processors. The config file option 'submit' was used to generate `numactl` 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/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"
MALLOCONF = "retain:true"`
# SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**  
**BrainSphere R389 F4 (Intel Xeon Silver 4208)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 89.6</th>
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<td>CPU2017 License: 97</td>
<td>Test Date: Dec-2020</td>
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<tr>
<td>Test Sponsor: Altos Computing Inc.</td>
<td>Hardware Availability: Feb-2020</td>
</tr>
<tr>
<td>Tested by: Altos Computing Inc.</td>
<td>Software Availability: Apr-2020</td>
</tr>
</tbody>
</table>

## 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
```

runcpu command invoked through numactl i.e.:  
```
numactl --interleave=all runcpu <etc>
```

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.  

## Platform Notes

BIOS Configuration:  
Power Policy Quick Settings set to Performance  
IMC set to 1-way interleaving  
Sub_NUMA Cluster set to enabled

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1b1e6e46a485a0011  
running on rhel81 Mon Dec 14 18:37:03 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 : Intel(R) Xeon(R) Silver 4208 CPU @ 2.10GHz
  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 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7
```

From lscpu:  
```
Architecture:      x86_64
```

(Continued on next page)
Platform Notes (Continued)

- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- 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: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Silver 4208 CPU @ 2.10GHz
- Stepping: 7
- CPU MHz: 800.185
- CPU max MHz: 3200.0000
- CPU min MHz: 800.0000
- BogoMIPS: 4200.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 11264K
- NUMA node0 CPU(s): 0-7, 16-23
- NUMA node1 CPU(s): 8-15, 24-31
- Flags: fpu vme de pse ts cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrdand lahf_lm abml hle 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
- invpcid_single intel_pmm_inl ssbd mba ibrs ibpb stibp sibet Enhanced tpr_shadow vnmi flexpriority ept found fsgsbase tsc_adjust bmid hle avx2 smep bmi2 erms invpcid rtm cmn mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occap_llc cqm_mmb_total cqm_mmb_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku ospke avx512_vnni md_clear flush_lld arch_capabilities

/proc/cpuinfo cache data
cache size : 11264 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
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: 192772 MB
node 0 free: 192442 MB
node 1 cpus: 8 9 10 11 12 13 14 15 24 25 26 27 28 29 30 31

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

**Altos Computing Inc.**

**BrainSphere R389 F4 (Intel Xeon Silver 4208)**

**SPECrate®2017_int_base = 89.6**

**SPECrate®2017_int_peak = 92.7**

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<th>Software Availability</th>
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<tr>
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<td>Dec-2020</td>
<td>Feb-2020</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

**Test Sponsor:** Altos Computing Inc.

**Tested by:** Altos Computing Inc.

## Platform Notes (Continued)

```text
node 1 size: 193532 MB
node 1 free: 192959 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10
```

From `/proc/meminfo`

- MemTotal: 395575840 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

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

```text
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"
```

```text
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
```

```text
uname -a:
Linux rhel81 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-2018-3620 (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: Enhanced IBRS, IBPB: conditional, RSB filling

**run-level 3 Dec 14 18:33**

**SPEC is set to:** `/home/cpu2017`

```text
Filesystem Type Size Used Avail Use% Mounted on
/devmapper/rhel-home xfs 1.5T 35G 1.4T 3% /home
```

(Continued on next page)
Altos Computing Inc.

BrainSphere R389 F4 (Intel Xeon Silver 4208)

SPECr[2017 int_base = 89.6

SPECr[2017 int_peak = 92.7

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

Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
BIOS:   GIGABYTE R12 07/21/2020
Vendor: Altos
Product: BrainSphere R389 F4
Product Family: Server
Serial:  GIGBN8521A0021

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:
12x NO DIMM NO DIMM
12x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(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 2021.1 NextGen Build 20200304
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 2021.1 NextGen Build 20200304
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 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================

(Continued on next page)
Altos Computing Inc.

BrainSphere R389 F4 (Intel Xeon Silver 4208)

**SPEC CPU®2017 Integer Rate Result**

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

**Test Date:** Dec-2020
**Hardware Availability:** Feb-2020
**Software Availability:** Apr-2020

**SPECrate®2017_int_base = 89.6**

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**Compiler Version Notes (Continued)**

| C       | 502.gcc_r(peak)
|---------|-----------------

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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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<table>
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<th>C</th>
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304
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<table>
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

(Continued on next page)
Altos Computing Inc.
BrainSphere R389 F4 (Intel Xeon Silver 4208)

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CPU2017 License: 97
Test Sponsor: Altos Computing Inc.
Test Date: Dec-2020

Tested by: Altos Computing Inc.
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

------------------------------------------------------------------------------
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 2021.1
NextGen Build 20200304
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 19.1.1.217 Build 20200306
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
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
Altos Computing Inc.
BrainSphere R389 F4 (Intel Xeon Silver 4208)

SPECrater®2017_int_base = 89.6
SPECrater®2017_int_peak = 92.7

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

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-WL,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-1hs -align array32byte -auto
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

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

(Continued on next page)
Altos Computing Inc.
BrainSphere R389 F4 (Intel Xeon Silver 4208)

**SPECrate®2017_int_base = 89.6**
**SPECrate®2017_int_peak = 92.7**

**CPU2017 License:** 97  
**Test Sponsor:** Altos Computing Inc.  
**Tested by:** Altos Computing Inc.  
**Test Date:** Dec-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

### Peak Portability Flags (Continued)

- 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`: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)`
- `-xCORE-AVX512` `-ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4 -fno-strict-overflow`
- `-mbranches-within-32B-boundaries`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

- `502.gcc_r`: `-m32`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/ia32_lin`
- `-std=gnu89`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs -fprofile-generate(pass l)`
- `-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto`
- `-Ofast(pass l) -O3 -ffast-math -qnextgen -fuse-ld=gold`
- `-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`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
- `-Wl,-z,muldefs -xCORE-AVX512 -flto -O3 -ffast-math`
- `-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

- `557.xz_r`: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

#### C++ benchmarks:

(Continued on next page)
Altos Computing Inc.  
BrainSphere R389 F4 (Intel Xeon Silver 4208)  

<table>
<thead>
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</tbody>
</table>

Peak Optimization Flags (Continued)

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

http://www.spec.org/cpu2017/flags/Altos-Platform-Settings-V1.0\_revA.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\_revA.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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