# SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**  
**BrainSphere R389 F4 (Intel Xeon Gold 6230)**

### CPU2017 License: 97  
**Test Sponsor:** Altos Computing Inc.  
**Tested by:** Altos Computing Inc.  
**Test Date:** May-2021  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

### SPECrate®2017_int_base = 245  
**SPECrate®2017_int_peak = 253**

<table>
<thead>
<tr>
<th>CPU Name</th>
<th>Max MHz</th>
<th>Nominal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel Xeon Gold 6230</td>
<td>3900</td>
<td>2100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enabled</th>
<th>Orderable</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 cores, 2 chips, 2 threads/core</td>
<td>1.2 chips</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cache L1</th>
<th>Cache L2</th>
<th>Cache L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 KB I + 32 KB D on chip per core</td>
<td>1 MB I+D on chip per core</td>
<td>27.5 MB I+D on chip per chip</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Memory</th>
<th>Storage</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>768 GB (24 x 32 GB 2Rx4 PC4-2933V-R)</td>
<td>1 x 1.6 TB SATA SSD</td>
<td>None</td>
</tr>
</tbody>
</table>

### 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
- **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

### Hardware

<table>
<thead>
<tr>
<th>Software</th>
<th>Resource</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SPECrate®2017_int_base (245)</td>
<td>411</td>
</tr>
<tr>
<td></td>
<td>SPECrate®2017_int_peak (253)</td>
<td>485</td>
</tr>
</tbody>
</table>

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</thead>
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<tr>
<td></td>
<td>SPECrate®2017_int_base (245)</td>
<td>316</td>
</tr>
<tr>
<td></td>
<td>SPECrate®2017_int_peak (253)</td>
<td>485</td>
</tr>
</tbody>
</table>

- **500.perlbench_r** 80  
- **502.gcc_r** 80  
- **505.mcf_r** 80  
- **520.omnetpp_r** 80  
- **523.xalancbmk_r** 80  
- **525.x264_r** 80  
- **531.deepsjeng_r** 80  
- **541.leela_r** 80  
- **548.exchange2_r** 80  
- **557.xz_r** 80  

The table shows the performance results for each benchmark, with the SPECrate values for both SPECrate®2017_int_base and SPECrate®2017_int_peak.
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<td>Apr-2020</td>
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</table>

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>80</td>
<td>756</td>
<td>168</td>
<td>758</td>
<td>168</td>
<td>756</td>
<td>168</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>80</td>
<td>591</td>
<td>192</td>
<td>589</td>
<td>192</td>
<td>588</td>
<td>193</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>80</td>
<td>314</td>
<td>411</td>
<td>315</td>
<td>411</td>
<td>315</td>
<td>411</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>80</td>
<td>626</td>
<td>169</td>
<td>618</td>
<td>170</td>
<td>619</td>
<td>170</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>80</td>
<td>268</td>
<td>316</td>
<td>267</td>
<td>316</td>
<td>267</td>
<td>316</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>80</td>
<td>289</td>
<td>485</td>
<td>288</td>
<td>486</td>
<td>291</td>
<td>482</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>80</td>
<td>484</td>
<td>189</td>
<td>483</td>
<td>190</td>
<td>484</td>
<td>189</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>80</td>
<td>753</td>
<td>176</td>
<td>749</td>
<td>177</td>
<td>755</td>
<td>176</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>80</td>
<td>464</td>
<td>452</td>
<td>464</td>
<td>452</td>
<td>464</td>
<td>452</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>80</td>
<td>582</td>
<td>148</td>
<td>583</td>
<td>148</td>
<td>583</td>
<td>148</td>
</tr>
</tbody>
</table>

### 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"

MALLOC_CONF = "retain:true"
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**SPECrate®2017_int_peak = 253**

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<th>Test Date: May-2021</th>
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<td>Test Sponsor: Altos Computing Inc.</td>
<td>Hardware Availability: Feb-2020</td>
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</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  
Files system 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.  
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:  
Power Policy Quick Settings set to Best Performance  
IMC set to 1-way interleaving  
Sub_NUMA Cluster set to Enabled  
Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d  
runtime on rhel81 Tue May 25 01:46:39 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) Gold 6230 CPU @ 2.10GHz  
2 "physical id"s (chips)  
80 "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 : 20  
siblings : 40  
physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28  
physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28  
From lscpu from util-linux 2.32.1:  
Architecture: x86_64

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

## Altos Computing Inc.

### Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Platform Note</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU op-mode(s):</td>
<td>32-bit, 64-bit</td>
</tr>
<tr>
<td>Byte Order:</td>
<td>Little Endian</td>
</tr>
<tr>
<td>CPU(s):</td>
<td>80</td>
</tr>
<tr>
<td>On-line CPU(s) list:</td>
<td>0-79</td>
</tr>
<tr>
<td>Thread(s) per core:</td>
<td>2</td>
</tr>
<tr>
<td>Core(s) per socket:</td>
<td>20</td>
</tr>
<tr>
<td>Socket(s):</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node(s):</td>
<td>4</td>
</tr>
<tr>
<td>Vendor ID:</td>
<td>GenuineIntel</td>
</tr>
<tr>
<td>CPU family:</td>
<td>6</td>
</tr>
<tr>
<td>Model:</td>
<td>85</td>
</tr>
<tr>
<td>Model name:</td>
<td>Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz</td>
</tr>
<tr>
<td>Stepping:</td>
<td>5</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>1990.181</td>
</tr>
<tr>
<td>CPU max MHz:</td>
<td>3900.0000</td>
</tr>
<tr>
<td>CPU min MHz:</td>
<td>1000.0000</td>
</tr>
<tr>
<td>BogoMIPS:</td>
<td>4200.00</td>
</tr>
<tr>
<td>Virtualization:</td>
<td>VT-x</td>
</tr>
<tr>
<td>L1d cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>1024K</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>28160K</td>
</tr>
</tbody>
</table>

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(Continued on next page)
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SPECrates®2017_int_base = 245
SPECrates®2017_int_peak = 253

Platform Notes (Continued)

node 0 free: 191543 MB
node 1 cpuS: 3 4 7 8 9 13 14 17 18 19 43 44 47 48 49 53 54 57 58 59
node 1 size: 193506 MB
node 1 free: 193265 MB
node 2 cpuS: 20 21 22 25 26 30 31 32 35 36 60 61 62 65 66 70 71 72 75 76
node 2 size: 193531 MB
node 2 free: 193325 MB
node 3 cpuS: 23 24 27 28 29 33 34 37 38 39 63 64 67 68 69 73 74 77 78 79
node 3 size: 193531 MB
node 3 free: 193061 MB
node distances:
node 0 1 2 3
0: 10 11 21 21
1: 11 10 21 21
2: 21 21 10 11
3: 21 21 11 10

From /proc/meminfo
MemTotal: 790958276 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

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 rhel81 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:

(Continued on next page)
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CPU2017 License: 97
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Platform Notes (Continued)

CVE-2018-12207 (iTLB Multihit):
   No status reported
CVE-2018-3620 (L1 Terminal Fault):
   No affected
Microarchitectural Data Sampling:
   Mitigation: Clear CPU buffers; SMT vulnerable
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 generic retpoline, IBPB: conditional, IBRS_FW, STIBP: conditional, 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 May 25 01:38

SPEC is set to: /home/cpu2017
   Filesystem          Type Size Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   1.5T  177G  1.3T  13% /home

From /sys/devices/virtual/dmi/id
   Vendor: Altos
   Product: BrainSphere R389 F4
   Product Family: Server
   Serial: GIGBN8521A0019

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:
   24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

BIOS:
   BIOS Vendor: GIGABYTE
   BIOS Version: R12
   BIOS Date: 07/21/2020
   BIOS Revision: 5.14

(End of data from sysinfo program)
Altos Computing Inc.  

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

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen Build 20200304
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---

### 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.

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### 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)

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### 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.xalanchmk_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`

### 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`

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- nostandard-realloc-lhs -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
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 -03 -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

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

**Altos Computing Inc.**  
BrainSphere R389 F4 (Intel Xeon Gold 6230)

<table>
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<tr>
<th>CPU2017 License:</th>
<th>97</th>
<th>Test Date:</th>
<th>May-2021</th>
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<td>Test Sponsor:</td>
<td>Altos Computing Inc.</td>
<td>Hardware Availability:</td>
<td>Feb-2020</td>
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<tr>
<td>Tested by:</td>
<td>Altos Computing Inc.</td>
<td>Software Availability:</td>
<td>Apr-2020</td>
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</table>

### SPECrate®2017_int_base = 245  
### SPECrate®2017_int_peak = 253

---

### Peak Optimization Flags (Continued)

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 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -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:

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-revD.html
## SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**

**BrainSphere R389 F4 (Intel Xeon Gold 6230)**

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


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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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