## SPEC CPU®2017 Integer Rate Result

### Altos Computing Inc.

**BrainSphere R389 F4 (Intel Xeon Gold 6248R)**

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

### Copies

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<tr>
<td>perlbench_r</td>
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<td>302</td>
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<td>gcc_r</td>
<td>96</td>
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<td>omnetpp_r</td>
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<td>203</td>
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<tr>
<td>xalancbmk_r</td>
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<tr>
<td>x264_r</td>
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<td>706</td>
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<tr>
<td>deepsjeng_r</td>
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</tr>
<tr>
<td>xz_r</td>
<td>96</td>
<td>208</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6248R
- **Max MHz:** 4000
- **Nominal:** 3000
- **Enabled:** 48 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:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933V-R)
- **Storage:** 1 x 1.6 TB SATA SSD
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux release 8.1 (Ootpa)
- **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 Gold 6248R)

**SPEC CPU®2017 Integer Rate Result**

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

---

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Ratio</th>
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<tbody>
<tr>
<td>500.perlbench_r</td>
<td>96</td>
<td>660</td>
<td>231</td>
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<tr>
<td>523.xalancbmk_r</td>
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<tr>
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<td>656</td>
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<td>659</td>
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<td>383</td>
<td>656</td>
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<tr>
<td>557.xz_r</td>
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<td>203</td>
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<td>203</td>
<td>96</td>
<td>499</td>
<td>208</td>
<td>500</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 = 
      
MALLOC_CONF = "retain:true"
```
# SPEC CPU®2017 Integer Rate Result

**Altos Computing Inc.**

**BrainSphere R389 F4 (Intel Xeon Gold 6248R)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 338</th>
<th>Test Date: Feb-2021</th>
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</thead>
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<tr>
<td>SPECrate®2017_int_peak = 352</td>
<td>Hardware Availability: Feb-2020</td>
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</tbody>
</table>

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<th>Test Sponsor: Altos Computing Inc.</th>
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</thead>
<tbody>
<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 Best 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 295195f888a3d7edeb1e6e46a485a0011
running on rhel81 Mon Feb 22 17:54:01 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 6248R CPU @ 3.00GHz
  2 "physical id"s (chips)
  96 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 24
siblings : 48
physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

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

(Continued on next page)
## Altos Computing Inc. 
### SPEC CPU®2017 Integer Rate Result

**SPEC CPU®2017_int_base = 338**  
**SPEC CPU®2017_int_peak = 352**

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<th>Test Date</th>
<th>CPU2017 License: 97</th>
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<td>Software Availability: Apr-2020</td>
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**Platform Notes (Continued)**

<table>
<thead>
<tr>
<th>CPU op-mode(s):</th>
<th>32-bit, 64-bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte Order:</td>
<td>Little Endian</td>
</tr>
<tr>
<td>CPU(s):</td>
<td>96</td>
</tr>
<tr>
<td>On-line CPU(s) list:</td>
<td>0-95</td>
</tr>
<tr>
<td>Thread(s) per core:</td>
<td>2</td>
</tr>
<tr>
<td>Core(s) per socket:</td>
<td>24</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>
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<tr>
<td>Model:</td>
<td>85</td>
</tr>
<tr>
<td>Model name:</td>
<td>Intel(R) Xeon(R) Gold 6248R CPU @ 3.00GHz</td>
</tr>
<tr>
<td>Stepping:</td>
<td>7</td>
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<tr>
<td>CPU MHz:</td>
<td>1200.066</td>
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<tr>
<td>CPU max MHz:</td>
<td>4000.0000</td>
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<tr>
<td>CPU min MHz:</td>
<td>1200.0000</td>
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<tr>
<td>BogoMIPS:</td>
<td>6000.00</td>
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<td>Virtualization:</td>
<td>VT-x</td>
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<tr>
<td>L1d cache:</td>
<td>32K</td>
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<tr>
<td>L1i cache:</td>
<td>32K</td>
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<tr>
<td>L2 cache:</td>
<td>1024K</td>
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<tr>
<td>L3 cache:</td>
<td>36608K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-3, 7, 8-12, 14-18, 20-24, 30-32, 36-48, 50-52, 56-60, 62-66, 68-72, 74-80, 82-88, 90-95</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>4-6, 9-11, 15-17, 21-23, 35-36, 40-42, 44-48, 50-52, 55-56, 58-60, 62-68, 70-78, 80-88, 90-95</td>
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<tr>
<td>NUMA node2 CPU(s):</td>
<td>28-30, 34-36, 40-42, 44-48, 50-52, 55-56, 58-60, 62-68, 70-78, 80-88, 90-95</td>
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<tr>
<td>NUMA node3 CPU(s):</td>
<td>24-27, 31-33, 37-39, 43-45, 47-49, 51-53, 55-57, 59-61, 63-65, 67-70, 72-75, 77-80, 82-85, 87-90, 92-95</td>
</tr>
</tbody>
</table>

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 pdelgb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault ebp cat_l3 cdp_l3
invpcid_single intel_pni ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bmih lhe avx2 smep bmi2 erms invpcid rtm
cqmp mxp rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsavesopt xsaves qgetbv1 xsaves cgq_mib cgq Occup LLC cgq_mib_total
cqmp_mib_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pkul
ospke avx512_vnni md_clear flush_l1d arch_capabilities
```

```
/proc/cpuinfo cache data
cache size : 36608 KB
```

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.

```
available: 4 nodes (0-3)
  node 0 cpus: 0 1 2 3 7 8 12 13 14 18 19 20 48 49 50 51 55 56 60 61 62 66 67 68
  node 0 size: 191849 MB
```

(Continued on next page)
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BrainSphere R389 F4 (Intel Xeon Gold 6248R)

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SPEC®2017_int_peak = 352

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Platform Notes (Continued)

node 0 free: 191614 MB
node 1 cpus: 4 5 6 9 10 11 15 16 17 21 22 23 52 53 54 57 58 59 63 64 65 69 70 71
node 1 size: 193531 MB
node 1 free: 193313 MB
node 2 cpus: 24 25 26 27 31 32 33 37 38 39 43 44 72 73 74 75 79 80 81 85 86 87 91 92
node 2 size: 193505 MB
node 2 free: 193028 MB
node 3 cpus: 28 29 30 34 40 41 42 45 46 47 76 77 78 82 83 84 88 89 90 93 94 95
node 3 size: 193530 MB
node 3 free: 193213 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: 790955200 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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 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

(Continued on next page)
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Platform Notes (Continued)
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user
pointersation
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional,
RSB filling

run-level 3 Feb 22 17:47
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 1.5T 138G 1.3T 10% /home

From /sys/devices/virtual/dmi/id
BIOS: GIGABYTE R12 07/21/2020
Vendor: Altos
Product: BrainSphere R389 F4
Product Family: Server
Serial: GIGBN8521A0019

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:
24x 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.
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---

## Compiler Version Notes (Continued)

```
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.

```
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.

```
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

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Compiler Version Notes (Continued)

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---

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.

---

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

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SPEC CPU®2017 Integer Rate Result

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Altos Computing Inc.
BrainSphere R389 F4 (Intel Xeon Gold 6248R)

SPECrate®2017_int_base = 338
SPECrate®2017_int_peak = 352

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

Test Date: Feb-2021
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Base Portability Flags (Continued)

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

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-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

(Continued on next page)
### Peak Compiler Invocation (Continued)

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 -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 -ljemalloc`  
- **502.gcc_r**: `-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`
Altos Computing Inc.

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Peak Optimization Flags (Continued)

525.x264_r (continued):
-Il=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-1qkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -03 -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
-1qkmalloc

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

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