ASUSTeK Computer Inc.

ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7252

SPEC CPU®2017 Integer Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECrate®2017_int_base = 60.9
SPECrate®2017_int_peak = 64.1

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.

Test Date: Mar-2020
Hardware Availability: Nov-2019
Software Availability: Jun-2019

500.perlbench_r 16
502.gcc_r 16
505.mcf_r 16
520.omnetpp_r 16
523.xalancbmk_r 16
525.x264_r 16
531.deepsjeng_r 16
541.leela_r 16
548.exchange2_r 16
557.xz_r 16

SPECrate®2017_int_base (60.9)
SPECrate®2017_int_peak (64.1)

Hardware
CPU Name: AMD EPYC 7252
Max MHz: 3200
Nominal: 3100
Enabled: 8 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I+ 32 KB D on chip per core
L2: 512 KB I+D on chip per core
L3: 64 MB I+D on chip per chip, 16 MB shared / 2 cores
Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 240 GB SATA SSD
Other: None

Software
OS: SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default
Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
Parallel: No
Firmware: Version 0501 released Nov-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc; jemalloc memory allocator library v5.2.0
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.
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Results Table

| Benchmark        | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Base         | Base         | Base         | Base         | Base         | Base         | Peak         | Peak         | Peak         | Peak         | Peak         | Peak         | Peak         | Peak         |
|------------------|--------|---------|-------|---------|-------|---------|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 500.perlbench_r  | 16     | 593     | 43.0  | 594     | 42.9  | 592     | 43.0  | 16           | 574          | 44.4         | 567          | 44.9         | 569          | 44.7         | 64.1         |              |              |              |              |              |              |
| 502.gcc_r        | 16     | 380     | 59.7  | 380     | 59.7  | 379     | 59.7  | 16           | 322          | 70.3         | 322          | 70.4         | 322          | 70.3         |              |              |              |              |              |              |              |
| 505.mcf_r        | 16     | 275     | 94.2  | 274     | 94.5  | 273     | 94.6  | 16           | 253          | 102          | 252          | 103          | 251          | 103          |              |              |              |              |              |              |              |
| 520.omnetpp_r    | 16     | 637     | 33.0  | 637     | 33.0  | 634     | 33.1  | 16           | 637          | 33.0         | 637          | 33.0         | 634          | 33.0         |              |              |              |              |              |              |              |
| 523.xalancbmk_r  | 16     | 290     | 58.3  | 289     | 58.6  | 291     | 58.1  | 16           | 248          | 68.2         | 248          | 68.0         | 248          | 68.2         |              |              |              |              |              |              |              |
| 525.x264_r       | 16     | 227     | 123   | 228     | 123   | 228     | 123   | 16           | 222          | 126          | 222          | 126          | 222          | 126          |              |              |              |              |              |              |              |
| 531.deepsjeng_r  | 16     | 365     | 50.3  | 366     | 50.1  | 364     | 50.3  | 16           | 354          | 51.8         | 355          | 51.7         | 354          | 51.9         |              |              |              |              |              |              |              |
| 541.leela_r      | 16     | 557     | 47.6  | 557     | 47.6  | 557     | 47.6  | 16           | 557          | 47.6         | 557          | 47.6         | 557          | 47.5         |              |              |              |              |              |              |              |
| 548.exchange2_r  | 16     | 298     | 141   | 298     | 141   | 298     | 141   | 16           | 298          | 141          | 298          | 141          | 298          | 141          |              |              |              |              |              |              |              |
| 557.xz_r         | 16     | 471     | 36.7  | 471     | 36.7  | 472     | 36.6  | 16           | 471          | 36.7         | 472          | 36.6         | 471          | 36.7         |              |              |              |              |              |              |              |

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

Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

Submit Notes

The config file option 'submit' was used. 'numactl' was used to bind copies to the cores. See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size 'ulimit -l 2097152' was used to set environment locked pages in memory limit

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

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu
dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)

(Continued on next page)
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### Operating System Notes (Continued)

OS set to performance mode via `cpupower frequency-set -g performance`.

### Environment Variables Notes

Environment variables set by `runcpu` before the start of the run:

```bash
LD_LIBRARY_PATH =
    "/spec2017c3/amd_rate_aocc200_rome_C_lib/64;/spec2017c3/amd_rate_aocc200_rome_C_lib/32:" 
MALLOC_CONF = "retain:true"
```

### General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26.

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: configured and built with GCC v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2

### Platform Notes

BIOS Configuration:
Power phase shedding = Disabled
SVM Mode = Disabled
SR-IOV support = Disabled
DRAM Scrub time = Disabled
Determinism Slider = Power

Sysinfo program /spec2017c3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbb16e646a485a0011
running on linux-wv9n Sun Mar 29 11:05:27 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

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**Platform Notes (Continued)**

model name : AMD EPYC 7252 8-Core Processor  
1 "physical id"s (chips)  
16 "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 4 5 8 9 12 13

From lscpu:

Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
Address sizes: 43 bits physical, 48 bits virtual  
CPU(s): 16  
On-line CPU(s) list: 0-15  
Thread(s) per core: 2  
Core(s) per socket: 8  
Socket(s): 1  
NUMA node(s): 1  
Vendor ID: AuthenticAMD  
CPU family: 23  
Model: 49  
Model name: AMD EPYC 7252 8-Core Processor  
Stepping: 0  
CPU MHz: 3100.000  
CPU max MHz: 3100.0000  
CPU min MHz: 1500.0000  
BogoMIPS: 6262.28  
Virtualization: AMD-V  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 512K  
L3 cache: 16384K  
NUMA node0 CPU(s): 0-15  
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperef pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes avx avx2 f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb perfctr_l2 mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd senv ibrs ibp btm vmmcall fsqsbbase bmi1 avx2 smep bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsaves xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaveerpr arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

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Platform Notes (Continued)

/platform/cpudinfo cache data
  cache size : 512 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 4 5 6 7 8 9 10 11 12 13 14 15
  node 0 size: 515818 MB
  node 0 free: 515069 MB
  node distances:
    node 0
    0: 10

From /proc/meminfo
  MemTotal: 528197632 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP1"
    VERSION_ID="15.1"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15:sp1"

  uname -a:
    Linux linux-wv9n 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
    x86_64 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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBBP:
    conditional, IBRS_FW, STIBP: conditional, RSB
    filling

run-level 3 Mar 27 10:30

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Platform Notes (Continued)

SPEC is set to: /spec2017c3
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdd4 xfs 199G 18G 182G 9% /

From /sys/devices/virtual/dmi/id
BIOS: American Megatrends Inc. 0501 11/07/2019
Vendor: ASUSTeK COMPUTER INC.
Product: KRPA-U16 Series
Product Family: Server
Serial: System Serial Number

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:
8x Samsung M393A8G40AB2-CWE 64 kB 2 rank 3200
8x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 502.gcc_r(peak)
==============================================================================
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
| 525.x264_r(base, peak) 557.xz_r(base, peak)
==============================================================================
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
==============================================================================
C       | 502.gcc_r(peak)
(Continued on next page)
Compiler Version Notes (Continued)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
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    AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
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Thread model: posix
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Thread model: posix
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    AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: i386-unknown-linux-gnu
Thread model: posix
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Compiler Version Notes (Continued)

InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

------------------------------------------------------------------------------
| C++  | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)                           |
|      | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)                      |
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins  
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)  
Target: x86_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

------------------------------------------------------------------------------
| Fortran  | 548.exchange2_r(base, peak)                                               |
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins  
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)  
Target: x86_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
flang

Base Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64  
502.gcc_r: -DSPEC_LP64  
505.mcf_r: -DSPEC_LP64  
520.omnetpp_r: -DSPEC_LP64  
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64  
525.x264_r: -DSPEC_LP64

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Base Portability Flags (Continued)

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:
- flto -Wl,-mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
- Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
- march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
- freemap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
- mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
- mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
- flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
- lflang

C++ benchmarks:
- flto -Wl,-mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
- Wl,-mllvm -Wl,-reduce-array-computations=3
- Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
- mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
- mllvm -unroll-threshold=100 -flv-function-specialization
- mllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
- ljemalloc -lflang

Fortran benchmarks:
- flto -Wl,-mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
- Wl,-mllvm -Wl,-reduce-array-computations=3 -ffast-math
- Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
- Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops
- Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
- mllvm -disable-indvar-simplify -mllvm -unroll-aggressive
- mllvm -unroll-threshold=150 -lmvec -lamdlibm -ljemalloc -lflang

Peak Compiler Invocation

C benchmarks:
clang

(Continued on next page)
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SPECrates

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Peak Compiler Invocation (Continued)

C++ benchmarks:
c++

Fortran benchmarks:
flang

Peak Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -D_FILE_OFFSET_BITS=64
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: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver2
-mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -lmvec -lamdlibm -ljemalloc
-llflang

(Continued on next page)
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Peak Optimization Flags (Continued)

502.gcc_r: -m32 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -fgnu89-inline -ljemalloc

505.mcf_r: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -lmvec -lamdlibm -ljemalloc
-flang

525.x264_r: Same as 500.perlbench_r

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -flv-function-specialization
-mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000
-mllvm -vector-library=LIBMVEC
-mllvm -inline-threshold=1000 -ljemalloc

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

**ASUSTeK Computer Inc.**

ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7252

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>60.9</th>
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<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>64.1</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9016
**Test Date:** Mar-2020
**Test Sponsor:** ASUSTeK Computer Inc.
**Hardware Availability:** Nov-2019
**Tested by:** ASUSTeK Computer Inc.
**Software Availability:** Jun-2019

#### Peak Optimization Flags (Continued)

531.deepsjeng_r: -flto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize
-Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -flv-function-specialization
-mlllvm -unroll-threshold=100
-mlllvm -enable-partial-unswitch
-mlllvm -loop-unswitch-threshold=200000
-mlllvm -vector-library=LIBMVEC
-mlllvm -inline-threshold=1000 -lmvec -lamdlibm -ljemalloc
-lflang

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

#### Peak Other Flags

**C benchmarks:**

502.gcc_r: -L/sppo/dev/cpu2017/v110/amd_rate_aocc200_rome_C_lib/32

**C++ benchmarks:**

523.xalancbmk_r: -L/sppo/dev/cpu2017/v110/amd_rate_aocc200_rome_C_lib/32

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:


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Tested with SPEC CPU®2017 v1.1.0 on 2020-03-28 23:05:26-0400.