ASUSTeK Computer Inc.

ASUS RS500A-E10(KRPA-U16) Server System
2.80 GHz, AMD EPYC 7282

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 32
502.gcc_r 32
505.mcf_r 32
520.omnetpp_r 32
523.xalancbmk_r 32
525.x264_r 32
531.deepsjeng_r 32
541.leela_r 32
548.exchange2_r 32
557.xz_r 32

SPECrate®2017_int_base = 110
SPECrate®2017_int_peak = 118

Hardware
CPU Name: AMD EPYC 7282
Max MHz: 3200
Nominal: 2800
Enabled: 16 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 / 4 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.
### SPEC CPU®2017 Integer Rate Result

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#### Results Table

<table>
<thead>
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<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>67.1</td>
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**Results appear in the order in which they were run. Bold underlined text indicates a median measurement.**

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### Compiler Notes

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

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### 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)

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

ejemalloc: 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 295195f888a3d7ed1e6e46a485a0011
running on linux-wv9n Sun Mar 22 10:43:01 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

(Continued on next page)
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Platform Notes (Continued)

model name : AMD EPYC 7282 16-Core Processor
  1 "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 : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7282 16-Core Processor
Stepping: 0
CPU MHz: 2800.000
CPU max MHz: 2800.0000
CPU min MHz: 1500.0000
BogoMIPS: 5656.20
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-31
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 aperfmerf pni
pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdseed lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb b perpetr perfctr_l2 mwaitx cpb
cat_l3 cd p_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep
bmi2 cqm rdt_a rdseedadx smap clflushopt clwb sha ni xsaveopt xsaveopt xsaveopt xsave
xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsavertrap arat
npt lbrv svm_lock nrip_safe tsc_scale vmcb_clean flushbyasid decodeassist psu pfthreshold avic
v_vmsave_vmload vgif umip rdpid overflow_recover succor smca

(Continued on next page)
Platform Notes (Continued)

/proc/cpuinfo 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 16 17 18 19 20 21 22 23 24 25 26 27
  28 29 30 31
  node 0 size: 515818 MB
  node 0 free: 515045 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, IBPB:
  conditional, IBRS_FW, STIBP: conditional, RSB

run-level 3 Mar 20 14:35

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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)

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

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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

(Continued on next page)
### Base 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

### 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  
- -fremap-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
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### Peak Compiler Invocation

- **C benchmarks:** clang
- **C++ benchmarks:** clang++
- **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:**
  - `-fprofile-instr-generate(pass 1)`
  - `-fprofile-instr-use(pass 2)`
  - `-Ofast` -march=znver2
  - `-mno-sse4a` -fstruct-layout=5
  - `-mlvm -vectorize-memory-aggressively`
  - `-mlvm -function-specialize` `-mlvm -enable-gvn-hoist`
  - `-mlvm -unroll-threshold=50` `-fremap-arrays`
  - `-mlvm -vector-library=LIBMVEC`
  - `-mlvm -reduce-array-computations=3`
  - `-mlvm -global-vectorize-slp` `-mlvm -inline-threshold=1000`
  - `-flv-function-specialization` `-lmvec -lamlidlib -ljemalloc`
  - `-lflang`

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ASUSTeK Computer Inc.

ASUS RS500A-E10(KRPA-U16) Server System
2.80 GHz, AMD EPYC 7282

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

spec

SPEC CPU®2017 Integer Rate Result
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SPECrate®2017_int_base = 110
SPECrate®2017_int_peak = 118

Peak Optimization Flags (Continued)

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

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

525.x264_r: Same as 500.perlbench_r

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -flto -Wl,-mlllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-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 -ljemalloc

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SPEC CPU®2017 Integer Rate Result

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SPECrate®2017_int_base = 110
SPECrate®2017_int_peak = 118

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Peak Optimization Flags (Continued)


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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