## Hardware

**CPU Name:** AMD EPYC 7232P  
**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:** 32 MB I+D on chip per core, 8 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:** 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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### Test Details

- **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
### Results Table

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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>503.bwaves_r</td>
<td>16</td>
<td>957</td>
<td>168</td>
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<td>165</td>
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<td>305</td>
</tr>
</tbody>
</table>

**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

(Continued on next page)
ASUSTeK Computer Inc.  
ASUS RS500A-E10(KRPA-U16) Server System  
3.10 GHz, AMD EPYC 7232P

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

SPECrate®2017_fp_base = 70.7
SPECrate®2017_fp_peak = 72.3

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

Operating System Notes (Continued)
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)  
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.
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 295195f888a3d7eb1e6e46a485a0011  
running on linux-wv9n Tue Mar 31 23:37:52 2020

SUT (System Under Test) info as seen by some common utilities.

(Continued on next page)
Platform Notes (Continued)

For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo

model name : AMD EPYC 7232P 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 7232P 8-Core Processor
Stepping: 0
CPU MHz: 3100.000
CPU max MHz: 3100.0000
CPU min MHz: 1500.0000
BogoMIPS: 6261.63
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 8192K
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 aperfmperf pni
pcrmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm ssse4 misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb
cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep
bmi2 cqm rdt_a rdseed adx clflushopt clwb sha_ni xsaveopt xsaves xsavec xgetbv1 xsave
(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRSA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECRate®2017_fp_base = 70.7
SPECRate®2017_fp_peak = 72.3

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

Platform Notes (Continued)

cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaverptr 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

/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
node 0 size: 515818 MB
node 0 free: 515059 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
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

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECrate®2017_fp_base = 70.7
SPECrate®2017_fp_peak = 72.3

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

Platform Notes (Continued)

run-level 3 Mar 31 16:25

SPEC is set to: /spec2017c3
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdd4 xfs 199G 18G 182G 10% /

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        | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
         | 544.nab_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++      | 508.namd_r(base, peak) 510.parest_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

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECrate®2017 fp_base = 70.7
SPECrate®2017 fp_peak = 72.3

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

Compiler Version Notes (Continued)

C++, C | 511.povray_r(base, peak) 526.blender_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
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++, C, Fortran | 507.cactuBSSN_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
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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_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

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECrater®2017_fp_base = 70.7
SPECrater®2017_fp_peak = 72.3

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

Compiler Version Notes (Continued)

Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
---------------------------------------------------------------------------------------------------------------------
AOCCL.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCCL_2_0_0-Build#191) (based on LLVM AOCCL.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64–unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aoccl-compiler-2.0.0/bin
---------------------------------------------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
clang
C++ benchmarks:
clang+

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
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SPECrate®2017_fp_base = 70.7
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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

Base Portability Flags (Continued)

519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -D__BOOL_DEFINED -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

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

C++ benchmarks:
-std=c++98 -flto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-mlllvm -loop-unswitch-threshold=200000 -mlllvm -vector-library=LIBMVEC
-mlllvm -unroll-threshold=100 -flv-function-specialization
-mlllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-ljemalloc -lflang

Fortran benchmarks:
-flto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-flunroll-loops -Mrecursive -mlllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

Benchmarks using both Fortran and C:
-flto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mlllvm -unroll-threshold=50

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECrate\textsuperscript{2017} _fp_base = 70.7
SPECrate\textsuperscript{2017} _fp_peak = 72.3

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

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-\texttt{-fremap-arrays \texttt{-mllvm -function-specialize }\texttt{-mllvm -enable-gvn-hoist}}
-\texttt{-mllvm -reduce-array-computations=3 \texttt{-mllvm -global-vectorize-slp}}
-\texttt{-mllvm -vector-library=LIBMVEC \texttt{-mllvm -inline-threshold=1000}}
-\texttt{-flv-function-specialization -funroll-loops -Mrecursive -z muldefs}
-\texttt{-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang}

Benchmarks using both C and C++:
-\texttt{-std=c++98 -flto -Wl,\texttt{-mllvm -Wl,\texttt{-f}function-specialize}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-region-vectorize}} \texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-vector-library=LIBMVEC}}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-reduce-array-computations=3}}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-suppress-fmas} -O3 -ffast-math -march=znver2}}
-\texttt{-fstruct-layout=3 \texttt{-mllvm -unroll-threshold=50 -fremap-arrays}}
-\texttt{-mllvm -function-specialize \texttt{-mllvm -enable-gvn-hoist}}
-\texttt{-mllvm -reduce-array-computations=3 \texttt{-mllvm -global-vectorize-slp}}
-\texttt{-mllvm -vector-library=LIBMVEC \texttt{-mllvm -inline-threshold=1000}}
-\texttt{-flv-function-specialization -mllvm -loop-unswitch-threshold=200000}
-\texttt{-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs}
-\texttt{-lmvec -lamdlibm -ljemalloc -lflang}

Benchmarks using Fortran, C, and C++:
-\texttt{-std=c++98 -flto -Wl,\texttt{-mllvm -Wl,\texttt{-function-specialize}}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-region-vectorize}} \texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-vector-library=LIBMVEC}}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-reduce-array-computations=3}}}
-\texttt{-Wl,\texttt{-mllvm -Wl,\texttt{-suppress-fmas} -O3 -ffast-math -march=znver2}}
-\texttt{-fstruct-layout=3 \texttt{-mllvm -unroll-threshold=50 -fremap-arrays}}
-\texttt{-mllvm -function-specialize \texttt{-mllvm -enable-gvn-hoist}}
-\texttt{-mllvm -reduce-array-computations=3 \texttt{-mllvm -global-vectorize-slp}}
-\texttt{-mllvm -vector-library=LIBMVEC \texttt{-mllvm -inline-threshold=1000}}
-\texttt{-flv-function-specialization -mllvm -loop-unswitch-threshold=200000}
-\texttt{-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs}
-\texttt{-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang}

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.10 GHz, AMD EPYC 7232P

SPECrate®2017_fp_base = 70.7
SPECrate®2017_fp_peak = 72.3

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

Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang

Peak Portability Flags

Same as Base Portability Flags

Peak 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 -Ofast -march=znver2
-mms-se4a -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 -lflang

C++ benchmarks:

508.namd_r_basepeak = yes
510.parest_r -std=c++98 -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 -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 -lmvec -lamdlibm -ljemalloc

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

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: -flto -Wl,-mllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-mlllvm -Wl,-reduce-array-computations=3
-wfunroll-loops -Mrecursive -mlllvm -vector-library=LIBMVEC
-Klee -fnl-features -lmvec -ldblibm -ljemalloc
-llflang

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: -flto -Wl,-mllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-mlllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -ffast-math -ffast-math -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 -O3 -funroll-loops
-Mrecursive -Klee -fno-finite-math-only -lmvec
-ldblibm -ljemalloc -llflang

Benchmarks using both C and C++:

511.povray_r: -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-mlllvm -Wl,-reduce-array-computations=3
-wfunroll-loops -Mrecursive -mlllvm -x86-use-zeroupper=false -Ofast
-march=znver2 -mno-sse4a -ffast-math -ffast-math -fstruct-layout=5
-mlllvm -vectorize-memory-aggressively

(Continued on next page)
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Hardware Availability: Nov-2019
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Peak Optimization Flags (Continued)

511.povray_r (continued):
-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 -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000 -lmvec -lamdlibm
-ljemalloc -lflang

526.blender_r:basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r:basepeak = yes

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 2020-03-31 11:37:51-0400.