ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.20 GHz, AMD EPYC 7F72

**SPECrate®2017_fp_base = 204**

**SPECrate®2017_fp_peak = 207**

**Hardware**

- **CPU Name:** AMD EPYC 7F72
- **Max MHz:** 3700
- **Nominal:** 3200
- **Enabled:** 24 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:** 192 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:** 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

<table>
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<th>Benchmark</th>
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<td>370</td>
<td>103</td>
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</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 204
SPECrate®2017_fp_peak = 207

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

(Continued on next page)
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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  
NUMA nodes per socket = NPS2  
Determinism Slider = Power  

Sysinfo program /spec2017c3/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7e6b1e6e46a485a0011  
running on linux-wv9n Wed Mar 11 12:10:35 2020

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SPECRate®2017_fp_base = 204
SPECRate®2017_fp_peak = 207

Platform Notes (Continued)

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 : AMD EPYC 7F72 24-Core Processor
  1 "physical id"s (chips)
  48 "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 : 24
siblings : 48
physical 0: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29 32 33 36 37 40 41 44 45

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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 2
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7F72 24-Core Processor
Stepping: 0
CPU MHz: 3200.000
CPU max MHz: 3200.0000
CPU min MHz: 2500.0000
BogoMIPS: 6464.30
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-11,24-35
NUMA node1 CPU(s): 12-23,36-47
Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nop1 xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor sse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abi sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb

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ASUSTeK Computer Inc.
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SPECrater®2017_fp_base = 204
SPECrater®2017_fp_peak = 207

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

Platform Notes (Continued)

cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsigsbase bmi1 avx2 smep
bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsavees
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean 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: 2 nodes (0-1)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 24 25 26 27 28 29 30 31 32 33 34 35
  node 0 size: 257807 MB
  node 0 free: 257356 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 36 37 38 39 40 41 42 43 44 45 46 47
  node 1 size: 258008 MB
  node 1 free: 257586 MB
  node distances:
    node  0   1
    0:  10  12
    1:  12  10

From /proc/meminfo
  MemTotal:     528195408 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

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

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Platform Notes (Continued)

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 filling

run-level 3 Mar 10 11:41

SPEC is set to: /spec2017c3

Filesystem Type Size Used Avail Use% Mounted on
/dev/sdd4 xfs 199G 25G 175G 13% /

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)
--------------------------------------------------------------------------------------------------------
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins AOCC_2_0_0-Build#191) (based on LLVM AOCCLLVM.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)
(Continued on next page)
ASUSTeK Computer Inc.

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<table>
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<tr>
<th>Specification</th>
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<tr>
<td>SPECrate\textsuperscript{®}2017_fp_peak</td>
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CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Mar-2020
Hardware Availability: Apr-2020
Tested by: ASUSTeK Computer Inc.
Software Availability: Jun-2019

Compiler Version Notes (Continued)

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CPU2017 License: 9016
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Hardware Availability: Apr-2020
Software Availability: Jun-2019

Compiler Version Notes (Continued)

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, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

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.puremt_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
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:
-fflto -Wl,-mllex -Wl,-function-specialize
-Wl,-mllex -Wl,-region-vectorize -Wl,-mllex -Wl,-vector-library=LIBMVEC
-Wl,-mllex -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllex -unroll-threshold=50
-freomap-arrays -mllex -function-specialize -mllex -enable-gvn-hoist
-mllex -reduce-array-computations=3 -mllex -global-vectorize-slp
-mllex -vector-library=LIBMVEC -mllex -inline-threshold=1000
-flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
-fflto

C++ benchmarks:
-std=c++98 -fflto -Wl,-mllex -Wl,-function-specialize
-Wl,-mllex -Wl,-region-vectorize -Wl,-mllex -Wl,-vector-library=LIBMVEC
-Wl,-mllex -Wl,-reduce-array-computations=3
-Wl,-mllex -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-mllex -loop-unswitch-threshold=200000 -mllex -vector-library=LIBMVEC
-mllex -unroll-threshold=1000 -flv-function-specialization
-mllex -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-ljemalloc -fflto

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

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SPEC CPU®2017 Floating Point Rate Result

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Software Availability: Jun-2019

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
-\-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
-\-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 -funroll-loops -Mrecursive -z muldefs
-\-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

Benchmarks using both C and C++:
-\-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 -O3 -ffast-math -march=znver2
-\-fstruct-layout=3 -mllvm -unroll-threshold=50 -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 -mllvm -loop-unswitch-threshold=200000
-\-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs
-\-lmvec -lamdlibm -ljemalloc -lflang

Benchmarks using Fortran, C, and C++:
-\-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 -O3 -ffast-math -march=znver2
-\-fstruct-layout=3 -mllvm -unroll-threshold=50 -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 -mllvm -loop-unswitch-threshold=200000
-\-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-\-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-\-lmvec -lamdlibm -ljemalloc -lflang

Peak Compiler Invocation

C benchmarks:
clang

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
3.20 GHz, AMD EPYC 7F72

SPECrate®2017_fp_base = 204
SPECrate®2017_fp_peak = 207

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

Peak Compiler Invocation (Continued)

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

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
- -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 -lflang

C++ benchmarks:

508.namd_r: basepeak = yes
510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: basepeak = yes

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

**ASUSTeK Computer Inc.**

ASUS RS500A-E10(KRPA-U16) Server System

3.20 GHz, AMD EPYC 7F72

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**SPECrate®2017_fp_base = 204**

**SPECrate®2017_fp_peak = 207**

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**CPU2017 License:** 9016

**Test Sponsor:** ASUSTeK Computer Inc.

**Tested by:** ASUSTeK Computer Inc.

**Test Date:** Mar-2020

**Hardware Availability:** Apr-2020

**Software Availability:** Jun-2019

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**Peak Optimization Flags (Continued)**

549.fotonik3d_r: basepeak = yes

554.roms_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
- Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver2
- funroll-loops -Mrecursive -mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-vector-library=LIBMVEC
- Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc
- llflang

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_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,-x86-use-vzeroupper=false -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
- fvl-function-specialization -mllvm -unroll-threshold=100
- mllvm -enable-partial-unswitch
- mllvm -loop-unswitch-threshold=200000 -lmvec -lamdlibm
- ljemalloc -llflang

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

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The flags files that were used to format this result can be browsed at


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<thead>
<tr>
<th>SPEC CPU®2017 Floating Point Rate Result</th>
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<tbody>
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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 2020-03-11 00:10:35-0400.
Originally published on 2020-04-14.