SPEC® CPU2017 Integer Rate Result

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Cisco Systems

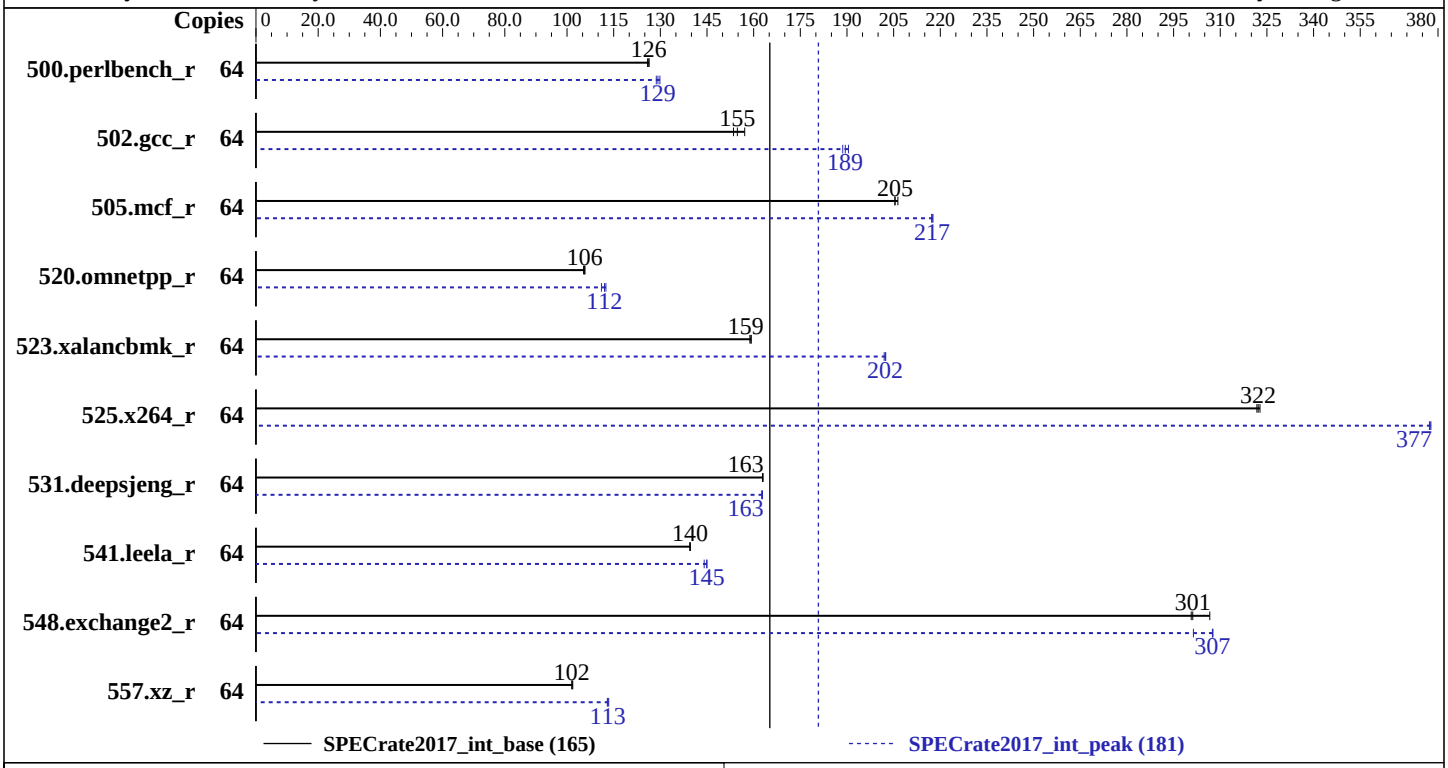
Cisco UCS C125 (AMD EPYC 7351)

SPECrate2017_int_base = 165

SPECrate2017_int_peak = 181

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Jun-2018
Hardware Availability: Aug-2018
Software Availability: Aug-2018



Hardware

CPU Name:	AMD EPYC 7351
Max MHz.:	2900
Nominal:	2400
Enabled:	32 cores, 2 chips, 2 threads/core
Orderable:	1,2 chip
Cache L1:	64 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, 8 MB shared / 2 cores
Other:	None
Memory:	1 TB (16 x 64 GB 4Rx4 PC4-2667V-R)
Storage:	600 GB SAS HDD, 15K RPM
Other:	None

Software

OS:	SUSE Linux Enterprise Server 12 SP3 x86_64 kernel 4.4.143-94.47-default
Compiler:	C/C++: Version 1.0.0 of AOCC Fortran: Version 4.8.2 of GCC
Parallel:	No
Firmware:	Cisco Systems, Inc. BIOS Version C125.4.0.0.16.0511180518 released May-2018
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	32/64-bit
Other:	jemalloc general purpose malloc implementation v4.5.0

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	806	126	809	126	**807**	**126**	64	792	129	**788**	**129**	785	130
502.gcc_r	64	**586**	**155**	577	157	590	154	64	480	189	476	190	**478**	**189**
505.mcf_r	64	501	206	**503**	**205**	504	205	64	**476**	**217**	476	217	475	218
520.omnetpp_r	64	794	106	797	105	**795**	**106**	64	746	113	756	111	**749**	**112**
523.xalancbmk_r	64	425	159	426	159	**425**	**159**	64	335	202	**334**	**202**	334	202
525.x264_r	64	**348**	**322**	347	323	348	322	64	297	378	297	377	**297**	**377**
531.deepsjeng_r	64	450	163	**450**	**163**	450	163	64	451	163	450	163	**451**	**163**
541.leela_r	64	760	140	759	140	**759**	**140**	64	731	145	**731**	**145**	736	144
548.exchange2_r	64	547	307	**557**	**301**	558	301	64	556	301	545	308	**545**	**307**
557.xz_r	64	681	102	679	102	**680**	**102**	64	610	113	**611**	**113**	612	113

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

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

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <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 were enabled for this run (OS default)

Huge pages were not configured for this run.
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/opt/cpu2017/amd1704-rate-libs-revC/64;/opt/cpu2017/amd1704-rate-libs-revC/32:"
MALLOC_CONF = "lg_chunk:26"

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

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4

jemalloc, a general purpose malloc implementation, was obtained at
https://github.com/jemalloc/jemalloc/releases/download/4.5.0/jemalloc-4.5.0.tar.bz2
jemalloc was built with GCC v4.8.5 in RHEL v7.2 under default conditions.
jemalloc uses environment variable MALLOC_CONF with values narenas and lg_chunk:
  narenas: sets the maximum number of arenas to use for automatic multiplexing
           of threads and arenas.
  lg_chunk: set the virtual memory chunk size (log base 2). For example,
            lg_chunk:21 sets the default chunk size to 2^21 = 2MiB.

The AOCC Gold Linker plugin was installed and used for the link stage.

The AOCC Fortran Plugin version 1.0 was used to leverage AOCC optimizers
with gfortran. It is available here:
http://developer.amd.com/amd-aocc/
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 Settings:
Performance Determinism set to Power Deterministic
 Sysinfo program /opt/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-7bdx Sat Jan  1 08:43:15 2011

 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 7351 16-Core Processor
       2  "physical id"s (chips)
       64 "processors"
```

(Continued on next page)

Platform Notes (Continued)

```
    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 4 5 8 9 12 13 16 17 20 21 24 25 28 29
       physical 1: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                64
      On-line CPU(s) list:   0-63
      Thread(s) per core:    2
      Core(s) per socket:    16
      Socket(s):             2
      NUMA node(s):          8
      Vendor ID:             AuthenticAMD
      CPU family:            23
      Model:                 1
      Model name:            AMD EPYC 7351 16-Core Processor
      Stepping:              2
      CPU MHz:               2400.000
      CPU max MHz:           2400.0000
      CPU min MHz:           1200.0000
      BogoMIPS:              4790.90
      Virtualization:        AMD-V
      L1d cache:             32K
      L1i cache:             64K
      L2 cache:              512K
      L3 cache:              8192K
      NUMA node0 CPU(s):     0-3,32-35
      NUMA node1 CPU(s):     4-7,36-39
      NUMA node2 CPU(s):     8-11,40-43
      NUMA node3 CPU(s):     12-15,44-47
      NUMA node4 CPU(s):     16-19,48-51
      NUMA node5 CPU(s):     20-23,52-55
      NUMA node6 CPU(s):     24-27,56-59
      NUMA node7 CPU(s):     28-31,60-63
      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 nonstop_tsc extd_apicid amd_dcm aperfmperf eagerfpu pni
      pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
      rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
      osvw skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx arat
      hw_pstate ssbd ibpb retpoline retpoline_amd npt lbrv svm_lock nrip_save tsc_scale
      vmcb_clean flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase
```

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Platform Notes (Continued)

```
      bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero
      irperf 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: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 32 33 34 35
   node 0 size: 128831 MB
   node 0 free: 128643 MB
   node 1 cpus: 4 5 6 7 36 37 38 39
   node 1 size: 129020 MB
   node 1 free: 128865 MB
   node 2 cpus: 8 9 10 11 40 41 42 43
   node 2 size: 129020 MB
   node 2 free: 128878 MB
   node 3 cpus: 12 13 14 15 44 45 46 47
   node 3 size: 129020 MB
   node 3 free: 128878 MB
   node 4 cpus: 16 17 18 19 48 49 50 51
   node 4 size: 129020 MB
   node 4 free: 128883 MB
   node 5 cpus: 20 21 22 23 52 53 54 55
   node 5 size: 129020 MB
   node 5 free: 128921 MB
   node 6 cpus: 24 25 26 27 56 57 58 59
   node 6 size: 129020 MB
   node 6 free: 128918 MB
   node 7 cpus: 28 29 30 31 60 61 62 63
   node 7 size: 116923 MB
   node 7 free: 116824 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  16  16  16  32  32  32  32
     1:  16  10  16  16  32  32  32  32
     2:  16  16  10  16  32  32  32  32
     3:  16  16  16  10  32  32  32  32
     4:  32  32  32  32  10  16  16  16
     5:  32  32  32  32  16  10  16  16
     6:  32  32  32  32  16  16  10  16
     7:  32  32  32  32  16  16  16  10

 From /proc/meminfo
    MemTotal:       1044357880 kB
    HugePages_Total:       0
```

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Platform Notes (Continued)

```
    Hugepagesize:       2048 kB

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 3
       # This file is deprecated and will be removed in a future service pack or release.
       # Please check /etc/os-release for details about this release.
    os-release:
       NAME="SLES"
       VERSION="12-SP3"
       VERSION_ID="12.3"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12:sp3"

 uname -a:
    Linux linux-7bdx 4.4.143-94.47-default #1 SMP Thu Aug 9 12:47:15 UTC 2018 (6bff971)
    x86_64 x86_64 x86_64 GNU/Linux

 run-level 3 Dec 31 16:26

 SPEC is set to: /opt/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda3      xfs   450G   20G  431G   5% /

 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.
   BIOS Cisco Systems, Inc. C125.4.0.0.16.0511180518 05/11/2018
   Memory:
    16x 0xCE00 M386A8K40BM2-CTD 64 GB 4 rank 2667

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 CC  502.gcc_r(peak)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: i386-unknown-linux-gnu
```

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Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
 CXXC 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
 CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
     525.x264_r(base) 557.xz_r(base, peak)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
 CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base,
     peak) 541.leela_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
CC   500.perlbench_r(peak) 525.x264_r(peak)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
```

(Continued on next page)

Compiler Version Notes (Continued)

```
CXXC 541.leela_r(peak)
------------------------------------------------------------------------------
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
  AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
 FC  548.exchange2_r(base, peak)
------------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
clang gfortran

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
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, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -z muldefs -ljemalloc

C++ benchmarks:
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -march=znver1 -mllvm -unroll-threshold=100
-finline-aggressive -fremap-arrays -inline-threshold=1000 -z muldefs
-ljemalloc

Fortran benchmarks:
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -mavx -madx -funroll-loops -ffast-math
-z muldefs -Ofast -fdefault-integer-8 -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=" -enable-iv-split
-inline-threshold:1000 -disable-vect-cmp" -ljemalloc -lgfortran
-lamdlibm

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
clang gfortran

Peak Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64

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Peak Portability Flags (Continued)

557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -ljemalloc

502.gcc_r: -m32 -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -fgnu89-inline
-D_FILE_OFFSET_BITS=64(*) -ljemalloc

505.mcf_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -ljemalloc

525.x264_r: Same as 500.perlbench_r

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100
-fremap-arrays -inline-threshold=1000 -ljemalloc

523.xalancbmk_r: -m32 -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100
-fremap-arrays -inline-threshold=1000
-D_FILE_OFFSET_BITS=64(*) -ljemalloc

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Peak Optimization Flags (Continued)

531.deepsjeng_r: `Same as 520.omnetpp_r`

541.leela_r: `-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop -fprofile-instr-generate`(pass 1) `-fprofile-instr-use`(pass 2) `-Ofast -march=znver1 -mllvm -unroll-count=8 -unroll-threshold=100 -ljemalloc`

Fortran benchmarks:
`-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop -O3 -mavx2 -madx -funroll-loops -ffast-math -Ofast -fdefault-integer-8 -fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=" -enable-iv-split -inline-threshold:1000 -disable-vect-cmp" -ljemalloc -lgfortran -lamdlibm`

(*) Indicates an optimization flag that was found in a portability variable.

Peak Other Flags

C benchmarks:

502.gcc_r: `-L/root/work/lib/jemalloc/lib32`

C++ benchmarks:

523.xalancbmk_r: `-L/root/work/lib/jemalloc/lib32`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.html`
`http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html`
`http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-V1-revA.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml`
`http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml`
`http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-V1-revA.xml`

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Tested with SPEC CPU2017 v1.0.2 on 2011-01-01 11:43:14-0500.
Report generated on 2018-10-31 19:15:01 by CPU2017 PS formatter v6067.
Originally published on 2018-10-02.