SPEC® CPU2017 Integer Rate Result

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Supermicro

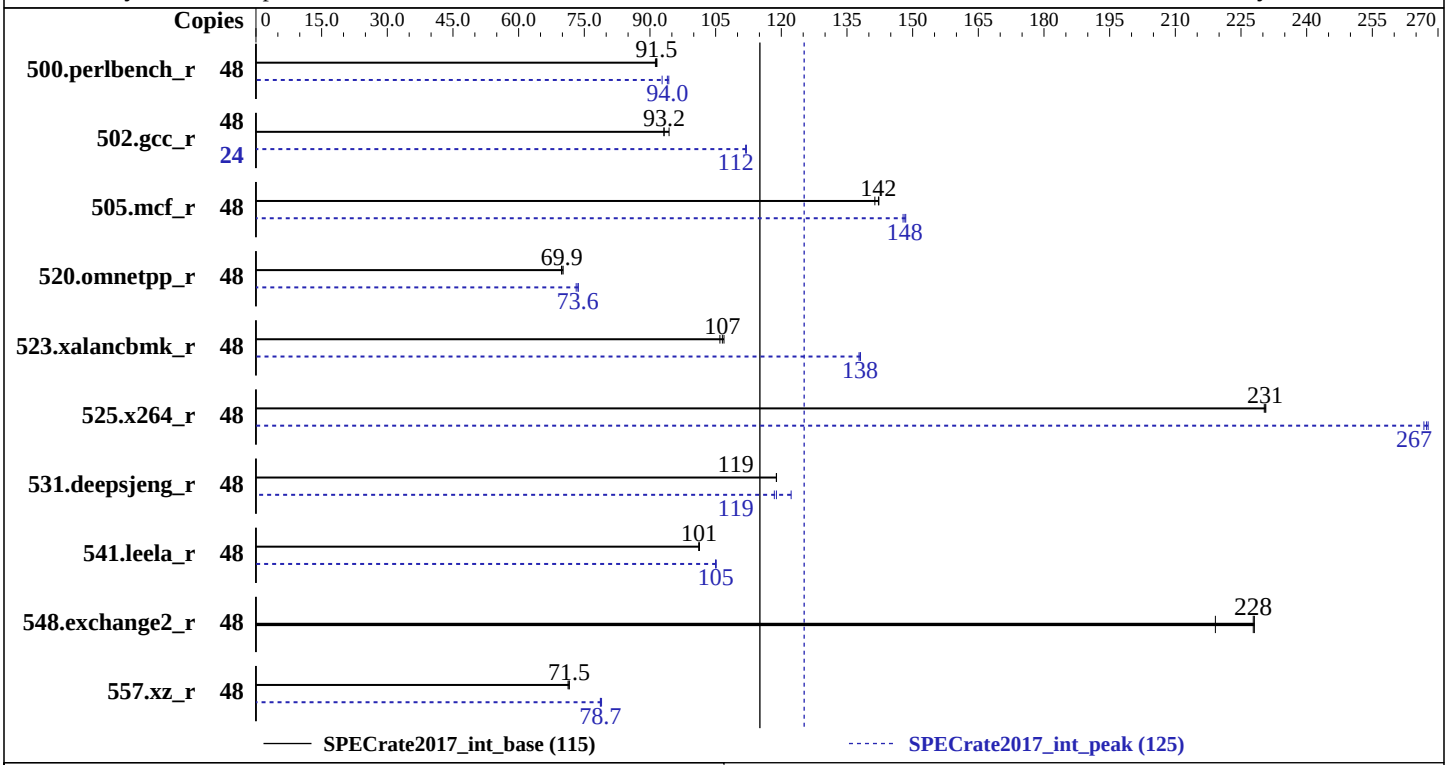
A+ Server 1113S-WN10RT
(H11SSW-NT , AMD EPYC 7401)

SPECrate2017_int_base = 115

SPECrate2017_int_peak = 125

CPU2017 License: 001176
Test Sponsor: Supermicro
Tested by: Supermicro

Test Date: Nov-2018
Hardware Availability: Sep-2018
Software Availability: Feb-2018



Hardware

CPU Name:	AMD EPYC 7401
Max MHz.:	3000
Nominal:	2000
Enabled:	24 cores, 1 chip, 2 threads/core
Orderable:	1 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 / 3 cores
Other:	None
Memory:	512 GB (8 x 64 GB 4Rx4 PC4-2666V-L)
Storage:	1 x 200 GB SATAIII SSD
Other:	None

Software

OS:	SUSE Linux Enterprise Server 12 SP3 (x86_64) kernel 4.4.114-94.11-default
Compiler:	C/C++: Version 1.0.0 of AOCC Fortran: Version 4.8.2 of GCC
Parallel:	No
Firmware:	Supermicro BIOS version 1.0 released Sep-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	48	**835**	**91.5**	837	91.2	834	91.6	48	810	94.3	824	92.8	**813**	**94.0**
502.gcc_r	48	**729**	**93.2**	720	94.4	729	93.2	24	**304**	**112**	303	112	304	112
505.mcf_r	48	545	142	**546**	**142**	549	141	48	525	148	523	148	**523**	**148**
520.omnetpp_r	48	898	70.2	**901**	**69.9**	902	69.8	48	855	73.6	861	73.1	**856**	**73.6**
523.xalancbmk_r	48	478	106	**476**	**107**	474	107	48	368	138	**367**	**138**	367	138
525.x264_r	48	**365**	**231**	365	230	364	231	48	**314**	**267**	315	267	314	268
531.deepsjeng_r	48	463	119	**463**	**119**	463	119	48	**463**	**119**	465	118	450	122
541.leela_r	48	785	101	**785**	**101**	786	101	48	757	105	**757**	**105**	756	105
548.exchange2_r	48	551	228	574	219	**552**	**228**	48	551	228	574	219	**552**	**228**
557.xz_r	48	727	71.3	**725**	**71.5**	724	71.6	48	659	78.7	**659**	**78.7**	657	78.9

SPECrate2017_int_base = 115

SPECrate2017_int_peak = 125

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/

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/
```

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
```

(Continued on next page)

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 were enabled for this run (OS default)
```

General Notes

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

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.
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:
Determinism Slider = Power
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-pm02 Mon Nov  5 15:38:00 2018

 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 7401 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.)
```

(Continued on next page)

Platform Notes (Continued)

```
       cpu cores : 24
       siblings  : 48
       physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      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):          4
      Vendor ID:             AuthenticAMD
      CPU family:            23
      Model:                 1
      Model name:            AMD EPYC 7401 24-Core Processor
      Stepping:              2
      CPU MHz:               2000.000
      CPU max MHz:           2000.0000
      CPU min MHz:           1200.0000
      BogoMIPS:              3999.77
      Virtualization:        AMD-V
      L1d cache:             32K
      L1i cache:             64K
      L2 cache:              512K
      L3 cache:              8192K
      NUMA node0 CPU(s):     0-5,24-29
      NUMA node1 CPU(s):     6-11,30-35
      NUMA node2 CPU(s):     12-17,36-41
      NUMA node3 CPU(s):     18-23,42-47
      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 cpb
      hw_pstate retpoline retpoline_amd npt lbrv svm_lock nrip_save tsc_scale vmcb_clean
      flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase bmi1 avx2
      smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero irperf
      ibpb 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
```


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Platform Notes (Continued)

```
physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0 1 2 3 4 5 24 25 26 27 28 29
  node 0 size: 128826 MB
  node 0 free: 128662 MB
  node 1 cpus: 6 7 8 9 10 11 30 31 32 33 34 35
  node 1 size: 129021 MB
  node 1 free: 128869 MB
  node 2 cpus: 12 13 14 15 16 17 36 37 38 39 40 41
  node 2 size: 129021 MB
  node 2 free: 128866 MB
  node 3 cpus: 18 19 20 21 22 23 42 43 44 45 46 47
  node 3 size: 129020 MB
  node 3 free: 128864 MB
  node distances:
  node   0   1   2   3
    0:  10  16  16  16
    1:  16  10  16  16
    2:  16  16  10  16
    3:  16  16  16  10

From /proc/meminfo
   MemTotal:       528271804 kB
   HugePages_Total:       0
   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-pm02 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
```

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Platform Notes (Continued)

```
 CVE-2017-5754 (Meltdown):          Not affected
 CVE-2017-5753 (Spectre variant 1): Mitigation: Barriers
 CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline + IBPB

 run-level 3 Nov 5 15:20

 SPEC is set to: /home/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda4      xfs   145G  5.6G  139G   4% /home

 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 American Megatrends Inc. 1.0 09/04/2018
   Memory:
    8x NO DIMM NO DIMM
    8x Samsung 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
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)
```

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Compiler Version Notes (Continued)

```
      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
------------------------------------------------------------------------------

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

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Compiler Version Notes (Continued)

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

C++ benchmarks:
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
-O3 -march=znver1 -mllvm -unroll-threshold=100 -finline-aggressive
-fremap-arrays -mllvm -inline-threshold=1000 -mllvm -disable-vect-cmp
-z muldefs -ljemalloc

Fortran benchmarks:
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Wl,-plugin-opt=-disable-vect-cmp
-O3 -mavx -madx -funroll-loops -ffast-math -z muldefs -Ofast
-fdefault-integer-8 -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-lsr-in-nested-loop
-fplugin-arg-dragonegg-llvm-option=-enable-iv-split
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000
-fplugin-arg-dragonegg-llvm-option=-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
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,-plugin-opt=-merge-constant -Wl,-plugin-opt=-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 -mllvm -unroll-threshold=100 -fremap-arrays -mllvm -inline-threshold=1000 -ljemalloc`

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

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

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

531.deepsjeng_r: `Same as 520.omnetpp_r`

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

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Peak Optimization Flags (Continued)

Fortran benchmarks:

548.exchange2_r: `basepeak = yes`

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.2018-11-13.html`
`http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html`
`http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revD.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-11-13.xml`
`http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml`
`http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revD.xml`

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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