SPEC® CPU2017 Integer Rate Result

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Supermicro

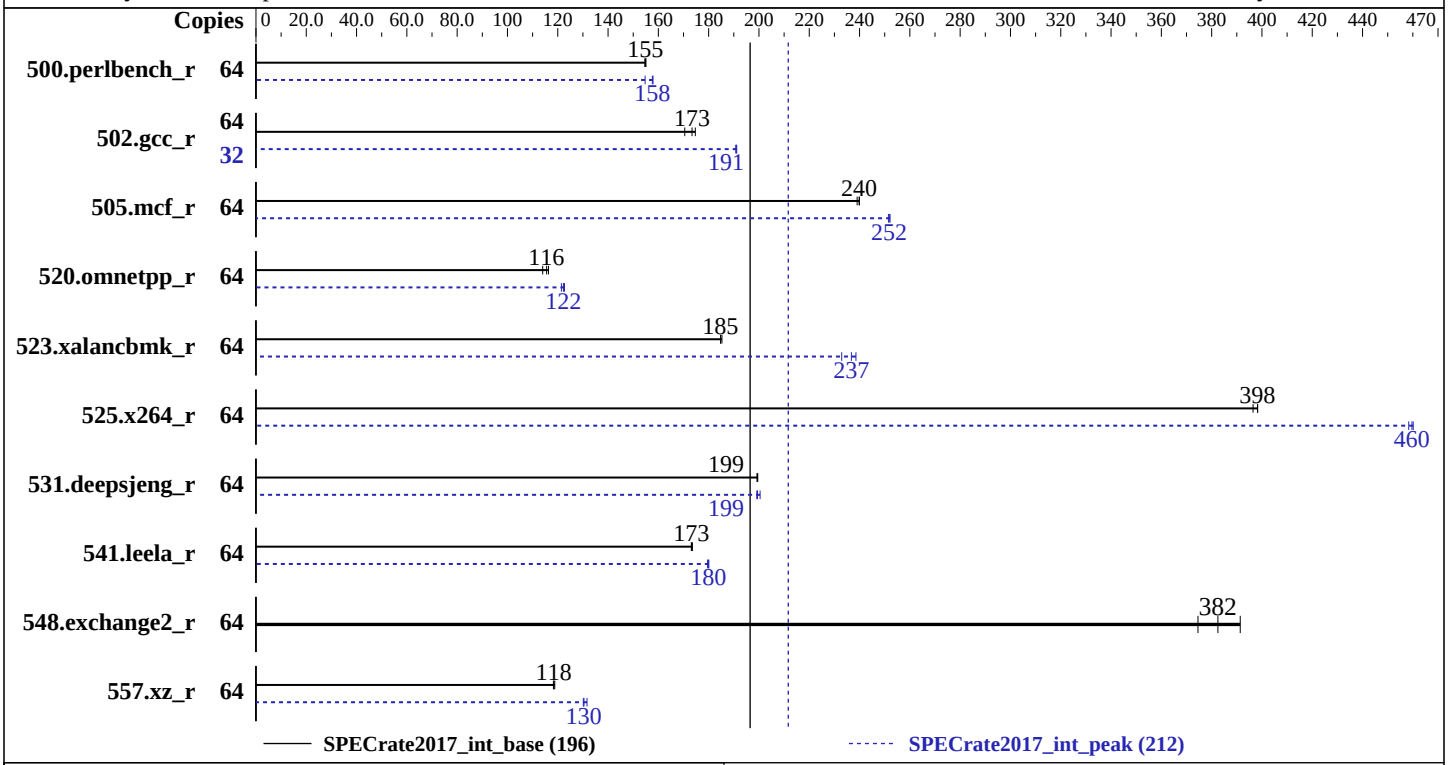
A+ Server 2023US-TR4
(H11DSU-iN , AMD EPYC 7371)

SPECrate2017_int_base = 196

SPECrate2017_int_peak = 212

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

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



Hardware

CPU Name:	AMD EPYC 7371
Max MHz.:	3800
Nominal:	3100
Enabled:	32 cores, 2 chips, 2 threads/core
Orderable:	1,2 chips
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 PC4-2666V-L)
Storage:	1 x 500 GB SATAIII, 7200 RPM
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 1.1c released Oct-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	657	155	**658**	**155**	659	155	64	**646**	**158**	658	155	645	158
502.gcc_r	64	532	170	519	175	**523**	**173**	32	237	191	237	191	**237**	**191**
505.mcf_r	64	431	240	433	239	**431**	**240**	64	411	251	410	252	**411**	**252**
520.omnetpp_r	64	**727**	**116**	722	116	737	114	64	**687**	**122**	684	123	691	121
523.xalancbmk_r	64	365	185	**366**	**185**	366	185	64	290	233	**285**	**237**	283	239
525.x264_r	64	283	396	281	398	**281**	**398**	64	**244**	**460**	244	460	244	458
531.deepsjeng_r	64	368	199	368	199	**368**	**199**	64	**368**	**199**	368	199	366	200
541.leela_r	64	611	174	612	173	**612**	**173**	64	590	180	589	180	**589**	**180**
548.exchange2_r	64	428	391	**438**	**382**	448	375	64	428	391	**438**	**382**	448	375
557.xz_r	64	582	119	584	118	**584**	**118**	64	525	132	**530**	**130**	531	130

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SPECrate2017_int_peak = 212

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
```

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Operating System Notes (Continued)

```
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)
```

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-769d Fri Nov 23 18:25:22 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 7371 16-Core Processor
       2  "physical id"s (chips)
       64 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
```

(Continued on next page)

Platform Notes (Continued)

```
    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 7371 16-Core Processor
       Stepping:              2
       CPU MHz:               3100.000
       CPU max MHz:           3100.0000
       CPU min MHz:           2500.0000
       BogoMIPS:              6200.07
       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 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
```

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Platform Notes (Continued)

```
      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
  physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0 1 2 3 32 33 34 35
    node 0 size: 128849 MB
    node 0 free: 128718 MB
    node 1 cpus: 4 5 6 7 36 37 38 39
    node 1 size: 129022 MB
    node 1 free: 128895 MB
    node 2 cpus: 8 9 10 11 40 41 42 43
    node 2 size: 129022 MB
    node 2 free: 128909 MB
    node 3 cpus: 12 13 14 15 44 45 46 47
    node 3 size: 129022 MB
    node 3 free: 128904 MB
    node 4 cpus: 16 17 18 19 48 49 50 51
    node 4 size: 129022 MB
    node 4 free: 128923 MB
    node 5 cpus: 20 21 22 23 52 53 54 55
    node 5 size: 129022 MB
    node 5 free: 128928 MB
    node 6 cpus: 24 25 26 27 56 57 58 59
    node 6 size: 129022 MB
    node 6 free: 128925 MB
    node 7 cpus: 28 29 30 31 60 61 62 63
    node 7 size: 116925 MB
    node 7 free: 116832 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:       1044386048 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB
```

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Platform Notes (Continued)

```
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-769d 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:

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 23 17:20

SPEC is set to: /home/cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda4      xfs   422G   28G  394G   7% /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. 1.1c 10/04/2018
  Memory:
   16x NO DIMM NO DIMM
   16x 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)
      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)
```

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Compiler Version Notes (Continued)

```
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
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

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Base Portability Flags (Continued)

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
-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

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Peak Compiler Invocation (Continued)

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

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Peak Optimization Flags (Continued)

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`

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

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

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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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