SPEC® CPU2017 Integer Rate Result

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Supermicro
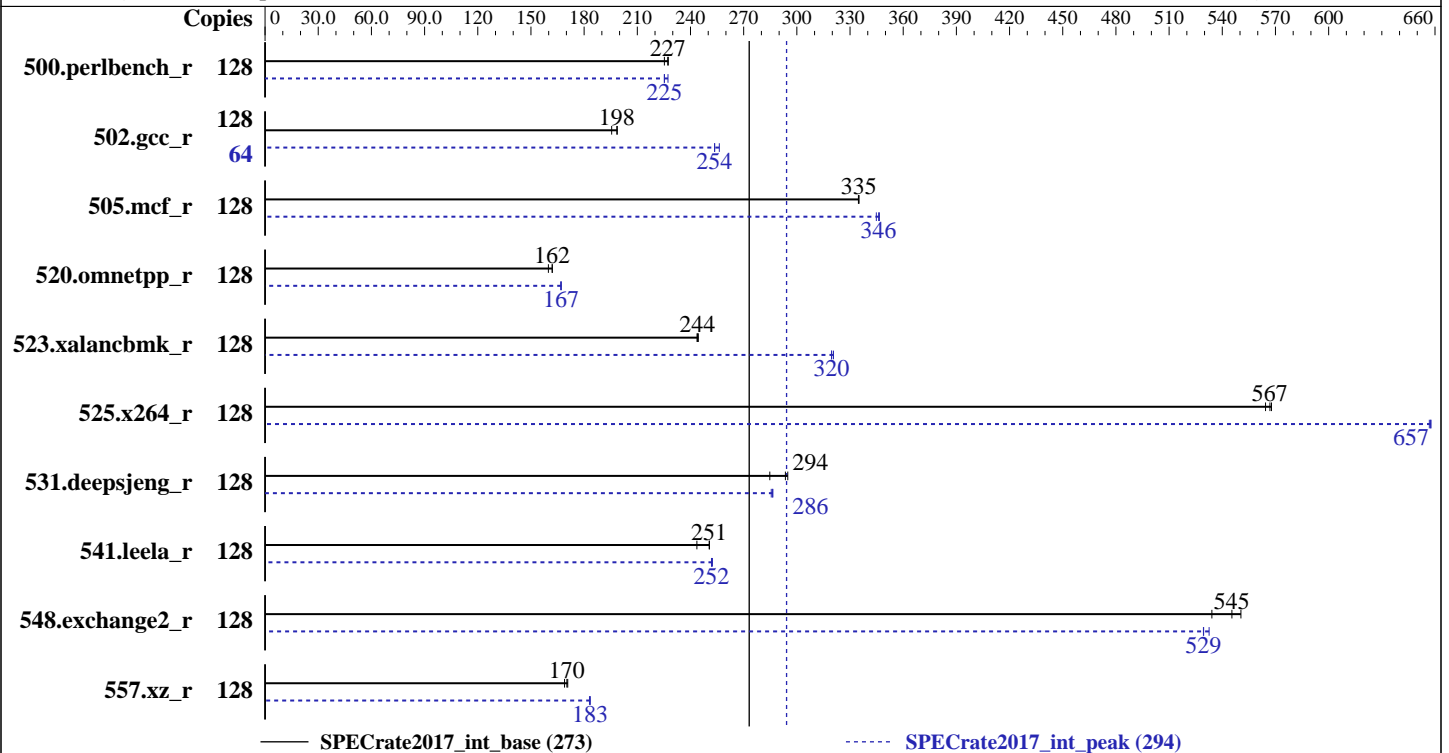
A+ Server 2023US-TR4
(H11DSU-iN , AMD EPYC 7501)

SPECrate2017_int_base = 273

SPECrate2017_int_peak = 294

CPU2017 License: 001176

Test Sponsor: Supermicro

Tested by: Supermicro

Test Date: Mar-2018

Hardware Availability: Jun-2017

Software Availability: Nov-2017

Copies		
500.perlbench_r	128	227 / 225
502.gcc_r	128 / 64	198 / 254
505.mcf_r	128	335 / 346
520.omnetpp_r	128	162 / 167
523.xalancbmk_r	128	244 / 320
525.x264_r	128	567 / 657
531.deepsjeng_r	128	294 / 286
541.leela_r	128	251 / 252
548.exchange2_r	128	545 / 529
557.xz_r	128	170 / 183

SPECrate2017_int_base (273)   SPECrate2017_int_peak (294)

Hardware

CPU Name: AMD EPYC 7501
 Max MHz.: 3000
 Nominal: 2000
Enabled: 64 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 / 4 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 1.1 released Feb-2018
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc: 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	128	**897**	**227**	905	225	896	227	128	905	225	897	227	**904**	**225**
502.gcc_r	128	**913**	**198**	927	196	912	199	64	**357**	**254**	357	254	354	256
505.mcf_r	128	618	335	**618**	**335**	617	335	128	600	345	597	347	**598**	**346**
520.omnetpp_r	128	1051	160	1036	162	**1037**	**162**	128	1007	167	**1006**	**167**	1005	167
523.xalancbmk_r	128	555	244	**554**	**244**	553	244	128	**423**	**320**	422	321	423	320
525.x264_r	128	395	568	**395**	**567**	397	564	128	341	658	341	657	**341**	**657**
531.deepsjeng_r	128	**500**	**294**	497	295	515	285	128	512	286	514	286	**513**	**286**
541.leela_r	128	**846**	**251**	846	251	870	244	128	840	252	**841**	**252**	842	252
548.exchange2_r	128	**615**	**545**	609	551	628	534	128	630	533	634	529	**633**	**529**
557.xz_r	128	**812**	**170**	810	171	818	169	128	754	183	755	183	**754**	**183**
SPECrate2017_int_base =		**273**												
SPECrate2017_int_peak =		**294**												

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.
```

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General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/amd1704-rate-libs-revC/64;/home/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:
Determinism Slider = Power
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-769d Tue Mar 6 23:32:53 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 7501 32-Core Processor
       2 "physical id"s (chips)

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Platform Notes (Continued)

```
     128 "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 : 32
     siblings  : 64
     physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
     25 26 27 28 29 30 31
     physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
     25 26 27 28 29 30 31

 From lscpu:
     Architecture:          x86_64
     CPU op-mode(s):        32-bit, 64-bit
     Byte Order:            Little Endian
     CPU(s):                128
     On-line CPU(s) list:   0-127
     Thread(s) per core:    2
     Core(s) per socket:    32
     Socket(s):             2
     NUMA node(s):          8
     Vendor ID:             AuthenticAMD
     CPU family:            23
     Model:                 1
     Model name:            AMD EPYC 7501 32-Core Processor
     Stepping:              2
     CPU MHz:               2000.000
     CPU max MHz:           2000.0000
     CPU min MHz:           1200.0000
     BogoMIPS:              3999.33
     Virtualization:        AMD-V
     L1d cache:             32K
     L1i cache:             64K
     L2 cache:              512K
     L3 cache:              8192K
     NUMA node0 CPU(s):     0-7,64-71
     NUMA node1 CPU(s):     8-15,72-79
     NUMA node2 CPU(s):     16-23,80-87
     NUMA node3 CPU(s):     24-31,88-95
     NUMA node4 CPU(s):     32-39,96-103
     NUMA node5 CPU(s):     40-47,104-111
     NUMA node6 CPU(s):     48-55,112-119
     NUMA node7 CPU(s):     56-63,120-127
     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
```

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Platform Notes (Continued)

```
     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
 physical chip.
   available: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 4 5 6 7 64 65 66 67 68 69 70 71
   node 0 size: 128848 MB
   node 0 free: 128699 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
   node 1 size: 129021 MB
   node 1 free: 128866 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
   node 2 size: 129021 MB
   node 2 free: 128863 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
   node 3 size: 129021 MB
   node 3 free: 128873 MB
   node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
   node 4 size: 129021 MB
   node 4 free: 128901 MB
   node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
   node 5 size: 129021 MB
   node 5 free: 128901 MB
   node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
   node 6 size: 129021 MB
   node 6 free: 128905 MB
   node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
   node 7 size: 129019 MB
   node 7 free: 128906 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
```

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Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       1056763384 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-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

run-level 3 Mar 6 19:26

SPEC is set to: /home/cpu2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda4       xfs   422G   25G  397G   6% /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. 1.1 02/07/2018
   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)
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------
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)
Target: x86_64-unknown-linux-gnu
Thread model: posix
```

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Compiler Version Notes (Continued)

```
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
 523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
 525.x264_r: -DSPEC_LP64
```

(Continued on next page)

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Base Portability Flags (Continued)

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(gfortran) -O3(clang) -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`

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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`
`-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`
`-L/root/work/lib/jemalloc/lib32 -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`

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Peak Optimization Flags (Continued)

520.omnetpp_r (continued):
```
-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
-L/root/work/lib/jemalloc/lib32 -ljemalloc
```

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(gfortran) -O3(clang) -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
```

The flags files that were used to format this result can be browsed at
```
http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.html
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revC.2018-03-20.html
```

You can also download the XML flags sources by saving the following links:
```
http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revC.2018-03-20.xml
```

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

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