# SPEC® CPU2017 Integer Rate Result

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## GIGA-BYTE TECHNOLOGY CO., LTD

(Test Sponsor: GIGA-BYTE TECHNOLOGY CO., LTD.)

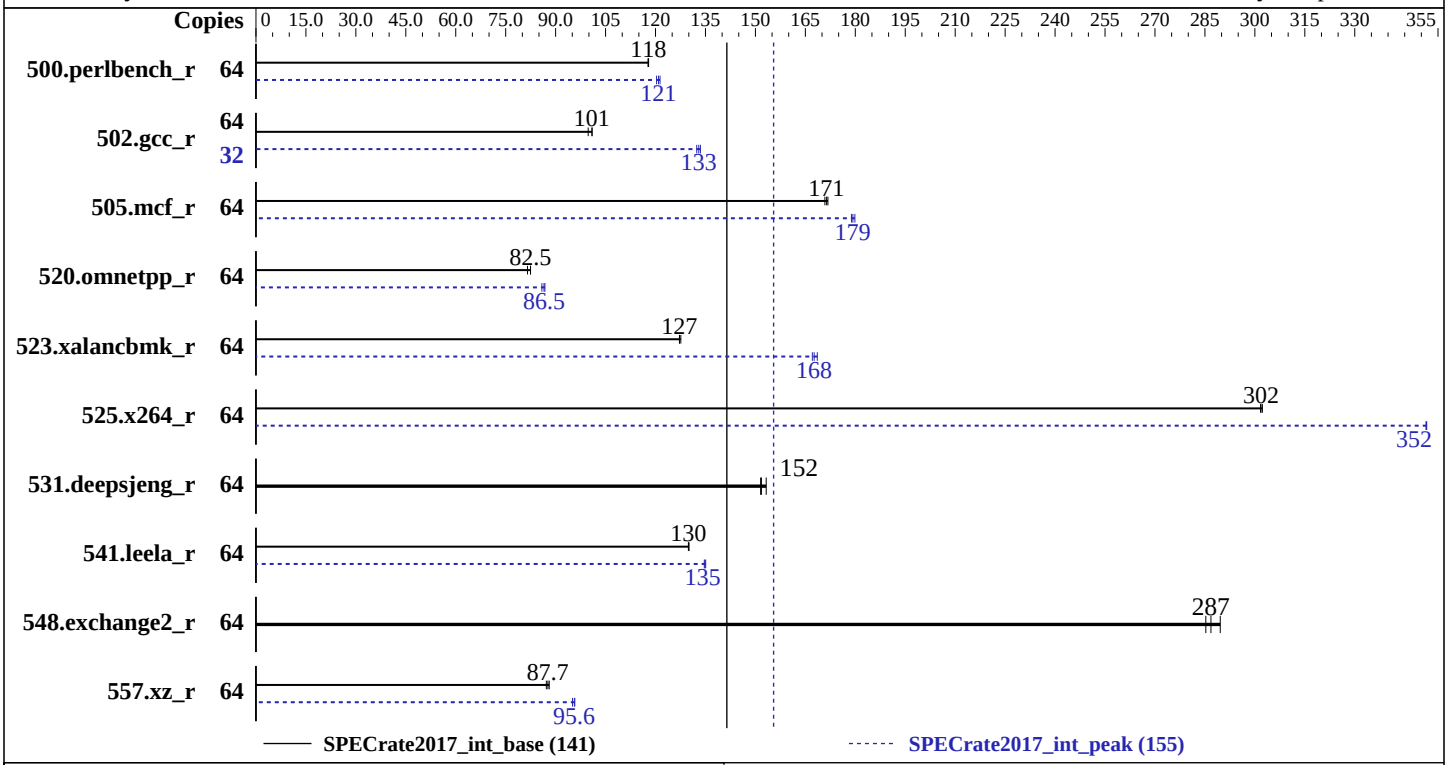
R271-Z31
(AMD EPYC 7601, 2.20 GHz)

SPECrate2017_int_base = 141

SPECrate2017_int_peak = 155

**CPU2017 License:** 4872
**Test Sponsor:** GIGA-BYTE TECHNOLOGY CO., LTD.
**Tested by:** GIGA-BYTE TECHNOLOGY CO., LTD.

**Test Date:** Apr-2018
**Hardware Availability:** Mar-2018
**Software Availability:** Apr-2018




## Hardware

| | |
|---|---|
| CPU Name: | AMD EPYC 7601 |
| Max MHz.: | 3200 |
| Nominal: | 2200 |
| Enabled: | 32 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 / 4 cores |
| Other: | None |
| Memory: | 512 GB (8 x 64 GB 4Rx4 PC4-2667V-L) |
| Storage: | 1 x 240 GB SATA SSD |
| Other: | None |

## Software

| | |
|---|---|
| OS: | Ubuntu 16.04.4 LTS<br>kernel 4.4.0-116-generic |
| Compiler: | C/C++: Version 1.0.0 of AOCC<br>Fortran: Version 4.8.2 of GCC |
| Parallel: | No |
| Firmware: | Version F07b released Apr-2018 |
| File System: | ext4 |
| System State: | Run Level 5 (multi-user, graphical) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 32/64-bit |
| Other: | jemalloc general purpose malloc implementation<br>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 | 865 | 118 | **864** | **118** | 864 | 118 | 64 | 847 | 120 | 840 | 121 | **843** | **121** |
| 502.gcc_r | 64 | 908 | 99.8 | 898 | 101 | **898** | **101** | 32 | **341** | **133** | 342 | 132 | 339 | 133 |
| 505.mcf_r | 64 | **603** | **171** | 605 | 171 | 602 | 172 | 64 | 578 | 179 | **577** | **179** | 575 | 180 |
| 520.omnetpp_r | 64 | 1018 | 82.5 | **1018** | **82.5** | 1030 | 81.6 | 64 | 978 | 85.9 | **971** | **86.5** | 968 | 86.8 |
| 523.xalancbmk_r | 64 | **531** | **127** | 531 | 127 | 530 | 128 | 64 | 401 | 169 | **403** | **168** | 404 | 167 |
| 525.x264_r | 64 | 371 | 302 | **371** | **302** | 371 | 302 | 64 | 319 | 352 | 319 | 351 | **319** | **352** |
| 531.deepsjeng_r | 64 | **483** | **152** | 479 | 153 | 484 | 152 | 64 | **483** | **152** | 479 | 153 | 484 | 152 |
| 541.leela_r | 64 | 815 | 130 | **816** | **130** | 816 | 130 | 64 | **786** | **135** | 787 | 135 | 785 | 135 |
| 548.exchange2_r | 64 | 588 | 285 | 579 | 290 | **585** | **287** | 64 | 588 | 285 | 579 | 290 | **585** | **287** |
| 557.xz_r | 64 | 785 | 88.1 | **788** | **87.7** | 793 | 87.2 | 64 | **723** | **95.6** | 727 | 95.1 | 722 | 95.8 |

**SPECrate2017_int_base =** **141**

**SPECrate2017_int_peak =** **155**

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

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 = "/home/amd/amd1704-rate-libs-revC/64;/home/amd/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/
Yes: 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
cTDP Control = Manual
cTDP = 200
 Sysinfo program /home/amd/cpu2017-1.0.2.tar/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on amd-ubuntu Fri Apr 20 17:34:54 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 7601 32-Core Processor
```

**(Continued on next page)**

## Platform Notes (Continued)

```
      1  "physical id"s (chips)
      64 "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

 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:    32
      Socket(s):             1
      NUMA node(s):          4
      Vendor ID:             AuthenticAMD
      CPU family:            23
      Model:                 1
      Model name:            AMD EPYC 7601 32-Core Processor
      Stepping:              2
      CPU MHz:               2200.000
      CPU max MHz:           2200.0000
      CPU min MHz:           1200.0000
      BogoMIPS:              4399.75
      Virtualization:        AMD-V
      L1d cache:             32K
      L1i cache:             64K
      L2 cache:              512K
      L3 cache:              8192K
      NUMA node0 CPU(s):     0-7,32-39
      NUMA node1 CPU(s):     8-15,40-47
      NUMA node2 CPU(s):     16-23,48-55
      NUMA node3 CPU(s):     24-31,56-63
      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 cpb
      hw_pstate retpoline retpoline_amd vmmcall fsgsbase bmi1 avx2 smep bmi2 rdseed adx
      smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero ibpb arat npt lbrv svm_lock
      nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold

 /proc/cpuinfo cache data
```

**(Continued on next page)**

## Platform Notes (Continued)

```
    cache size : 512 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
   available: 4 nodes (0-3)
   node 0 cpus: 0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39
   node 0 size: 128895 MB
   node 0 free: 128572 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
   node 1 size: 129019 MB
   node 1 free: 128677 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
   node 2 size: 129019 MB
   node 2 free: 128689 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
   node 3 size: 129017 MB
   node 3 free: 128708 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:       528334532 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /usr/bin/lsb_release -d
    Ubuntu 16.04.4 LTS

 From /etc/*release* /etc/*version*
    debian_version: stretch/sid
    os-release:
       NAME="Ubuntu"
       VERSION="16.04.4 LTS (Xenial Xerus)"
       ID=ubuntu
       ID_LIKE=debian
       PRETTY_NAME="Ubuntu 16.04.4 LTS"
       VERSION_ID="16.04"
       HOME_URL="http://www.ubuntu.com/"
       SUPPORT_URL="http://help.ubuntu.com/"

 uname -a:
    Linux amd-ubuntu 4.4.0-116-generic #140-Ubuntu SMP Mon Feb 12 21:23:04 UTC 2018 x86_64
    x86_64 x86_64 GNU/Linux
```

**(Continued on next page)**

## Platform Notes (Continued)

```
 run-level 5 Apr 20 17:31

 SPEC is set to: /home/amd/cpu2017-1.0.2.tar
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda2      ext4  219G  5.3G  203G   3% /

 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 GIGABYTE F07b 04/02/2018
   Memory:
    8x Samsung M386A8K40BM2-CTD 64 GB 4 rank 2667
    8x Unknown Unknown

 (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)
```

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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 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
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(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

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):
`-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 -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`

**(Continued on next page)**

## Peak Optimization Flags (Continued)

502.gcc_r (continued):
-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
-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: basepeak = yes

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:

548.exchange2_r: basepeak = yes

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

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


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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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