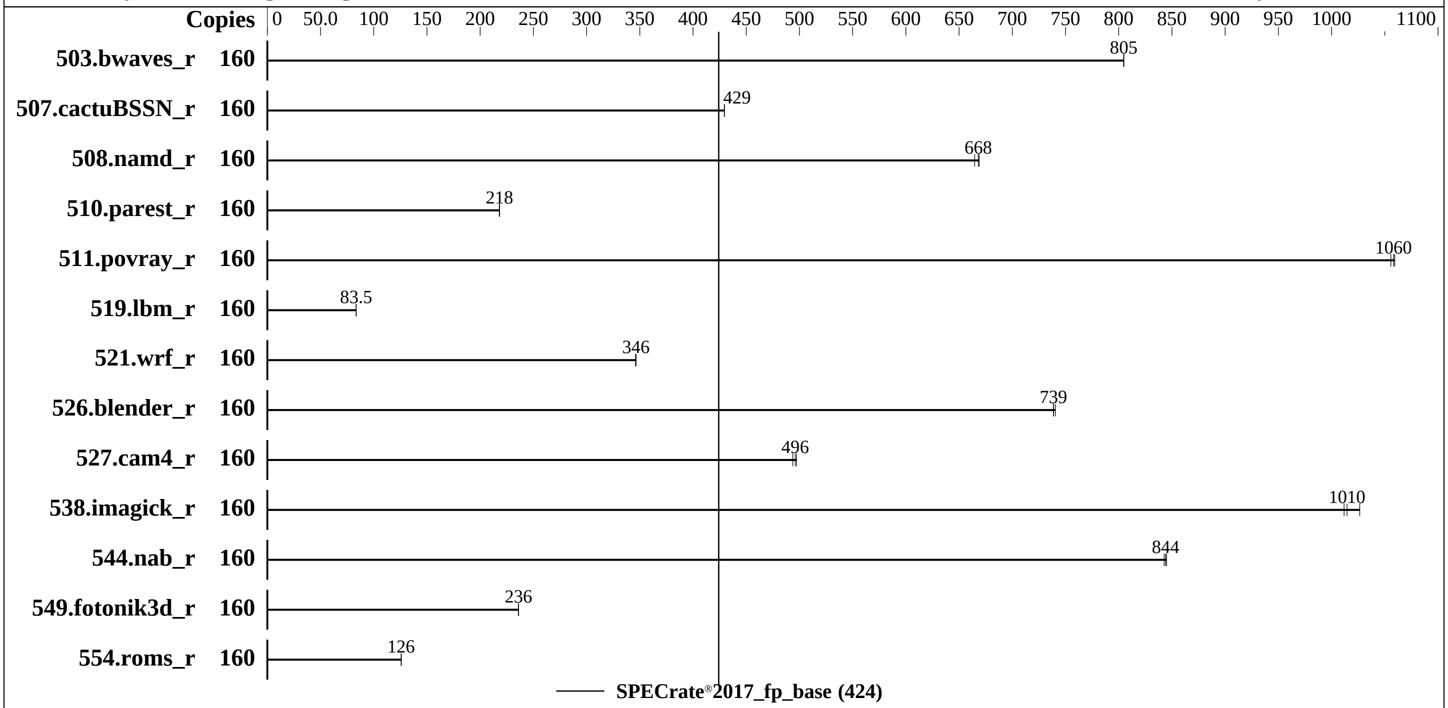
Inspur Corporation

SPECrate®2017_fp_base = 424

Inspur NF5280R6 (Ampere Altra Q80-33)

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 3358
Test Sponsor: Inspur Corporation
Tested by: Inspur Corporation
Test Date: Sep-2021
Hardware Availability: Jan-2022
Software Availability: Dec-2020



Hardware

CPU Name: Ampere Altra Q80-33
Max MHz: 3300
Nominal: 3000
Enabled: 160 cores, 2 chips
Orderable: 2 chips
Cache L1: 64 KB I + 64 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 32 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.3 (Ootpa) 4.18.0-240.el8.aarch64
Compiler: C/C++/Fortran: Version 10.2.1 of Ampere GCC
Parallel: No
Firmware: Version 05.00.04 released Aug-2021
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: Jemalloc memory allocator library v5.2.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

Results Table

Benchmark	Base Copies	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Peak Copies	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio
503.bwaves_r	160	**1994**	**805**	1994	805	1994	805							
507.cactuBSSN_r	160	472	429	472	429	**472**	**429**							
508.namd_r	160	227	669	**228**	**668**	229	665							
510.parest_r	160	**1918**	**218**	1921	218	1918	218							
511.povray_r	160	**353**	**1060**	353	1060	354	1060							
519.lbm_r	160	2019	83.5	2020	83.5	**2019**	**83.5**							
521.wrf_r	160	1035	346	**1035**	**346**	1036	346							
526.blender_r	160	330	739	**330**	**739**	329	740							
527.cam4_r	160	563	497	567	494	**564**	**496**							
538.imagick_r	160	393	1010	**392**	**1010**	388	1030							
544.nab_r	160	319	845	320	843	**319**	**844**							
549.fotonik3d_r	160	2644	236	**2642**	**236**	2642	236							
554.roms_r	160	2019	126	**2021**	**126**	2021	126							

SPECrate®2017_fp_base = 424

SPECrate®2017_fp_peak = Not Run

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

Compiler Notes

```
Binaries were compiled on a system with 2x Ampere Altra Q80-33 CPU
chips + 256 GB Memory using CentOS 8.3.

Ampere GCC 10.2.1 is available via
https://github.com/AmpereComputing/ampere-gcc/releases
```

Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
```

Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size
Set dirty_ratio=8 to limit dirty cache to 8% of memory
i.e. echo 8 | sudo tee /proc/sys/vm/dirty_ratio
Set swappiness=1 to swap only if necessary
i.e. echo 1 | sudo tee /proc/sys/vm/swappiness
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
i.e. echo 1 | sudo tee /proc/sys/vm/zone_reclaim_mode
Set drop_caches=3 to reset caches before invoking runcpu
i.e. echo 3 | sudo tee /proc/sys/vm/drop_caches
Set numa_balancing=0 to disable automatic numa balancing
```

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Operating System Notes (Continued)

```
i.e. echo 0 | sudo tee /proc/sys/kernel/numa_balancing
Switch off all ktune and tuned settings
i.e. sudo tuned-adm off
Transparent huge pages set to 'never'
i.e. sudo bash -c "echo never > /sys/kernel/mm/transparent_hugepage/enabled"
Enable address randomization
i.e. echo 2 | sudo tee /proc/sys/kernel/randomize_va_space

runcpu command invoked through numactl
1 chip system: numactl --interleave=0-3 runcpu <etc>
2 chip system: numactl --interleave=all runcpu <etc>
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/CPU2017_fp/jemalloc/install/lib:/home/CPU2017_fp/gcc/install/lib6
     4:/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib:/home/ampt
     est/ampere_spec2017/spec2017/gcc/install/lib64:/home/amptest/ampere_spec
     2017/spec2017/jemalloc/install/lib:"
```

General Notes

```
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.
NA: 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.

Jemalloc v5.2.1 is available via
https://github.com/jemalloc/jemalloc/releases/download/5.2.1/jemalloc-5.2.1.tar.bz2
It was built on CentOS 8.3 using Version 10.2.1 of Ampere GCC with configure options
--prefix=/home/amptest/jemalloc/install --with-lg-quantum=3
```

Platform Notes

```
BIOS configuration:
ANC Mode Set to Quadrant

Sysinfo program /home/CPU2017_fp/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Wed Sep 22 02:30:14 2021
```

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Platform Notes (Continued)

```
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
*
* Did not identify cpu model.  If you would
* like to write your own sysinfo program, see
* www.spec.org/cpu2017/config.html#sysinfo
*
*
* 0 "physical id" tags found.  Perhaps this is an older system,
* or a virtualized system.  Not attempting to guess how to
* count chips/cores for this system.
*
      160 "processors"
   cores, siblings (Caution: counting these is hw and system dependent. The following
   excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)

From lscpu from util-linux 2.32.1:
     Architecture:        aarch64
     Byte Order:          Little Endian
     CPU(s):              160
     On-line CPU(s) list: 0-159
     Thread(s) per core:  1
     Core(s) per socket:  80
     Socket(s):           2
     NUMA node(s):        8
     Vendor ID:           ARM
     Model:               1
     Stepping:            r3p1
     CPU max MHz:         3300.0000
     CPU min MHz:         1000.0000
     BogoMIPS:            50.00
     L1d cache:           64K
     L1i cache:           64K
     L2 cache:            1024K
     L3 cache:            32768K
     NUMA node0 CPU(s):   0-19
     NUMA node1 CPU(s):   20-39
     NUMA node2 CPU(s):   40-59
     NUMA node3 CPU(s):   60-79
     NUMA node4 CPU(s):   80-99
     NUMA node5 CPU(s):   100-119
     NUMA node6 CPU(s):   120-139
     NUMA node7 CPU(s):   140-159
```

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Platform Notes (Continued)

```
      Flags:              fp asimd evtstrm aes pmull sha1 sha2 crc32 atomics fphp asimdhp
      cpuid asimdrdm lrcpc dcpop asimddp ssbs

 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 8 9 10 11 12 13 14 15 16 17 18 19
   node 0 size: 64974 MB
   node 0 free: 62587 MB
   node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
   node 1 size: 65459 MB
   node 1 free: 63186 MB
   node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
   node 2 size: 65459 MB
   node 2 free: 63243 MB
   node 3 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
   node 3 size: 65459 MB
   node 3 free: 63260 MB
   node 4 cpus: 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
   node 4 size: 64436 MB
   node 4 free: 62120 MB
   node 5 cpus: 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117
   118 119
   node 5 size: 65459 MB
   node 5 free: 63439 MB
   node 6 cpus: 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137
   138 139
   node 6 size: 65421 MB
   node 6 free: 63359 MB
   node 7 cpus: 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157
   158 159
   node 7 size: 65390 MB
   node 7 free: 63261 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  11  12  20  20  21  21
     1:  11  10  12  11  20  20  21  21
     2:  11  12  10  11  21  21  22  22
     3:  12  11  11  10  21  21  22  22
     4:  20  20  21  21  10  11  11  12
     5:  20  20  21  21  11  10  12  11
     6:  21  21  22  22  11  12  10  11
     7:  21  21  22  22  12  11  11  10

 From /proc/meminfo
    MemTotal:       534589632 kB
    HugePages_Total:       0
```

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Platform Notes (Continued)

```
    Hugepagesize:     524288 kB

 /sbin/tuned-adm active
     No current active profile.

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="8.3 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.3"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

 uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.aarch64 #1 SMP Wed Sep 23 05:09:38 EDT 2020
    aarch64 aarch64 aarch64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (iTLB Multihit):                        Not affected
 CVE-2018-3620 (L1 Terminal Fault):                     Not affected
 Microarchitectural Data Sampling:                      Not affected
 CVE-2017-5754 (Meltdown):                              Not affected
 CVE-2018-3639 (Speculative Store Bypass):              Mitigation: Speculative Store
                                                        Bypass disabled via prctl
 CVE-2017-5753 (Spectre variant 1):                     Mitigation: __user pointer
                                                        sanitization
 CVE-2017-5715 (Spectre variant 2):                     Not affected
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):               Not affected

 run-level 3 Sep 18 05:19

 SPEC is set to: /home/CPU2017_fp
    Filesystem            Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   372G   56G  317G  15% /home

 From /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
    Vendor:         Inspur
    Product:        NF5280R6
    Product Family: ARM
    Serial:         221624226

Additional information from dmidecode 3.2 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.
  Memory:
    2x Array 1 Manufacturer 10 Array 1 Part Number 10
    2x Array 1 Manufacturer 12 Array 1 Part Number 12
    2x Array 1 Manufacturer 14 Array 1 Part Number 14
    2x Array 1 Manufacturer 16 Array 1 Part Number 16
    2x Array 1 Manufacturer 2 Array 1 Part Number 2
    2x Array 1 Manufacturer 4 Array 1 Part Number 4
    2x Array 1 Manufacturer 6 Array 1 Part Number 6
    2x Array 1 Manufacturer 8 Array 1 Part Number 8
    16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

BIOS:
   BIOS Vendor:       American Megatrends Inc.
   BIOS Version:      05.00.04
   BIOS Date:         08/23/2021
   BIOS Revision:     5.15
   Firmware Revision: 1.7

(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++             | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
```

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Compiler Version Notes (Continued)

```
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
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warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
Fortran         | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
------------------------------------------------------------------------------
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
```

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Compiler Version Notes (Continued)

```
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`gcc`

C++ benchmarks:
`g++`

Fortran benchmarks:
`gfortran`

Benchmarks using both Fortran and C:
`gfortran gcc`

Benchmarks using both C and C++:
`g++ gcc`

Benchmarks using Fortran, C, and C++:
`g++ gcc gfortran`

Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64`
526.blender_r: `-funsigned-char -DSPEC_LINUX -DSPEC_LP64`
527.cam4_r: `-DSPEC_CASE_FLAG -DSPEC_LP64`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
-mabi=lp64 -std=c99
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -fno-strict-aliasing -ljemalloc

C++ benchmarks:
-mabi=lp64 -std=c++03
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -ljemalloc

Fortran benchmarks:
-mabi=lp64 -L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -fno-stack-arrays -ljemalloc

Benchmarks using both Fortran and C:
-mabi=lp64 -std=c99
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -fno-stack-arrays -fno-strict-aliasing
-ljemalloc

Benchmarks using both C and C++:
-mabi=lp64 -std=c++03 -std=c99
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -fno-strict-aliasing -ljemalloc

Benchmarks using Fortran, C, and C++:
-mabi=lp64 -std=c++03 -std=c99
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto=32 -fno-stack-arrays -fno-strict-aliasing
-ljemalloc

Base Other Flags

C benchmarks:
-Wl,-Map,mapfile

C++ benchmarks:
-Wl,-Map,mapfile

Fortran benchmarks:
-fallow-argument-mismatch -Wl,-Map,mapfile

Benchmarks using both Fortran and C:
-fallow-argument-mismatch -Wl,-Map,mapfile

Benchmarks using both C and C++:
-Wl,-Map,mapfile

Benchmarks using Fortran, C, and C++:
-fallow-argument-mismatch -Wl,-Map,mapfile

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/gcc.2021-07-21.html
http://www.spec.org/cpu2017/flags/Inspur-platform-settings-Amp-v1.1.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/gcc.2021-07-21.xml
http://www.spec.org/cpu2017/flags/Inspur-platform-settings-Amp-v1.1.xml

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