



# SPEC CPU®2017 Floating Point Rate Result

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## Inspur Corporation

SPECrate®2017\_fp\_base = 424

### Inspur NF5280R6 (Ampere Altra Q80-33)

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 3358

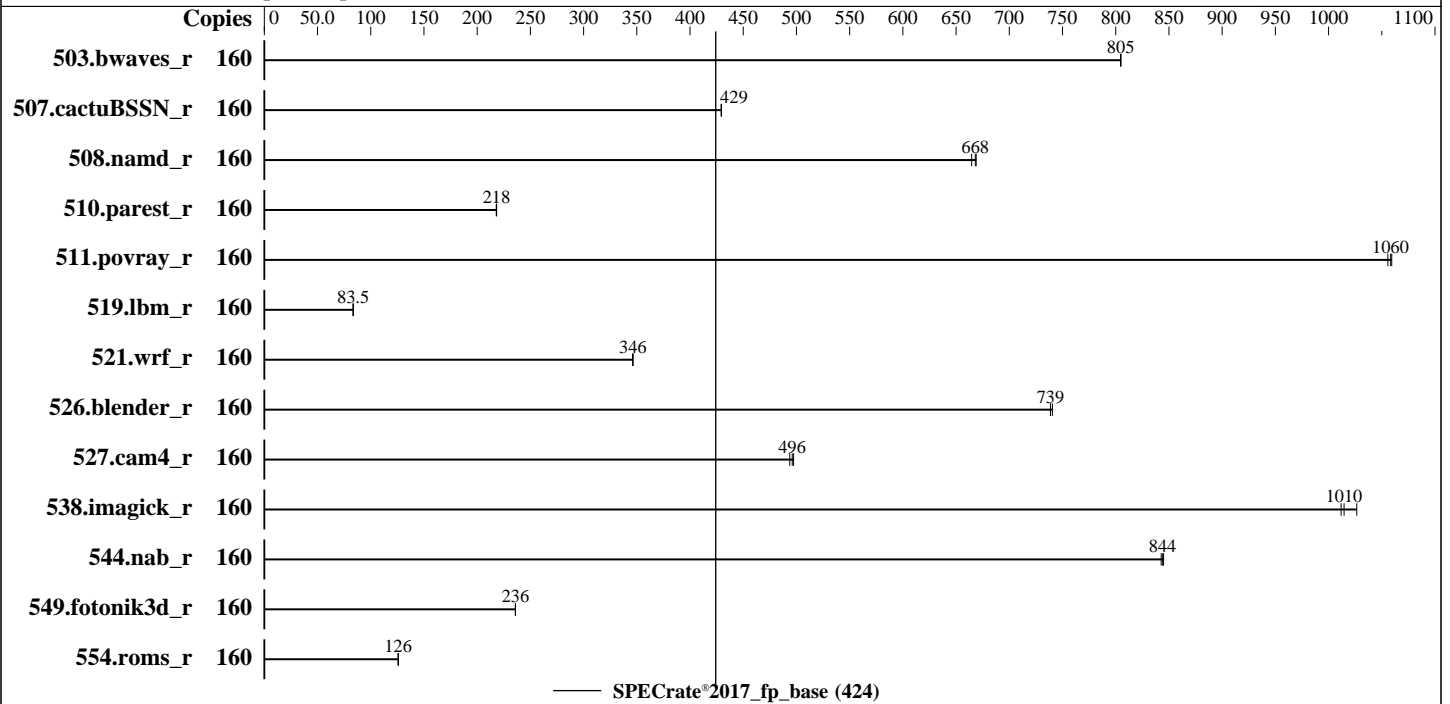
Test Sponsor: Inspur Corporation

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.



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### Results Table

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

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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/lib64:/home/amptest/ampere_spec2017/spec2017/jemalloc/install/lib:/home/amptest/ampere_spec2017/spec2017/gcc/install/lib64:/home/amptest/ampere_spec2017/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](http://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  
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## Compiler Version Notes (Continued)

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=====  
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.  
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Copyright (C) 2020 Free Software Foundation, Inc.  
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=====  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
=====

g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216  
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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  
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## Compiler Version Notes (Continued)

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gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216

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## 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



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## 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
```



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## 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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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

Tested with SPEC CPU®2017 v1.1.8 on 2021-09-22 02:30:13-0400.

Report generated on 2021-12-07 16:57:57 by CPU2017 PDF formatter v6442.

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