



# SPEC CPU®2017 Integer Rate Result

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## Supermicro

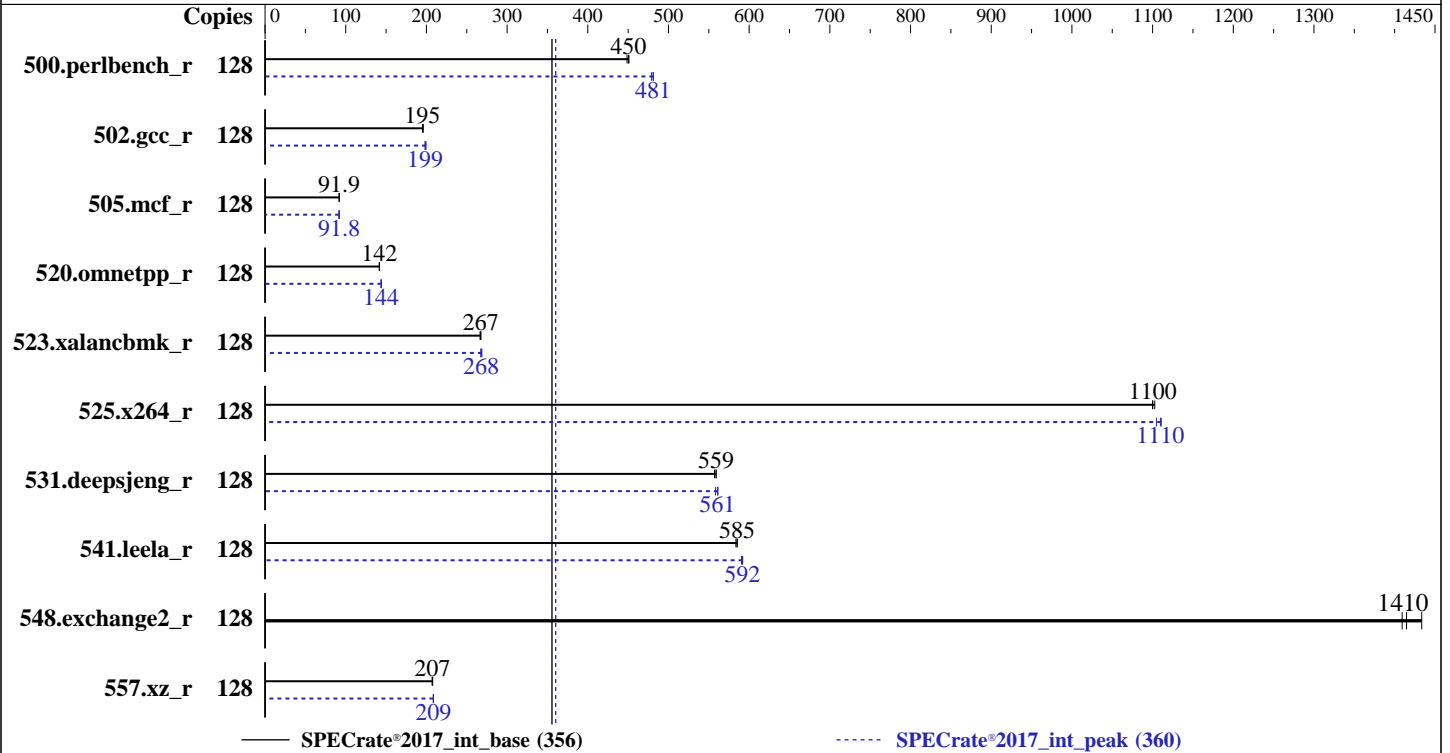
SuperServer ARS-210M-NR  
(R12SPD-A , Ampere Altra Max M128-30)

SPECrate®2017\_int\_base = 356

SPECrate®2017\_int\_peak = 360

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

Test Date: Nov-2022  
Hardware Availability: Nov-2022  
Software Availability: May-2022



### Hardware

CPU Name: Ampere Altra Max M128-30  
Max MHz: 3300  
Nominal: 3000  
Enabled: 128 cores, 1 chip  
Orderable: 1 chip  
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 (8 x 64 GB 2Rx4 PC4-3200AA-R)  
Storage: 1 x 4 TB NVMe SSD  
Other: None

### Software

OS: CentOS Stream release 8  
Kernel 4.18.0-383.el8.aarch64  
Compiler: C/C++/Fortran: Version 10.2.1 of Ampere GCC  
GNU Compiler Collection  
Parallel: No  
Firmware: Version 1.1 released Oct-2022  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 64-bit  
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
500.perlbench_r	128	454	449	452	451	<b>453</b>	<b>450</b>	128	426	479	<b>424</b>	<b>481</b>	423	481
502.gcc_r	128	929	195	<b>928</b>	<b>195</b>	924	196	128	914	198	908	200	<b>913</b>	<b>199</b>
505.mcf_r	128	2249	92.0	2251	91.9	<b>2250</b>	<b>91.9</b>	128	<b>2254</b>	<b>91.8</b>	2253	91.8	2255	91.7
520.omnetpp_r	128	<b>1185</b>	<b>142</b>	1186	142	1185	142	128	1165	144	1169	144	<b>1166</b>	<b>144</b>
523.xalancbmk_r	128	507	266	<b>506</b>	<b>267</b>	505	267	128	503	269	506	267	<b>505</b>	<b>268</b>
525.x264_r	128	203	1100	204	1100	<b>204</b>	<b>1100</b>	128	203	1100	<b>202</b>	<b>1110</b>	202	1110
531.deepsjeng_r	128	262	559	263	557	<b>262</b>	<b>559</b>	128	263	558	261	561	<b>262</b>	<b>561</b>
541.leela_r	128	363	584	362	585	<b>362</b>	<b>585</b>	128	359	591	<b>358</b>	<b>592</b>	358	592
548.exchange2_r	128	<b>237</b>	<b>1410</b>	234	1430	238	1410	128	<b>237</b>	<b>1410</b>	234	1430	238	1410
557.xz_r	128	668	207	<b>667</b>	<b>207</b>	665	208	128	663	208	662	209	<b>662</b>	<b>209</b>

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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.

## 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
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"

runcpu command invoked through numactl i.e.
numactl --interleave=0-3 runcpu <etc>
```



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## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH =  
"/home/amptest/ampere_spec2017/jemalloc/install/lib:/home/amptest/ampere  
_spec2017/gcc/install/lib64:/home/amptest/ampere_spec2017/gcc/install/l  
ib:/home/cpu2017-0621/gcc/install/lib64:/home/cpu2017-0621/jemalloc/ins  
tall/lib:"
```

## General Notes

Binaries were compiled on a system with the following configuration  
Ampere Altra Q80-33 2P CPU + 512GB Memory  
using CentOS 8.2 + glibc 2.28 + binutil 2.30

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

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>  
Build aarch64 version with configure options  
--prefix=/home/amptest/jemalloc/install --with-lg-quantum=3

## Platform Notes

BIOS Settings:  
Enable ACPI Auto Configuration = Disabled  
Enable CPPC = Disabled  
Enable LPI = Disabled  
ANC mode = Quadrant

sysinfo program /home/cpu2017-0621/spec2017/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d  
running on 135-170-65.engtw Mon Nov 28 09:39:23 2022

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  
\*

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### Platform Notes (Continued)

- \* 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.
- \*

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.)

From lscpu from util-linux 2.32.1:

```

Architecture:      aarch64
Byte Order:        Little Endian
CPU(s):            128
On-line CPU(s) list: 0-127
Thread(s) per core: 1
Core(s) per socket: 128
Socket(s):         1
NUMA node(s):     4
Vendor ID:         ARM
BIOS Vendor ID:   Ampere(R)
Model:             1
Model name:        Neoverse-N1
BIOS Model name:   Ampere(R) Altra(R) Max Processor
Stepping:          r3p1
BogoMIPS:          50.00
L1d cache:         64K
L1i cache:         64K
L2 cache:          1024K
NUMA node0 CPU(s): 0-31
NUMA node1 CPU(s): 32-63
NUMA node2 CPU(s): 64-95
NUMA node3 CPU(s): 96-127
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: 4 nodes (0-3)
node 0 cpus: 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
node 0 size: 129973 MB
node 0 free: 127542 MB
node 1 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56

```

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### Platform Notes (Continued)

```

57 58 59 60 61 62 63
node 1 size: 130923 MB
node 1 free: 129806 MB
node 2 cpus: 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
89 90 91 92 93 94 95
node 2 size: 130923 MB
node 2 free: 130464 MB
node 3 cpus: 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114
115 116 117 118 119 120 121 122 123 124 125 126 127
node 3 size: 130811 MB
node 3 free: 130227 MB
node distances:
node  0  1  2  3
  0:  10  11  11  12
  1:  11  10  12  11
  2:  11  12  10  11
  3:  12  11  11  10

```

```

From /proc/meminfo
MemTotal:      535176320 kB
HugePages_Total:      0
Hugepagesize:    524288 kB

```

```

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

```

```

From /etc/*release* /etc/*version*
centos-release: CentOS Stream release 8
os-release:
  NAME="CentOS Stream"
  VERSION="8"
  ID="centos"
  ID_LIKE="rhel fedora"
  VERSION_ID="8"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="CentOS Stream 8"
  ANSI_COLOR="0;31"
redhat-release: CentOS Stream release 8
system-release: CentOS Stream release 8
system-release-cpe: cpe:/o:centos:centos:8

```

```

uname -a:
Linux 135-170-65.engtw 4.18.0-383.el8.aarch64 #1 SMP Wed Apr 20 15:39:57 UTC 2022
aarch64 aarch64 aarch64 GNU/Linux

```

Kernel self-reported vulnerability status:

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### Platform Notes (Continued)

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 Nov 28 09:32

```
SPEC is set to: /home/cpu2017-0621/spec2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/mapper/cl-home xfs   3.5T  279G  3.2T   8% /home
```

```
From /sys/devices/virtual/dmi/id
Vendor:          Supermicro Corporation
Product:         R12SPD .....
Product Family: Altra Max
Serial:         .....
```

Additional information from dmidecode 3.3 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:
  8x Samsung M393A8G 64 GB 2 rank 3200
```

```
BIOS:
  BIOS Vendor:      Ampere(R)
  BIOS Version:     1.1
  BIOS Date:        10/31/2022
  BIOS Revision:    5.15
```

(End of data from sysinfo program)

### Compiler Version Notes

```
=====
C      | 500.perlbench_r(base, peak) 502.gcc_r(base, peak) 505.mcf_r(base,
      | peak) 525.x264_r(base, peak) 557.xz_r(base, peak)
-----
```

gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216

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### Compiler Version Notes (Continued)

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

```
=====  
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)  
          | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)  
-----
```

```
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.
```

```
=====  
Fortran | 548.exchange2_r(base, peak)  
-----
```

```
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.
```

### Base Compiler Invocation

C benchmarks:  
gcc

C++ benchmarks:  
g++

Fortran benchmarks:  
gfortran

### Base Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_AARCH64 -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
```

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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:

```
-mabi=lp64 -std=c99 -L/home/ampctest/ampere_spec2017/gcc/install/lib64  
-L/home/ampctest/ampere_spec2017/gcc/install/lib  
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=96 --param max-inline-insns-auto=64  
--param inline-unit-growth=96 -fgnu89-inline -ljemalloc
```

C++ benchmarks:

```
-mabi=lp64 -std=c++03 -L/home/ampctest/ampere_spec2017/gcc/install/lib64  
-L/home/ampctest/ampere_spec2017/gcc/install/lib  
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=256 --param max-inline-insns-auto=128  
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

Fortran benchmarks:

```
-mabi=lp64 -L/home/ampctest/ampere_spec2017/gcc/install/lib64  
-L/home/ampctest/ampere_spec2017/gcc/install/lib  
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param ipa-cp-eval-threshold=1 --param ipa-cp-unit-growth=80  
--param ipa-cp-max-recursive-depth=8 -fno-inline-functions-called-once  
-fstack-arrays -flto-partition=one -ljemalloc
```

## Base Other Flags

C benchmarks:

```
-fcommon -Wl,-Map,mapfile
```

C++ benchmarks:

```
-Wl,-Map,mapfile
```

Fortran benchmarks:

```
-Wl,-Map,mapfile
```





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## Peak Compiler Invocation

C benchmarks:

gcc

C++ benchmarks:

g++

Fortran benchmarks:

gfortran

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -mabi=lp64 -std=c99
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -fno-strict-aliasing
-fno-unsafe-math-optimizations -fno-finite-math-only
-ljemalloc
```

```
502.gcc_r: -mabi=lp64 -std=c99
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -fno-strict-aliasing
-fgnu89-inline -ljemalloc
```

```
505.mcf_r: -mabi=lp64 -std=c99
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
```

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## Peak Optimization Flags (Continued)

505.mcf\_r (continued):

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib  
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib  
-fprofile-generate -fprofile-use -g -Ofast  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=96  
--param max-inline-insns-auto=64  
--param inline-unit-growth=96 -fno-strict-aliasing  
-ljemalloc
```

525.x264\_r: -mabi=lp64 -std=c99

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64  
-L/home/ampptest/ampere_spec2017/gcc/install/lib  
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib -g  
-Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=96  
--param max-inline-insns-auto=64  
--param inline-unit-growth=96 -ljemalloc
```

557.xz\_r: -mabi=lp64 -std=c99

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64  
-L/home/ampptest/ampere_spec2017/gcc/install/lib  
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib  
-fprofile-generate -fprofile-use -g -Ofast  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=96  
--param max-inline-insns-auto=64  
--param inline-unit-growth=96 -ljemalloc
```

C++ benchmarks:

520.omnetpp\_r: -mabi=lp64 -std=c++03

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64  
-L/home/ampptest/ampere_spec2017/gcc/install/lib  
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib  
-fprofile-generate -fprofile-use -g -Ofast  
-mcpu=neoverse-n1 -funroll-loops -flto=32  
--param early-inlining-insns=256  
--param max-inline-insns-auto=128  
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

523.xalancbmk\_r: Same as 520.omnetpp\_r

531.deepsjeng\_r: -mabi=lp64 -std=c++03

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64  
-L/home/ampptest/ampere_spec2017/gcc/install/lib
```

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## Peak Optimization Flags (Continued)

531.deepsjeng\_r (continued):

```
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g
-Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=256
--param max-inline-insns-auto=128
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

541.leela\_r: Same as 520.omnetpp\_r

Fortran benchmarks:

548.exchange2\_r: basepeak = yes

## Peak Other Flags

C benchmarks (except as noted below):

-Wl, -Map, mapfile

525.x264\_r: -fcommon -Wl, -Map, mapfile

557.xz\_r: -w -Wl, -Map, mapfile

C++ benchmarks:

-Wl, -Map, mapfile

Fortran benchmarks:

-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/Supermicro-Platform-Settings-V1.2-Ampere-revD.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/Supermicro-Platform-Settings-V1.2-Ampere-revD.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).

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