SPEC CPU®2017 Integer Rate Result

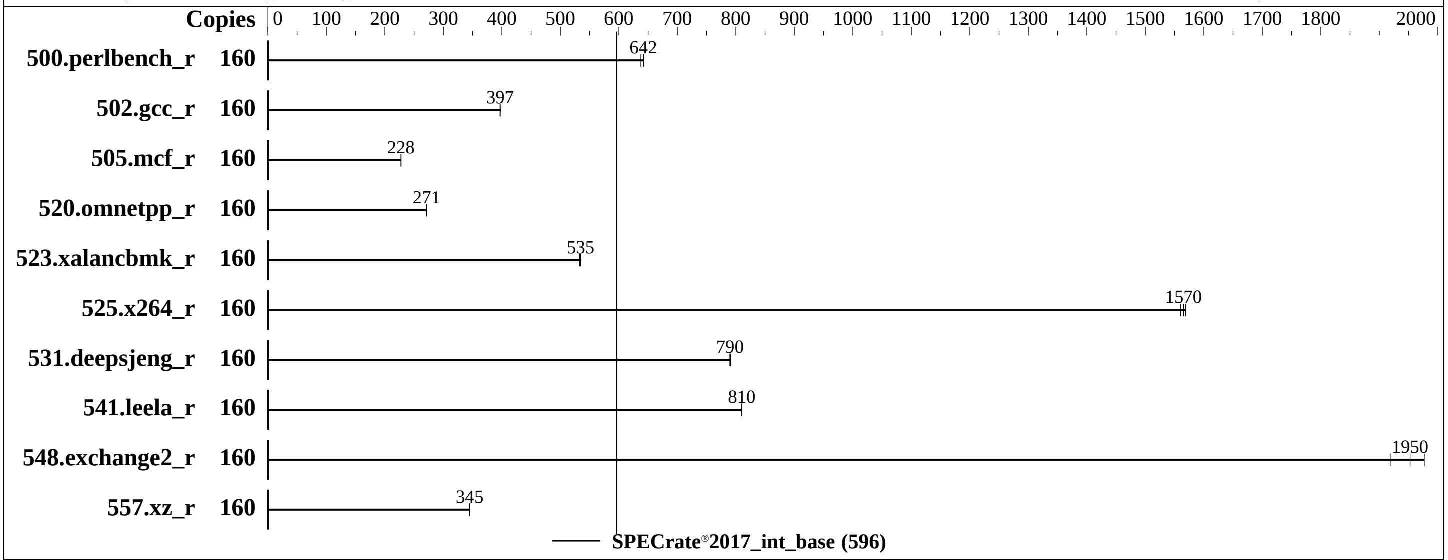
Inspur Corporation

Inspur NF5280R6 (Ampere Altra Q80-33)

SPECrate®2017_int_base = 596

SPECrate®2017_int_peak = Not Run

CPU2017 License:	3358	**Test Date:**	Sep-2021
Test Sponsor:	Inspur Corporation	**Hardware Availability:**	Jan-2022
Tested by:	Inspur Corporation	**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	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Peak Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	160	397	642	400	638	**397**	**642**							
502.gcc_r	160	**571**	**397**	569	398	571	397							
505.mcf_r	160	**1136**	**228**	1136	228	1136	228							
520.omnetpp_r	160	773	272	775	271	**774**	**271**							
523.xalancbmk_r	160	316	535	**316**	**535**	317	533							
525.x264_r	160	180	1560	**179**	**1570**	179	1570							
531.deepsjeng_r	160	**232**	**790**	232	790	232	791							
541.leela_r	160	**327**	**810**	327	811	327	809							
548.exchange2_r	160	212	1980	**215**	**1950**	218	1920							
557.xz_r	160	501	345	**501**	**345**	500	345							

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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
i.e. echo 0 | sudo tee /proc/sys/kernel/numa_balancing
Switch off all ktune and tuned settings
i.e. sudo tuned-adm off
```

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Operating System Notes (Continued)

```
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/jemalloc/install/lib:/home/CPU2017/gcc/install/lib64:/hom
     e/amptest/ampere_spec2017/spec2017/jemalloc/install/lib:/home/amptest/am
     pere_spec2017/spec2017/gcc/install/lib64:/home/amptest/ampere_spec2017/s
     pec2017/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/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Sat Sep 18 22:21:48 2021

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
```

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Platform Notes (Continued)

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

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Platform Notes (Continued)

```
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: 60258 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: 60782 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: 60832 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: 60873 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: 59727 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: 61051 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: 60989 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: 60882 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
   Hugepagesize:     524288 kB

/sbin/tuned-adm active
```

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Platform Notes (Continued)

```
     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
     Filesystem            Type  Size  Used Avail Use% Mounted on
     /dev/mapper/rhel-home xfs   372G   40G  333G  11% /home

  From /sys/devices/virtual/dmi/id
      Vendor:         Inspur
      Product:        NF5280R6
      Product Family: ARM
```

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Platform Notes (Continued)

```
    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       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
        | 525.x264_r(base) 557.xz_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++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
        | 541.leela_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.
```

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Compiler Version Notes (Continued)

```
------------------------------------------------------------------------------

==============================================================================
Fortran | 548.exchange2_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.
------------------------------------------------------------------------------
```

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`
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/amptest/ampere_spec2017/spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/spec2017/gcc/install/lib
```

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Base Optimization Flags (Continued)

C benchmarks (continued):
-L/home/amptest/ampere_spec2017/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/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 -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/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 -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

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

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

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