SPEC CPU®2017 Integer Rate Result

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ZTE Corporation

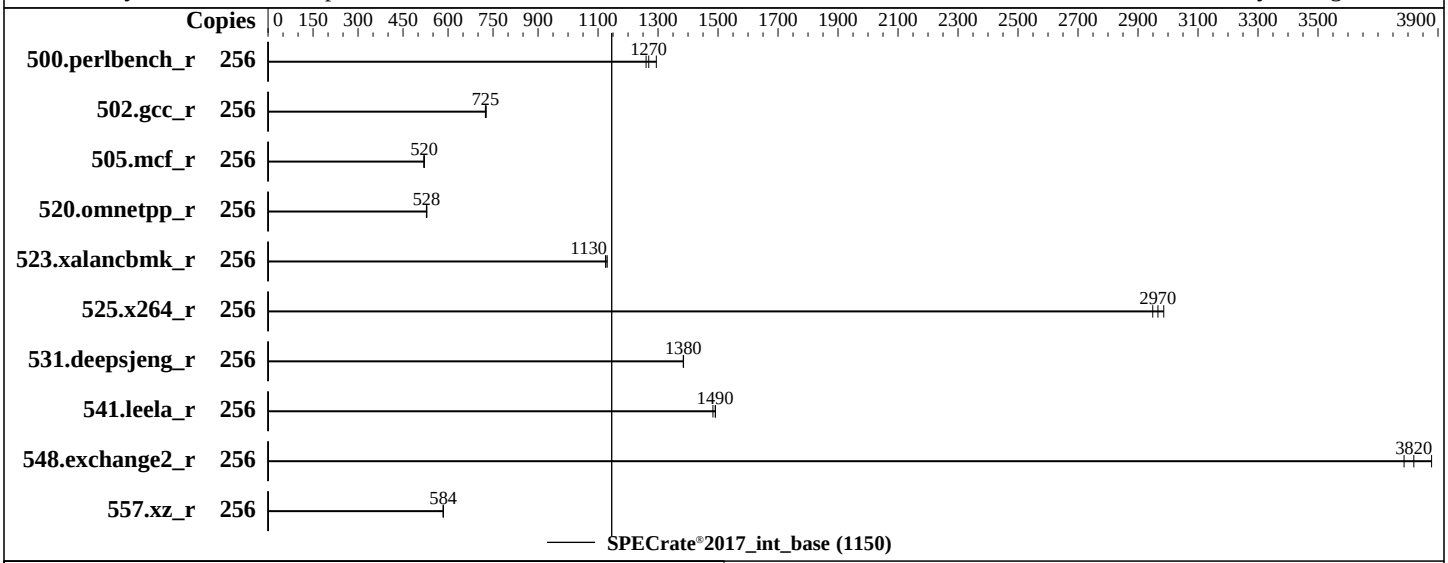
ZTE R5310G3 Server System
(3.10 GHz, ZXIC ZhuFengXin 8167)

SPECrate®2017_int_base = 1150

SPECrate®2017_int_peak = Not Run

CPU2017 License: 9061
Test Sponsor: ZTE Corporation
Tested by: ZTE Corporation

Test Date: Aug-2024
Hardware Availability: Jun-2024
Software Availability: Aug-2022



Hardware

CPU Name:	ZXIC ZhuFengXin 8167
Max MHz:	3100
Nominal:	3100
Enabled:	256 cores, 2 chips
Orderable:	1,2 chips
Cache L1:	64 KB I + 64 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	128 MB I+D on chip per chip
Other:	None
Memory:	1 TB (16 x 64 GB 2Rx4 PC5-5600B-R)
Storage:	1 x 480 GB SATA SSD
Other:	CPU Cooling: Air

Software

OS:	CentOS Stream 8 4.18.0-408.el8.aarch64
Compiler:	C/C++/Fortran: Version 12.2.0 of GCC, the GNU Compiler Collection
Parallel:	No
Firmware:	Version 31.24.03.00 released Jul-2024
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
500.perlbench_r	256	315	1290	323	1260	**321**	**1270**							
502.gcc_r	256	**500**	**725**	500	725	498	727							
505.mcf_r	256	**795**	**520**	794	521	796	519							
520.omnetpp_r	256	**636**	**528**	634	529	636	528							
523.xalancbmk_r	256	240	1120	**240**	**1130**	239	1130							
525.x264_r	256	150	2990	152	2950	**151**	**2970**							
531.deepsjeng_r	256	**212**	**1380**	212	1390	212	1380							
541.leela_r	256	284	1490	**284**	**1490**	286	1480							
548.exchange2_r	256	173	3880	177	3790	**176**	**3820**							
557.xz_r	256	473	584	**473**	**584**	473	584							

SPECrate®2017_int_base = 1150

SPECrate®2017_int_peak = Not Run

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

Submit Notes

```
The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.
```

Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
OS set to performance mode via cpupower frequency-set -g performance
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/usr/local/jemalloc-5.2.1_install/lib:/usr/local/gcc-12.2.0/lib64/:/usr/local/gcc-12.2.0/lib/:/usr/lo
     cal/gcc-12.2.0/lib64:"
```

General Notes

```
Binaries compiled on a system with 2x ZXIC ZhuFengXin 8167 CPU + 1 TB RAM
memory using CentOS Stream 8
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>       /proc/sys/vm/drop_caches
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.
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.
```

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General Notes (Continued)

```
jemalloc, a general purpose malloc implementation
built with the CentOS Stream 8, and the system compiler gcc 12.2.0
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
Sysinfo program /home/zfu/speccpu2017/speccpu2017_install/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Mon Aug  5 08:29:22 2024

SUT (System Under Test) info as seen by some common utilities.

------------------------------------------------------------
Table of contents
------------------------------------------------------------
 1. uname -a
 2. w
 3. Username
 4. ulimit -a
 5. sysinfo process ancestry
 6. /proc/cpuinfo
 7. lscpu
 8. numactl --hardware
 9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 239 (239-69.el8)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux localhost.localdomain 4.18.0-408.el8.aarch64 #1 SMP Mon Jul 18 15:47:44 UTC 2022 aarch64 aarch64
  aarch64 GNU/Linux

------------------------------------------------------------
2. w
   08:29:22 up 10 min,  3 users,  load average: 0.00, 1.17, 1.48
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     pts/0    198.168.42.111   08:19   13.00s  1.19s  0.07s -bash
  root     pts/1    198.168.42.111   08:20    7.00s  0.04s  0.04s -bash
  root     pts/2    198.168.42.111   08:20    9:02   0.03s  0.03s -bash

------------------------------------------------------------
3. Username
  From environment variable $USER:  root
```

(Continued on next page)

Platform Notes (Continued)

```
------------------------------------------------------------
4. ulimit -a
  core file size          (blocks, -c) 0
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
  file size               (blocks, -f) unlimited
  pending signals                 (-i) 1028357
  max locked memory       (kbytes, -l) 64
  max memory size         (kbytes, -m) unlimited
  open files                      (-n) 1024
  pipe size            (512 bytes, -p) 8
  POSIX message queues     (bytes, -q) 819200
  real-time priority              (-r) 0
  stack size              (kbytes, -s) unlimited
  cpu time               (seconds, -t) unlimited
  max user processes              (-u) 1028357
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 18
 /usr/sbin/sshd -D
   -oCiphers=aes256-gcm@openssh.com,chacha20-poly1305@openssh.com,aes256-ctr,aes256-cbc,aes128-gcm@openssh.co
   m,aes128-ctr,aes128-cbc
   -oMACs=hmac-sha2-256-etm@openssh.com,hmac-sha1-etm@openssh.com,umac-128-etm@openssh.com,hmac-sha2-512-etm@
   openssh.com,hmac-sha2-256,hmac-sha1,umac-128@openssh.com,hmac-sha2-512...
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 runcpu --config=zfx-gcc12.2-armv9-256core.cfg --reportable --copies=256 --threads=256 --iterations=3
   --tune=base --action=run intrate
 runcpu --configfile zfx-gcc12.2-armv9-256core.cfg --reportable --copies 256 --threads 256 --iterations 3
   --tune base --action run --nopower --runmode rate --tune base --size refrate intrate --nopreenv
   --note-preenv --logfile $SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0
   --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/zfu/speccpu2017/speccpu2017_install

------------------------------------------------------------
6. /proc/cpuinfo
    CPU implementer : 0x41
    CPU architecture: 8
    CPU variant     : 0x0
    CPU part        : 0xd49
    CPU revision    : 1
    Features        : fp asimd evtstrm crc32 atomics fphp asimdhp cpuid asimdrdm jscvt fcma lrcpc dcpop
                      asimddp sve asimdfhm dit uscat ilrcpc flagm ssbs sb dcpodp sve2 svebitperm flagm2 frint
                      svei8mm svebf16 i8mm bf16 dgh

------------------------------------------------------------
7. lscpu

From lscpu from util-linux 2.32.1:
  Architecture:        aarch64
  Byte Order:          Little Endian
  CPU(s):              256
  On-line CPU(s) list: 0-255
  Thread(s) per core:  1
  Core(s) per socket:  128
```

(Continued on next page)

Platform Notes (Continued)

```
  Socket(s):           2
  NUMA node(s):        4
  Vendor ID:           ARM
  BIOS Vendor ID:      SANECHIPS
  Model:               1
  BIOS Model name:     ZXIC(R) ZhuFengXin 8167 Processor
  Stepping:            r0p1
  CPU max MHz:         3100.0000
  CPU min MHz:         800.0000
  BogoMIPS:            250.00
  L1d cache:           64K
  L1i cache:           64K
  L2 cache:            1024K
  L3 cache:            262144K
  NUMA node0 CPU(s):   0-63
  NUMA node1 CPU(s):   64-127
  NUMA node2 CPU(s):   128-191
  NUMA node3 CPU(s):   192-255
  Flags:               fp asimd evtstrm crc32 atomics fphp asimdhp cpuid asimdrdm jscvt fcma lrcpc dcpop
                       asimddp sve asimdfhm dit uscat ilrcpc flagm ssbs sb dcpodp sve2 svebitperm flagm2
                       frint svei8mm svebf16 i8mm bf16 dgh

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0-63
  node 0 size: 256001 MB
  node 0 free: 252499 MB
  node 1 cpus: 64-127
  node 1 size: 257514 MB
  node 1 free: 256662 MB
  node 2 cpus: 128-191
  node 2 size: 257514 MB
  node 2 free: 255813 MB
  node 3 cpus: 192-255
  node 3 size: 257378 MB
  node 3 free: 256387 MB
  node distances:
  node   0   1   2   3
    0:  10  16  22  22
    1:  16  10  22  22
    2:  22  22  10  16
    3:  22  22  16  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1053091392 kB

------------------------------------------------------------
10. who -r
  run-level 3 Aug 5 08:19

------------------------------------------------------------
11. Systemd service manager version: systemd 239 (239-69.el8)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
```

(Continued on next page)

Platform Notes (Continued)

```
  STATE      UNIT FILES
  enabled    ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online accounts-daemon
             atd auditd autovt@ avahi-daemon bluetooth crond cups display-manager gdm getty@ import-state
             irqbalance iscsi iscsi-onboot kdump libstoragemgmt loadmodules lvm2-monitor mdmonitor multipathd
             nis-domainname nvmefc-boot-connections ostree-remount qemu-guest-agent rsyslog rtkit-daemon
             selinux-autorelabel-mark smartd sshd sssd syslog timedatex tuned udisks2 vdo
  disabled   arp-ethers blk-availability brltty canberra-system-bootup canberra-system-shutdown
             canberra-system-shutdown-reboot chrony-wait chronyd cni-dhcp console-getty cpupower cups-browsed
             debug-shell dnf-system-upgrade dnsmasq ebtables firewalld initial-setup
             initial-setup-reconfiguration iprdump iprinit iprupdate iscsid iscsiuio kpatch kvm_stat ledmon
             man-db-restart-cache-update ndctl-monitor nftables nvmf-autoconnect podman podman-auto-update
             podman-kube@ podman-restart psacct ras-mc-ctl rasdaemon rdisc speech-dispatcherd sshd-keygen@
             switcheroo-control systemd-resolved tcsd upower wpa_supplicant
  generated  SystemTap compile-server gcc-toolset-10-stap-server gcc-toolset-10-systemtap
             gcc-toolset-11-stap-server gcc-toolset-11-systemtap gcc-toolset-9-stap-server
             gcc-toolset-9-systemtap scripts startup
  indirect   serial-getty@ spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
  masked     systemd-timedated

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd0,gpt2)/vmlinuz-4.18.0-408.el8.aarch64
  root=UUID=79328569-298c-45f2-af56-924299e4920d
  ro
  crashkernel=auto
  skew_tick=1

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 3.10 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.

------------------------------------------------------------
15. tuned-adm active
  No current active profile.

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing               0
  kernel.randomize_va_space           2
  vm.compaction_proactiveness         0
  vm.dirty_background_bytes           0
  vm.dirty_background_ratio          10
  vm.dirty_bytes                      0
  vm.dirty_expire_centisecs        3000
  vm.dirty_ratio                      8
  vm.dirty_writeback_centisecs      500
  vm.dirtytime_expire_seconds     43200
  vm.extfrag_threshold              500
  vm.min_unmapped_ratio               1
  vm.nr_hugepages                     0
  vm.nr_hugepages_mempolicy           0
  vm.nr_overcommit_hugepages          0
  vm.swappiness                       1
  vm.watermark_boost_factor       15000
  vm.watermark_scale_factor          10
  vm.zone_reclaim_mode                1
```

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Platform Notes (Continued)

```
------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         always madvise [never]
  hpage_pmd_size  536870912
  shmem_enabled   always within_size advise [never] deny force

------------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs   60000
  defrag                      1
  max_ptes_none            8191
  max_ptes_swap            1024
  pages_to_scan           65536
  scan_sleep_millisecs    10000

------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release     CentOS Stream 8
  redhat-release CentOS Stream release 8
  system-release CentOS Stream release 8

------------------------------------------------------------
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
  itlb_multihit        Not affected
  l1tf                 Not affected
  mds                  Not affected
  meltdown             Not affected
  spec_store_bypass    Mitigation: Speculative Store Bypass disabled via prctl
  spectre_v1           Mitigation: __user pointer sanitization
  spectre_v2           Not affected
  srbds                Not affected
  tsx_async_abort      Not affected
For more information, see the Linux documentation on hardware vulnerabilities, for example
     https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html

------------------------------------------------------------
21. Disk information
SPEC is set to: /home/zfu/speccpu2017/speccpu2017_install
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda4      xfs   430G  182G  249G  43% /

------------------------------------------------------------
22. /sys/devices/virtual/dmi/id
    Vendor:         ZTE
    Product:        R5310 G3
    Product Family: Server
    Serial:         219537921268

------------------------------------------------------------
23. dmidecode
  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:
    16x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600
```

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Platform Notes (Continued)

```
 ------------------------------------------------------------
 24. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       Byosoft
    BIOS Version:      31.24.03.00 (SCP:24.03.01.49.02)
    BIOS Date:         07/25/2024
    BIOS Revision:     31.24
    Firmware Revision: 1.49
```

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 (GCC) 12.2.0
Copyright (C) 2022 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++ (GCC) 12.2.0
Copyright (C) 2022 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)
--------------------------------------------------------------------------------------------------------------
GNU Fortran (GCC) 12.2.0
Copyright (C) 2022 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/usr/local/gcc-12.2.0/lib64 -L/usr/local/gcc-12.2.0/lib -L/usr/local/jemalloc-5.2.1_install/lib -g -O3 -mcpu=neoverse-n1 -march=armv9-a -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 -fgnu89-inline -ljemalloc`

C++ benchmarks:
`-mabi=lp64 -std=c++03 -L/usr/local/gcc-12.2.0/lib64 -L/usr/local/gcc-12.2.0/lib -L/usr/local/jemalloc-5.2.1_install/lib -g -O3 -mcpu=neoverse-n1 -march=armv9-a -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/usr/local/gcc-12.2.0/lib64 -L/usr/local/gcc-12.2.0/lib -L/usr/local/jemalloc-5.2.1_install/lib -g -O3 -mcpu=neoverse-n1 -march=armv9-a -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`

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Base Other Flags (Continued)

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/ZTE-Platform-Settings-ZXIC-V1.0.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/ZTE-Platform-Settings-ZXIC-V1.0.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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