SPEC CPU®2017 Integer Rate Result

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ZTE Corporation
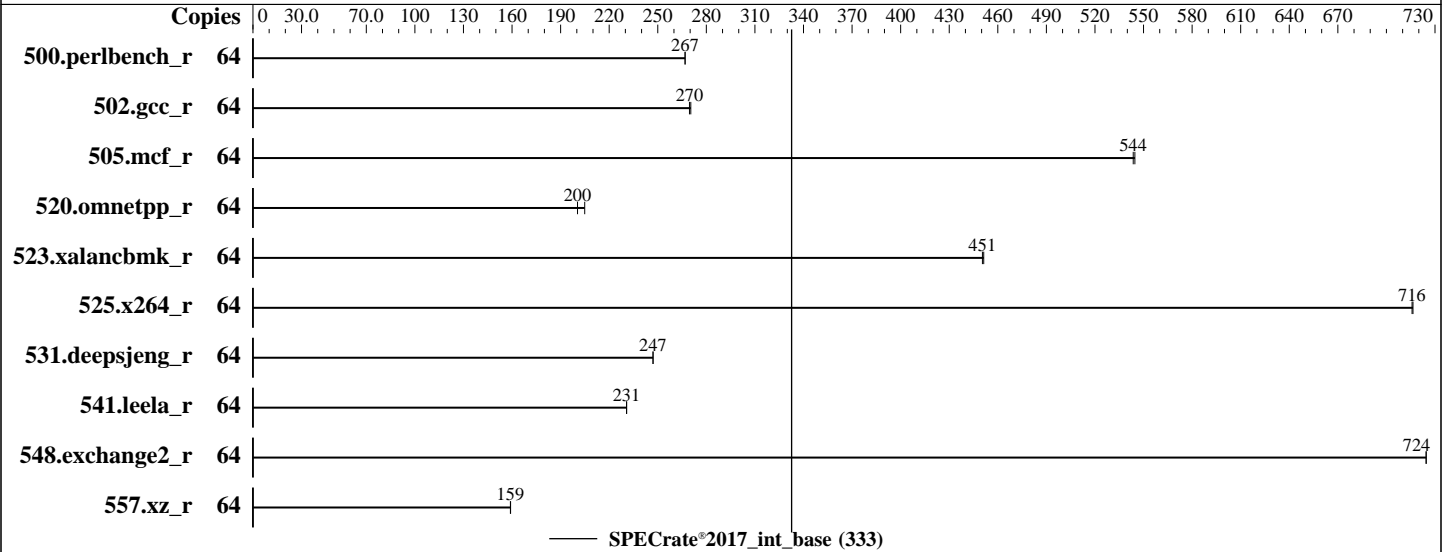
ZTE R5300G5 Server System
(2.50 GHz, Intel Xeon Gold 6548Y+)

$SPECrate^{®}2017\_int\_base = 333$

$SPECrate^{®}2017\_int\_peak = Not\ Run$

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

Test Date: Oct-2024
Hardware Availability: Feb-2024
Software Availability: Mar-2024

Copies		Value
500.perlbench_r	64	267
502.gcc_r	64	270
505.mcf_r	64	544
520.omnetpp_r	64	200
523.xalancbmk_r	64	451
525.x264_r	64	716
531.deepsjeng_r	64	247
541.leela_r	64	231
548.exchange2_r	64	724
557.xz_r	64	159

Chart scale (Copies): 0 30.0 70.0 100 130 160 190 220 250 280 310 340 370 400 430 460 490 520 550 580 610 640 670 730

SPECrate®2017_int_base (333)

Hardware

CPU Name: Intel Xeon Gold 6548Y+
 Max MHz: 4100
 Nominal: 2500
Enabled: 32 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 60 MB I+D on chip per chip
 Other: None
Memory: 640 GB (10 x 64 GB 2Rx4 PC5-5600B-R, running at 5200)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: Air

Software

OS: Red Hat Enterprise Linux 9.2 (Plow)
 5.14.0-284.11.1.el9_2.x86_64
Compiler: C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Version 04.24.01.10 released Mar-2024
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

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Results Table

Benchmark	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
500.perlbench_r	64	**382**	**267**	382	267									
502.gcc_r	64	**336**	**270**	335	270									
505.mcf_r	64	190	545	**190**	**544**									
520.omnetpp_r	64	**419**	**200**	410	205									
523.xalancbmk_r	64	**150**	**451**	150	451									
525.x264_r	64	156	716	**157**	**716**									
531.deepsjeng_r	64	297	247	**297**	**247**									
541.leela_r	64	**459**	**231**	459	231									
548.exchange2_r	64	**231**	**724**	231	725									
557.xz_r	64	**435**	**159**	434	159									
SPECrate®2017_int_base =		**333**												
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 = "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
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)
```

(Continued on next page)

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General Notes (Continued)

is mitigated in the system as tested and documented.

Platform Notes

```
BIOS Configuration:
ENERGY_PERF_BIAS_CFG mode = performance
LLC dead line alloc = Disabled
Patrol Scrub = Disabled
Sub NUMA(SNC) = Enable SNC2

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Fri Oct 25 19:41:27 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 252 (252-13.el9_2)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS
------------------------------------------------------------


------------------------------------------------------------
1. uname -a
  Linux localhost.localdomain 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT
  2023 x86_64 x86_64 x86_64 GNU/Linux


------------------------------------------------------------
2. w
   19:41:27 up 1 min,  3 users,  load average: 0.71, 0.39, 0.15
  USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
  root     pts/0      19:40    1:07   0.00s  0.00s -bash
  root     pts/1      19:40    7.00s  0.83s  0.00s /bin/sh
  ./reportable-ic2024.1-lin-sapphirerapids-rate-smt-on-20240308.sh
  root     pts/2      19:40    1:05   0.00s  0.00s -bash


------------------------------------------------------------
3. Username
```

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Platform Notes (Continued)

```
  From environment variable $USER:  root


  -------------------------------------------------------------
4. ulimit -a
   real-time non-blocking time  (microseconds, -R) unlimited
   core file size              (blocks, -c) 0
   data seg size               (kbytes, -d) unlimited
   scheduling priority              (-e) 0
   file size                   (blocks, -f) unlimited
   pending signals                  (-i) 2576385
   max locked memory           (kbytes, -l) 8192
   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) 2576385
   virtual memory              (kbytes, -v) unlimited
   file locks                       (-x) unlimited


  -------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 31
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@pts/1
 -bash
 /bin/sh ./reportable-ic2024.1-lin-sapphirerapids-rate-smt-on-20240308.sh
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 -c
   ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=32 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -n 2 -o all intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 --configfile
   ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=32 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base --iterations 2 --output_format all
   --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/cpu2017


  -------------------------------------------------------------
6. /proc/cpuinfo
     model name      : INTEL(R) XEON(R) GOLD 6548Y+
     vendor_id       : GenuineIntel
     cpu family      : 6
     model           : 207
     stepping        : 2
     microcode       : 0x21000200
     bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
     cpu cores       : 32
     siblings        : 64
     1 physical ids (chips)
     64 processors (hardware threads)
     physical id 0: core ids 0-31
     physical id 0: apicids 0-63
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.

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

(Continued on next page)

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Platform Notes (Continued)

```
7. lscpu

From lscpu from util-linux 2.37.4:
  Architecture:              x86_64
  CPU op-mode(s):            32-bit, 64-bit
  Address sizes:             46 bits physical, 57 bits virtual
  Byte Order:                Little Endian
  CPU(s):                    64
  On-line CPU(s) list:       0-63
  Vendor ID:                 GenuineIntel
  BIOS Vendor ID:            Intel(R) Corporation
  Model name:                INTEL(R) XEON(R) GOLD 6548Y+
  BIOS Model name:           INTEL(R) XEON(R) GOLD 6548Y+
  CPU family:                6
  Model:                     207
  Thread(s) per core:        2
  Core(s) per socket:        32
  Socket(s):                 1
  Stepping:                  2
  CPU max MHz:               4100.0000
  CPU min MHz:               800.0000
  BogoMIPS:                  5000.00
  Flags:                     fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                             clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                             lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                             nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                             ds_cpl smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2
                             x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm
                             abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3 invpcid_single
                             cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1
                             avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                             avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                             xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                             cqm_mbm_local avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hwp
                             hwp_act_window hwp_epp hwp_pkg_req hfi avx512vbmi umip pku ospke waitpkg
                             avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
                             avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
                             enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr ibt amx_bf16
                             avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities
  L1d cache:                 1.5 MiB (32 instances)
  L1i cache:                 1 MiB (32 instances)
  L2 cache:                  64 MiB (32 instances)
  L3 cache:                  60 MiB (1 instance)
  NUMA node(s):              2
  NUMA node0 CPU(s):         0-15,32-47
  NUMA node1 CPU(s):         16-31,48-63
  Vulnerability Itlb multihit:    Not affected
  Vulnerability L1tf:             Not affected
  Vulnerability Mds:              Not affected
  Vulnerability Meltdown:         Not affected
  Vulnerability Mmio stale data:  Not affected
  Vulnerability Retbleed:         Not affected
  Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
  Vulnerability Spectre v1:       Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Vulnerability Spectre v2:       Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW
                                  sequence
  Vulnerability Srbds:            Not affected
  Vulnerability Tsx async abort:  Not affected

From lscpu --cache:
```

(Continued on next page)

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Platform Notes (Continued)

```
      NAME ONE-SIZE ALL-SIZE WAYS TYPE         LEVEL  SETS PHY-LINE COHERENCY-SIZE
      L1d      48K      1.5M  12 Data             1    64       1              64
      L1i      32K        1M   8 Instruction      1    64       1              64
      L2        2M       64M  16 Unified          2  2048       1              64
      L3       60M       60M  15 Unified          3 65536       1              64

  --------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0-15,32-47
  node 0 size: 321590 MB
  node 0 free: 320674 MB
  node 1 cpus: 16-31,48-63
  node 1 size: 322547 MB
  node 1 free: 321781 MB
  node distances:
  node   0   1
    0:  10  12
    1:  12  10


  --------------------------------------------------------------
9. /proc/meminfo
   MemTotal:      659597448 kB


  --------------------------------------------------------------
10. who -r
   run-level 3 Oct 25 19:40


  --------------------------------------------------------------
11. Systemd service manager version: systemd 252 (252-13.el9_2)
   Default Target  Status
   multi-user      running


  --------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd chronyd crond
                    dbus-broker getty@ insights-client-boot lvm2-monitor mdmonitor microcode nis-domainname
                    rhsmcertd selinux-autorelabel-mark sshd sssd systemd-boot-update systemd-network-generator
                    udisks2
   enabled-runtime  systemd-remount-fs
   disabled         blk-availability chrony-wait console-getty cpupower debug-shell dnf-system-upgrade
                    firewalld irqbalance kdump kvm_stat man-db-restart-cache-update nftables rdisc rhcd rhsm
                    rhsm-facts rpmdb-rebuild rsyslog selinux-check-proper-disable serial-getty@ sshd-keygen@
                    systemd-boot-check-no-failures systemd-pstore systemd-sysext
   indirect         sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo systemd-sysupdate
                    systemd-sysupdate-reboot


  --------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
   root=/dev/mapper/rhel-root
   ro
   crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
   resume=/dev/mapper/rhel-swap
   rd.lvm.lv=rhel/root
   rd.lvm.lv=rhel/swap
   nohz_full=0-31
```

(Continued on next page)

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Platform Notes (Continued)

```
-------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 4.10 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes


-------------------------------------------------------------
15. sysctl
  kernel.numa_balancing            1
  kernel.randomize_va_space        2
  vm.compaction_proactiveness      20
  vm.dirty_background_bytes        0
  vm.dirty_background_ratio        10
  vm.dirty_bytes                   0
  vm.dirty_expire_centisecs        3000
  vm.dirty_ratio                   20
  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                    60
  vm.watermark_boost_factor        15000
  vm.watermark_scale_factor        10
  vm.zone_reclaim_mode             0


-------------------------------------------------------------
16. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         [always] madvise never
  hpage_pmd_size  2097152
  shmem_enabled   always within_size advise [never] deny force


-------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs   60000
  defrag                  1
  max_ptes_none           511
  max_ptes_shared         256
  max_ptes_swap           64
  pages_to_scan           4096
  scan_sleep_millisecs    10000


-------------------------------------------------------------
18. OS release
  From /etc/*-release /etc/*-version
  os-release     Red Hat Enterprise Linux 9.2 (Plow)
  redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
  system-release Red Hat Enterprise Linux release 9.2 (Plow)


-------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017
  Filesystem            Type  Size  Used Avail Use% Mounted on
```

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Platform Notes (Continued)

```
   /dev/mapper/rhel-home xfs   372G  146G  226G  40% /home


   -----------------------------------------------------------
   20. /sys/devices/virtual/dmi/id
       Vendor:         ZTE
       Product:        R5300 G5
       Product Family: Server
       Serial:         219440501031


   -----------------------------------------------------------
   21. 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:
       10x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 5200


   -----------------------------------------------------------
   22. BIOS
   (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:        American Megatrends Inc.
     BIOS Version:       04.24.01.10
     BIOS Date:          03/13/2024
     BIOS Revision:      4.24
```

Compiler Version Notes

```
==============================================================================
C     | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++   | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:

icx

(Continued on next page)

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Base Compiler Invocation (Continued)

C++ benchmarks:

`icpx`

Fortran benchmarks:

`ifx`

Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
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:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc
```

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/ZTE-Platform-Settings-EMR-V1.1.html
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html

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ZTE Corporation

ZTE R5300G5 Server System
(2.50 GHz, Intel Xeon Gold 6548Y+)

SPECrate®2017_int_base =   333

SPECrate®2017_int_peak = Not Run

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

Test Date: Oct-2024
Hardware Availability: Feb-2024
Software Availability: Mar-2024

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/ZTE-Platform-Settings-EMR-V1.1.xml
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml

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

Tested with SPEC CPU®2017 v1.1.9 on 2024-10-25 19:41:26-0400.
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