SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

$SPECrate^{®}2017\_int\_base = \quad 258$

ThinkSystem SD530 V3
(2.10 GHz, Intel Xeon Gold 5512U)

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

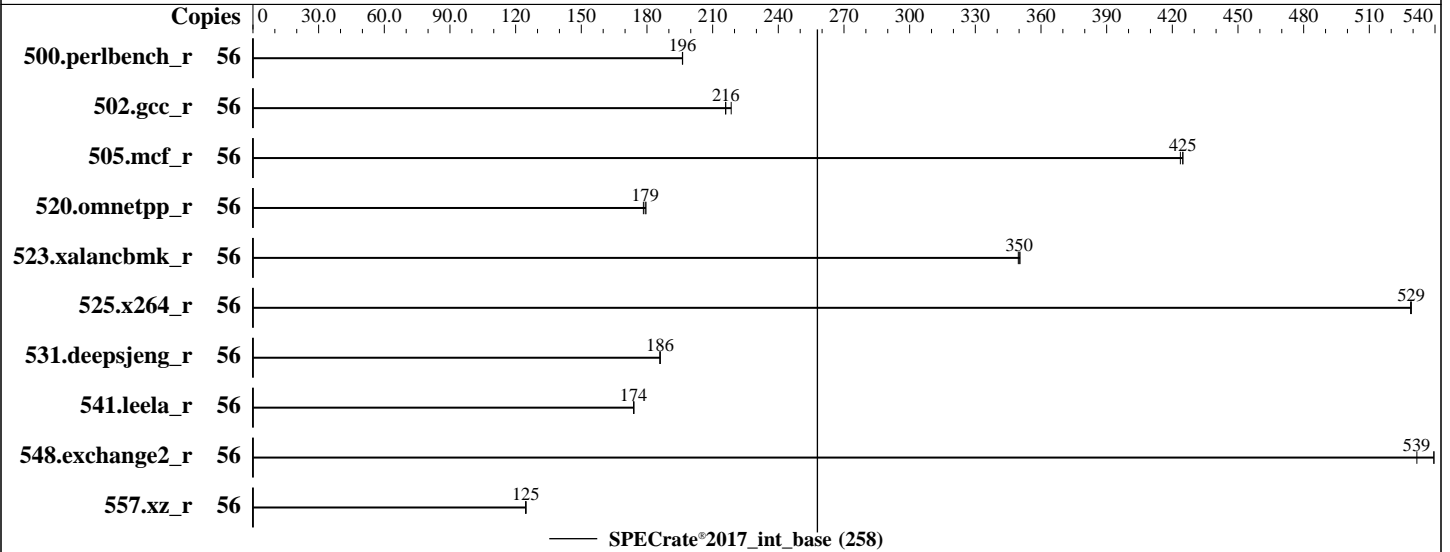**CPU2017 License:** 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Apr-2024
Hardware Availability: Mar-2024
Software Availability: Mar-2024

Copies 0 30.0 60.0 90.0 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540

Benchmark	Copies	Value
500.perlbench_r	56	196
502.gcc_r	56	216
505.mcf_r	56	425
520.omnetpp_r	56	179
523.xalancbmk_r	56	350
525.x264_r	56	529
531.deepsjeng_r	56	186
541.leela_r	56	174
548.exchange2_r	56	539
557.xz_r	56	125

SPECrate®2017_int_base (258)

Hardware

CPU Name: Intel Xeon Gold 5512U
 Max MHz: 3700
 Nominal: 2100
Enabled: 28 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: 52.5 MB I+D on chip per chip
 Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC5-5600B-R, running at 4800)
Storage: 1 x 480 GB M.2 SATA SSD
Other: CPU Cooling: Air

Software

OS: Red Hat Enterprise Linux 9.3 (Plow)
 Kernel 5.14.0-362.8.1.el9_3.x86_64
Compiler: C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Lenovo BIOS Version FNE113F 2.20 released Jan-2024
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS 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	56	454	196	454	196	**454**	**196**							
502.gcc_r	56	363	218	367	216	**367**	**216**							
505.mcf_r	56	**213**	**425**	214	424	213	425							
520.omnetpp_r	56	412	178	**410**	**179**	409	180							
523.xalancbmk_r	56	169	350	169	350	**169**	**350**							
525.x264_r	56	**185**	**529**	185	529	185	529							
531.deepsjeng_r	56	**345**	**186**	345	186	345	186							
541.leela_r	56	533	174	**533**	**174**	533	174							
548.exchange2_r	56	**272**	**539**	272	540	276	532							
557.xz_r	56	**485**	**125**	485	125	486	125							

SPECrate®2017_int_base =   258

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"

Environment Variables Notes

    Environment variables set by runcpu before the start of the run:
    LD_LIBRARY_PATH =
        "/home/cpu2017-1.1.9-ic2024.0.2/lib/intel64:/home/cpu2017-1.1.9-ic2024.0.2/lib/ia32:/home/cpu2017-1.1.
        9-ic2024.0.2/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.

(Continued on next page)

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General Notes (Continued)

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.

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
SNC set to SNC2
LLC Prefetch set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-ic2024.0.2/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Tue Apr  9 09:25:38 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 (252-18.el9)
 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 5.14.0-362.8.1.el9_3.x86_64 #1 SMP PREEMPT_DYNAMIC Tue Oct 3 11:12:36 EDT 2023
   x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    09:25:38 up 0 min,  1 user,  load average: 0.48, 0.15, 0.05
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1       09:25   10.00s  1.06s  0.01s /bin/bash ./rate_int.sh

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

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

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Platform Notes (Continued)

```
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) 2062596
   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) 2062596
   virtual memory              (kbytes, -v) unlimited
   file locks                       (-x) unlimited


   ------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 31
 login -- root
 -bash
 /bin/bash ./rate_int.sh
 /bin/bash ./rate_int.sh
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 -c
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=28 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 --configfile
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=28 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
   rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.158/templogs/preenv.intrate.158.0.log --lognum 158.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-ic2024.0.2


   ------------------------------------------------------------
6. /proc/cpuinfo
   model name      : INTEL(R) XEON(R) GOLD 5512U
   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       : 28
   siblings        : 56
   1 physical ids (chips)
   56 processors (hardware threads)
   physical id 0: core ids 0-27
   physical id 0: apicids 0-55
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


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

 From lscpu from util-linux 2.37.4:
   Architecture:                   x86_64
```

(Continued on next page)

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Platform Notes (Continued)

```
CPU op-mode(s):                  32-bit, 64-bit
Address sizes:                   46 bits physical, 57 bits virtual
Byte Order:                      Little Endian
CPU(s):                          56
On-line CPU(s) list:             0-55
Vendor ID:                       GenuineIntel
BIOS Vendor ID:                  Intel(R) Corporation
Model name:                      INTEL(R) XEON(R) GOLD 5512U
BIOS Model name:                 INTEL(R) XEON(R) GOLD 5512U
CPU family:                      6
Model:                           207
Thread(s) per core:              2
Core(s) per socket:              28
Socket(s):                       1
Stepping:                        2
BogoMIPS:                        4200.00
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 ds_cpl vmx 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 intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
                                 tpr_shadow flexpriority ept vpid ept_ad 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 split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm
                                 ida arat pln pts vnmi 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
Virtualization:                  VT-x
L1d cache:                       1.3 MiB (28 instances)
L1i cache:                       896 KiB (28 instances)
L2 cache:                        56 MiB (28 instances)
L3 cache:                        52.5 MiB (1 instance)
NUMA node(s):                    2
NUMA node0 CPU(s):               0-13,28-41
NUMA node1 CPU(s):               14-27,42-55
Vulnerability Gather data sampling: Not affected
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 / Automatic IBRS, IBPB conditional, RSB filling,
                                 PBRSB-eIBRS SW sequence
Vulnerability Srbds:             Not affected
Vulnerability Tsx async abort:   Not affected

From lscpu --cache:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE         LEVEL  SETS PHY-LINE COHERENCY-SIZE
    L1d       48K     1.3M   12 Data             1    64        1             64
    L1i       32K     896K    8 Instruction      1    64        1             64
```

(Continued on next page)

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Platform Notes (Continued)

```
    L2          2M      56M   16 Unified            2  2048     1           64
    L3       52.5M    52.5M   15 Unified            3 57344     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: 0-13,28-41
  node 0 size: 257652 MB
  node 0 free: 256863 MB
  node 1 cpus: 14-27,42-55
  node 1 size: 258035 MB
  node 1 free: 257425 MB
  node distances:
  node   0   1
    0:  10  12
    1:  12  10


    -------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       528064700 kB


    -------------------------------------------------------------
10. who -r
   run-level 3 Apr 9 09:25


    -------------------------------------------------------------
11. Systemd service manager version: systemd 252 (252-18.el9)
   Default Target  Status
   multi-user      running


    -------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE           UNIT FILES
   enabled         NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                   dbus-broker firewalld getty@ insights-client-boot irqbalance kdump low-memory-monitor
                   mdmonitor microcode nis-domainname rhsmcertd rsyslog rtkit-daemon selinux-autorelabel-mark
                   sshd sssd systemd-boot-update systemd-network-generator udisks2 upower
   enabled-runtime systemd-remount-fs
   disabled        canberra-system-bootup canberra-system-shutdown canberra-system-shutdown-reboot
                   console-getty cpupower debug-shell dnf-system-upgrade kvm_stat man-db-restart-cache-update
                   nftables pesign rdisc rhcd rhsm rhsm-facts rpmdb-rebuild 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,gpt3)/boot/vmlinuz-5.14.0-362.8.1.el9_3.x86_64
   root=UUID=be3ee7bd-6dba-4efc-8d0a-4f4f123b4865
   ro
   resume=UUID=8de8c2d1-84ee-4c60-9038-a9e1ae2929c4

    -------------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 0:
     Unable to determine current policy
     boost state support:
       Supported: yes
       Active: yes
```

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Platform Notes (Continued)

```
     ----------------------------------------------------------
     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 9.3 (Plow)
       redhat-release Red Hat Enterprise Linux release 9.3 (Plow)
       system-release Red Hat Enterprise Linux release 9.3 (Plow)

     ----------------------------------------------------------
     19. Disk information
     SPEC is set to: /home/cpu2017-1.1.9-ic2024.0.2
       Filesystem      Type  Size  Used Avail Use% Mounted on
       /dev/sda4       xfs   372G   35G  338G  10% /home

     ----------------------------------------------------------
     20. /sys/devices/virtual/dmi/id
        Vendor:          Lenovo
        Product:         ThinkSystem SD530 V3
        Product Family:  ThinkSystem
        Serial:          PASDVMK006
```

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Platform Notes (Continued)

```
  ----------------------------------------------------------
  21. dmidecode
    Additional information from dmidecode 3.5 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:
      7x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 4800
      1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4800


  ----------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       Lenovo
    BIOS Version:      FNE113F-2.20
    BIOS Date:         01/02/2024
    BIOS Revision:     2.20
    Firmware Revision: 1.10
```

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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

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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/2024.0/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/2024.0/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/2024.0/lib -lqkmalloc`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.html
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.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 2024-04-08 21:25:38-0400.
Report generated on 2024-05-07 22:18:14 by CPU2017 PDF formatter v6716.
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