SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

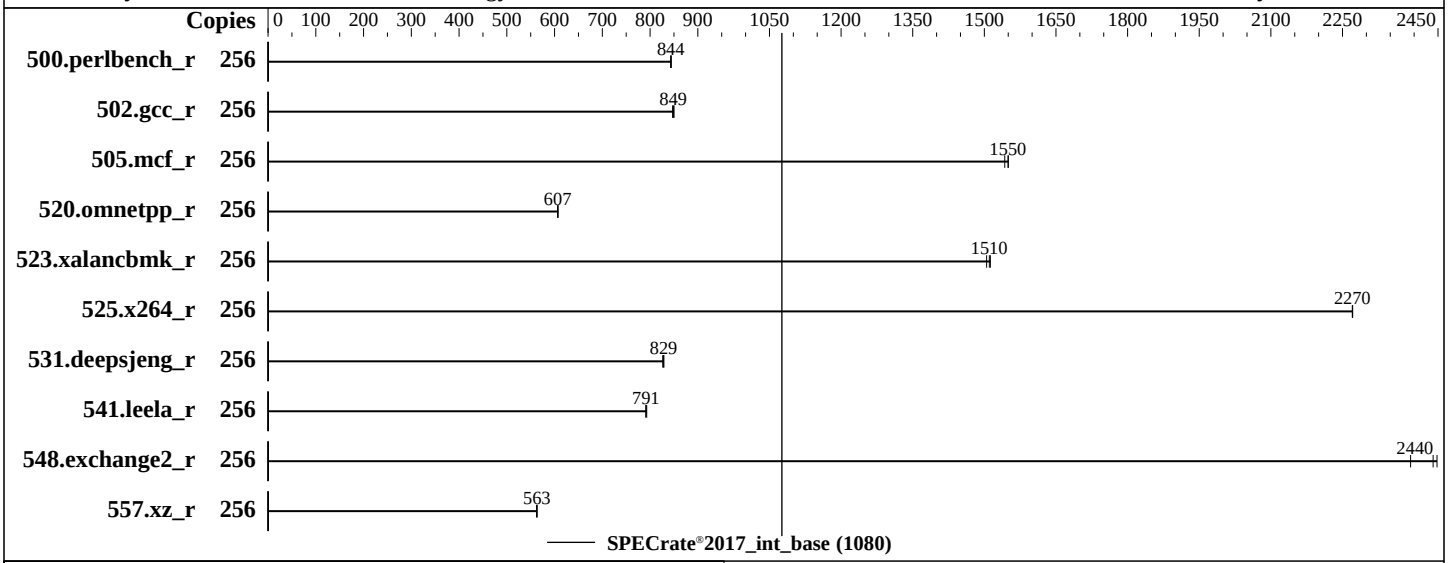
ThinkSystem SD650 V3
(2.20 GHz, Intel Xeon Platinum 8593Q)

SPECrate®2017_int_base = 1080

SPECrate®2017_int_peak = Not Run

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

Test Date: Nov-2023
Hardware Availability: Feb-2024
Software Availability: Dec-2023



Hardware

CPU Name:	Intel Xeon Platinum 8593Q
Max MHz:	3900
Nominal:	2200
Enabled:	128 cores, 2 chips, 2 threads/core
Orderable:	2 chips
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	2 MB I+D on chip per core
L3:	320 MB I+D on chip per chip
Other:	None
Memory:	1 TB (16 x 64 GB 2Rx4 PC5-5600B-R)
Storage:	1 x 1.92 TB SATA SSD
Other:	None

Software

OS:	SUSE Linux Enterprise Server 15 SP5 Kernel 5.14.21-150500.53-default
Compiler:	C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	Lenovo BIOS Version USE125B 4.10 released Nov-2023
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	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	256	483	844	**483**	**844**	483	843							
502.gcc_r	256	428	847	426	850	**427**	**849**							
505.mcf_r	256	267	1550	268	1540	**267**	**1550**							
520.omnetpp_r	256	554	607	**554**	**607**	553	607							
523.xalancbmk_r	256	179	1510	180	1500	**179**	**1510**							
525.x264_r	256	**197**	**2270**	197	2270	197	2270							
531.deepsjeng_r	256	355	826	**354**	**829**	354	829							
541.leela_r	256	536	791	**536**	**791**	535	793							
548.exchange2_r	256	274	2450	**275**	**2440**	280	2390							
557.xz_r	256	**491**	**563**	491	563	492	562							

SPECrate®2017_int_base = 1080

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-ic2023.2.3/lib/intel64:/home/cpu2017-1.1.9-ic2023.2.3/lib/ia32:/home/cpu2017-1.1.
     9-ic2023.2.3/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)

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 and then set it to Custom Mode
UPI Link Disable set to Minimum Number of Links Enabled
SNC set to SNC2

 Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Fri Nov 24 00:37:19 2023

 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 249 (249.16+suse.171.gdad0071f15)
 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 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)
   x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    00:37:19 up 2 min,  1 user,  load average: 0.26, 0.12, 0.04
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                00:36    7.00s  1.09s  0.02s /bin/bash ./rate_int.sh

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

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

(Continued on next page)

Platform Notes (Continued)

```
 4. ulimit -a
   core file size          (blocks, -c) unlimited
   data seg size           (kbytes, -d) unlimited
   scheduling priority             (-e) 0
   file size               (blocks, -f) unlimited
   pending signals                 (-i) 4126607
   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) 4126607
   virtual memory          (kbytes, -v) unlimited
   file locks                      (-x) unlimited

 ------------------------------------------------------------
 5. sysinfo process ancestry
  /usr/lib/systemd/systemd --switched-root --system --deserialize 30
  login -- root
  -bash
  /bin/bash ./rate_int.sh
  /bin/bash ./rate_int.sh
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=256 -c
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=128 --define physicalfirst
    --define invoke_with_interleave --define drop_caches --tune base -o all intrate
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=256 --configfile
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=128 --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/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-ic2023.2.3

 ------------------------------------------------------------
 6. /proc/cpuinfo
     model name      : INTEL(R) XEON(R) PLATINUM 8593Q
     vendor_id       : GenuineIntel
     cpu family      : 6
     model           : 207
     stepping        : 2
     microcode       : 0x21000190
     bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
     cpu cores       : 64
     siblings        : 128
     2 physical ids (chips)
     256 processors (hardware threads)
     physical id 0: core ids 0-63
     physical id 1: core ids 0-63
     physical id 0: apicids 0-127
     physical id 1: apicids 128-255
   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:
```

(Continued on next page)

Platform Notes (Continued)

```
  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):                          256
  On-line CPU(s) list:             0-255
  Vendor ID:                       GenuineIntel
  Model name:                      INTEL(R) XEON(R) PLATINUM 8593Q
  CPU family:                      6
  Model:                           207
  Thread(s) per core:              2
  Core(s) per socket:              64
  Socket(s):                       2
  Stepping:                        2
  BogoMIPS:                        4400.00
  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
                                   cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority
                                   ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid
                                   rtm 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 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 avx512_fp16
                                   amx_tile flush_l1d arch_capabilities
  Virtualization:                  VT-x
  L1d cache:                       6 MiB (128 instances)
  L1i cache:                       4 MiB (128 instances)
  L2 cache:                        256 MiB (128 instances)
  L3 cache:                        640 MiB (2 instances)
  NUMA node(s):                    4
  NUMA node0 CPU(s):               0-31,128-159
  NUMA node1 CPU(s):               32-63,160-191
  NUMA node2 CPU(s):               64-95,192-223
  NUMA node3 CPU(s):               96-127,224-255
  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 and seccomp
  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:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL   SETS PHY-LINE COHERENCY-SIZE
      L1d       48K       6M   12 Data            1     64        1             64
      L1i       32K       4M    8 Instruction     1     64        1             64
      L2         2M     256M   16 Unified         2   2048        1             64
```

(Continued on next page)

Platform Notes (Continued)

```
     L3       320M     640M   20 Unified         3 262144        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0-31,128-159
  node 0 size: 257695 MB
  node 0 free: 256882 MB
  node 1 cpus: 32-63,160-191
  node 1 size: 257997 MB
  node 1 free: 257192 MB
  node 2 cpus: 64-95,192-223
  node 2 size: 258031 MB
  node 2 free: 256951 MB
  node 3 cpus: 96-127,224-255
  node 3 size: 257957 MB
  node 3 free: 257251 MB
  node distances:
  node   0   1   2   3
    0:  10  12  21  21
    1:  12  10  21  21
    2:  21  21  10  12
    3:  21  21  12  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1056442388 kB

------------------------------------------------------------
10. who -r
  run-level 3 Nov 24 00:35

------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator
                   kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd
                   systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
  enabled-runtime  systemd-remount-fs
  disabled         autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                   chronyd console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
                   firewalld gpm grub2-once haveged haveged-switch-root ipmi ipmievd issue-add-ssh-keys
                   kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rpcbind rpmconfigcheck rsyncd
                   serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                   systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd
  indirect         wickedd

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
  root=UUID=d7791671-9fd7-462e-99cf-2cc433d1f618
  splash=silent
  mitigations=auto
  quiet
```

(Continued on next page)

Platform Notes (Continued)

```
  security=apparmor

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    Unable to determine current policy
    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 SUSE Linux Enterprise Server 15 SP5

------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2023.2.3
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda3      xfs   1.8T   57G  1.7T   4% /
```

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Platform Notes (Continued)

```
------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:          Lenovo
    Product:         ThinkSystem SD650 V3
    Product Family:  ThinkSystem
    Serial:          123456789

------------------------------------------------------------
21. dmidecode
  Additional information from dmidecode 3.4 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:
    15x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600
    1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600


------------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       Lenovo
   BIOS Version:      USE125B-4.10
   BIOS Date:         11/02/2023
   BIOS Revision:     4.10
   Firmware Revision: 0.30
```

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 2023.2.3 Build x
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 2023.2.3 Build x
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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

(Continued on next page)

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-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-ic2023p2-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-ic2023p2-official-linux64.xml

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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 2023-11-23 11:37:18-0500.
Report generated on 2024-01-03 16:20:18 by CPU2017 PS formatter v6716.
Originally published on 2023-12-14.