SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

$SPECrate^{®}2017\_int\_base =$ **194**

ThinkSystem SD530 V3
(3.60 GHz, Intel Xeon Gold 6544Y)

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

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

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

Benchmark	Copies	Result
500.perlbench_r	32	146
502.gcc_r	32	165
505.mcf_r	32	329
520.omnetpp_r	32	129
523.xalancbmk_r	32	273
525.x264_r	32	389
531.deepsjeng_r	32	136
541.leela_r	32	136
548.exchange2_r	32	418
557.xz_r	32	88.3

Scale: 0 20.0 40.0 60.0 80.0 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 425

SPECrate®2017_int_base (194)

Hardware

CPU Name: Intel Xeon Gold 6544Y
  Max MHz: 4100
  Nominal: 3600
Enabled: 16 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: 45 MB I+D on chip per chip
  Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC5-5600B-R, running at 5200)
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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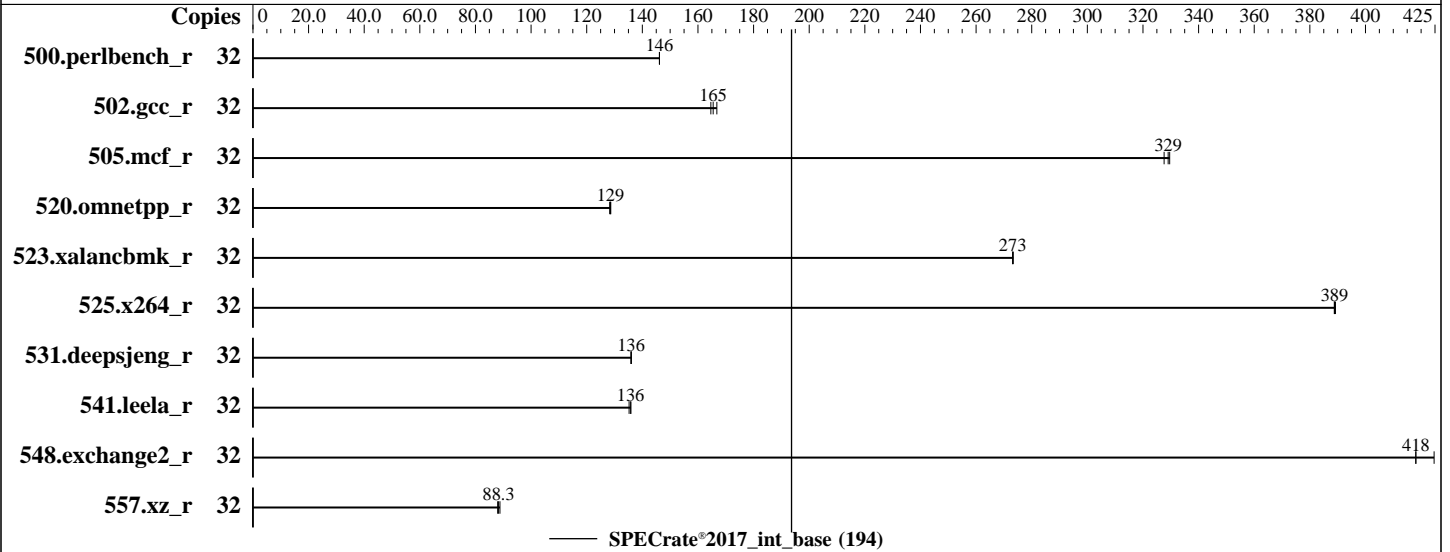
SPECrate®2017_int_peak = Not Run

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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	32	349	146	349	146	**349**	**146**							
502.gcc_r	32	272	167	275	165	**274**	**165**							
505.mcf_r	32	158	328	**157**	**329**	157	330							
520.omnetpp_r	32	327	128	**327**	**129**	326	129							
523.xalancbmk_r	32	124	273	124	273	**124**	**273**							
525.x264_r	32	144	389	**144**	**389**	144	389							
531.deepsjeng_r	32	**270**	**136**	270	136	270	136							
541.leela_r	32	392	135	390	136	**390**	**136**							
548.exchange2_r	32	197	425	**201**	**418**	201	418							
557.xz_r	32	389	88.8	**391**	**88.3**	393	88.0							
SPECrate®2017_int_base =	**194**													
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 taskset mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate taskset 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
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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Test Date: Mar-2024
Hardware Availability: Mar-2024
Software Availability: Mar-2024

Platform Notes

```
 BIOS configuration:
 Choose Operating Mode set to Maximum Performance

  Sysinfo program /home/cpu2017-1.1.9-ic2024.0.2/bin/sysinfo
  Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
  running on localhost.localdomain Sun Mar 31 03:47:48 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
     03:47:48 up 53 min,  1 user,  load average: 0.09, 6.47, 17.91
    USER       TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
    root      tty1        02:55   12.00s  0.82s  0.00s /bin/bash ./rate_int.sh

  ------------------------------------------------------------
  3. Username
    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) 2061852
    max locked memory           (kbytes, -l) 64
```

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Platform Notes (Continued)

```
   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) 2061852
   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=32 -c
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=16 --define physicalfirst
   --define no-numa --tune base -o all --define drop_caches intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --configfile
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=16 --define physicalfirst
   --define no-numa --tune base --output_format all --define drop_caches --nopower --runmode rate --tune base
   --size refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.113/templogs/preenv.intrate.113.0.log --lognum 113.0 --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 6544Y
    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         : 16
    siblings          : 32
    1 physical ids (chips)
    32 processors (hardware threads)
    physical id 0: core ids 0-15
    physical id 0: apicids 0-31
  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
  CPU op-mode(s):                32-bit, 64-bit
  Address sizes:                 46 bits physical, 57 bits virtual
  Byte Order:                    Little Endian
  CPU(s):                        32
  On-line CPU(s) list:           0-31
  Vendor ID:                     GenuineIntel
  BIOS Vendor ID:                Intel(R) Corporation
  Model name:                    INTEL(R) XEON(R) GOLD 6544Y
```

(Continued on next page)

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Hardware Availability: Mar-2024
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Platform Notes (Continued)

```
      BIOS Model name:                 INTEL(R) XEON(R) GOLD 6544Y
      CPU family:                      6
      Model:                           207
      Thread(s) per core:              2
      Core(s) per socket:              16
      Socket(s):                       1
      Stepping:                        2
      BogoMIPS:                        7200.00
      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 hfi 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:                       768 KiB (16 instances)
      L1i cache:                       512 KiB (16 instances)
      L2 cache:                        32 MiB (16 instances)
      L3 cache:                        45 MiB (1 instance)
      NUMA node(s):                    1
      NUMA node0 CPU(s):               0-31
      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     768K  12 Data            1    64        1             64
       L1i       32K     512K   8 Instruction     1    64        1             64
       L2         2M      32M  16 Unified         2  2048        1             64
       L3        45M      45M  15 Unified         3 49152        1             64


  ----------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0-31
    node 0 size: 515502 MB
```

(Continued on next page)

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Hardware Availability: Mar-2024
Software Availability: Mar-2024

Platform Notes (Continued)

```
  node 0 free: 514175 MB
  node distances:
  node   0
    0:  10


  -------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527874416 kB


  -------------------------------------------------------------
10. who -r
   run-level 3 Mar 31 02:54


  -------------------------------------------------------------
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


  -------------------------------------------------------------
15. sysctl
   kernel.numa_balancing              0
   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
```

(Continued on next page)

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Platform Notes (Continued)

```
   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


   ------------------------------------------------------------
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 5200
     1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 5200



   ------------------------------------------------------------
22. BIOS
```

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Platform Notes (Continued)

```
   (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

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

(Continued on next page)

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Base Portability Flags (Continued)

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 2024-03-30 15:47:48-0400.
Report generated on 2024-04-24 14:32:41 by CPU2017 PDF formatter v6716.
Originally published on 2024-04-24.