SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SD530 V3
(2.80 GHz, Intel Xeon Gold 6526Y)

$SPECrate^{®}2017\_int\_base =$ 340

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

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Feb-2024

Hardware Availability: Mar-2024

Software Availability: Dec-2023

Copies	Value
500.perlbench_r 64	259
502.gcc_r 64	290
505.mcf_r 64	572
520.omnetpp_r 64	235
523.xalancbmk_r 64	464
525.x264_r 64	673
531.deepsjeng_r 64	241
541.leela_r 64	233
548.exchange2_r 64	715
557.xz_r 64	161

SPECrate®2017_int_base (340)

Hardware

CPU Name: Intel Xeon Gold 6526Y
Max MHz: 3900
Nominal: 2800
Enabled: 32 cores, 2 chips, 2 threads/core
Orderable: 1,2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 37.5 MB I+D on chip per chip
Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 5200)
Storage: 1 x 960 GB M.2 NVME 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 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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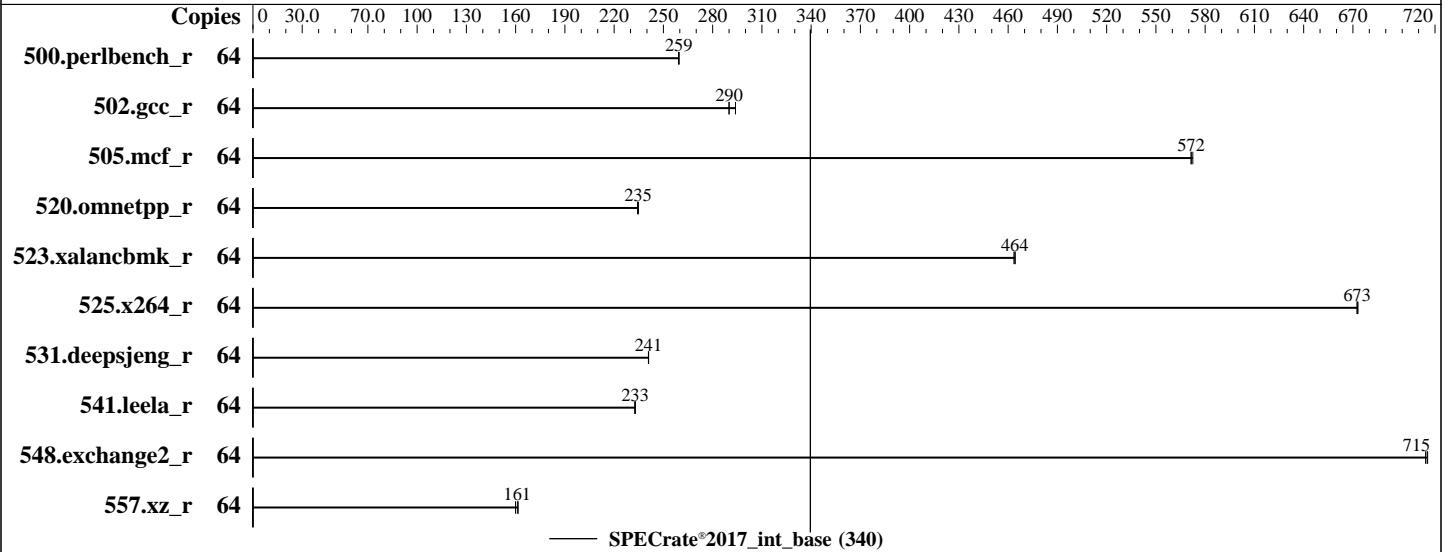SPECrate®2017_int_peak = Not Run

CPU2017 License: 9017
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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	64	393	259	393	260	**393**	**259**							
502.gcc_r	64	**312**	**290**	313	290	308	294							
505.mcf_r	64	181	572	181	571	**181**	**572**							
520.omnetpp_r	64	358	234	**358**	**235**	358	235							
523.xalancbmk_r	64	146	464	146	464	**146**	**464**							
525.x264_r	64	**167**	**673**	167	673	166	673							
531.deepsjeng_r	64	**304**	**241**	304	241	304	241							
541.leela_r	64	**455**	**233**	455	233	456	233							
548.exchange2_r	64	234	716	235	714	**234**	**715**							
557.xz_r	64	**429**	**161**	432	160	428	162							
SPECrate®2017_int_base =	**340**													
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.

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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-ic2023.2.3/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Mon Feb 19 13:44:24 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 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
   13:44:24 up  2:38,  1 user,  load average: 45.94, 59.17, 61.66
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                11:06    2:37m  0.96s  0.01s /bin/bash ./rate_int.sh

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

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

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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) 4127014
   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) 4127014
   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=64 -c
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=32 --define physicalfirst
    --define invoke_with_interleave --define drop_caches --tune base -o all intrate
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 --configfile
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=32 --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/CPU2017.602/templogs/preenv.intrate.602.0.log --lognum 602.0 --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) GOLD 6526Y
    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
    2 physical ids (chips)
    64 processors (hardware threads)
    physical id 0: core ids 0-15
    physical id 1: core ids 0-15
    physical id 0: apicids 0-31
    physical id 1: apicids 128-159
  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)

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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):                        64
On-line CPU(s) list:           0-63
Vendor ID:                     GenuineIntel
Model name:                    INTEL(R) XEON(R) GOLD 6526Y
CPU family:                    6
Model:                         207
Thread(s) per core:            2
Core(s) per socket:            16
Socket(s):                     2
Stepping:                      2
BogoMIPS:                      5600.00
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:                     1.5 MiB (32 instances)
L1i cache:                     1 MiB (32 instances)
L2 cache:                      64 MiB (32 instances)
L3 cache:                      75 MiB (2 instances)
NUMA node(s):                  4
NUMA node0 CPU(s):             0-7,32-39
NUMA node1 CPU(s):             8-15,40-47
NUMA node2 CPU(s):             16-23,48-55
NUMA node3 CPU(s):             24-31,56-63
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 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     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
```

(Continued on next page)

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Platform Notes (Continued)

```
     L3      37.5M      75M   15 Unified        3 40960       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: 0-7,32-39
     node 0 size: 257707 MB
     node 0 free: 256777 MB
     node 1 cpus: 8-15,40-47
     node 1 size: 258009 MB
     node 1 free: 257054 MB
     node 2 cpus: 16-23,48-55
     node 2 size: 258043 MB
     node 2 free: 257115 MB
     node 3 cpus: 24-31,56-63
     node 3 size: 258022 MB
     node 3 free: 257096 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:       1056546400 kB


   ----------------------------------------------------------
   10. who -r
     run-level 3 Feb 19 11:06


   ----------------------------------------------------------
   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 nvmefc-boot-connections 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 nvmf-autoconnect 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=f243a704-c613-4a2e-b642-e5754787f2a2
     splash=silent
```

(Continued on next page)

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Platform Notes (Continued)

```
   mitigations=auto
   quiet
   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
```

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Platform Notes (Continued)

```
   /dev/nvme0n1p3 xfs   893G   29G  864G   4% /

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


  ------------------------------------------------------------
  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:
      6x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 5200
      10x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 5200


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

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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/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
```

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Tested by: Lenovo Global Technology	**Software Availability:** Dec-2023

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

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

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