SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

$SPECrate^{®}2017_int_base = $ 220

ThinkSystem SR630 V3
(2.10 GHz, Intel Xeon Gold 5412U)

$SPECrate^{®}2017_int_peak = $ Not Run

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

Test Date: Apr-2023
Hardware Availability: May-2023
Software Availability: Dec-2022

Benchmark	Copies	Result
500.perlbench_r	48	157
502.gcc_r	48	185
505.mcf_r	48	353
520.omnetpp_r	48	151
523.xalancbmk_r	48	426
525.x264_r	48	416
531.deepsjeng_r	48	152
541.leela_r	48	141
548.exchange2_r	48	441
557.xz_r	48	101

SPECrate®2017_int_base (220)

Hardware

CPU Name: Intel Xeon Gold 5412U
 Max MHz: 3900
 Nominal: 2100
Enabled: 24 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: 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R, running at 4400)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86_64)
Kernel 5.14.21-150400.22-default
Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Lenovo BIOS Version ESE113G 2.10 released Mar-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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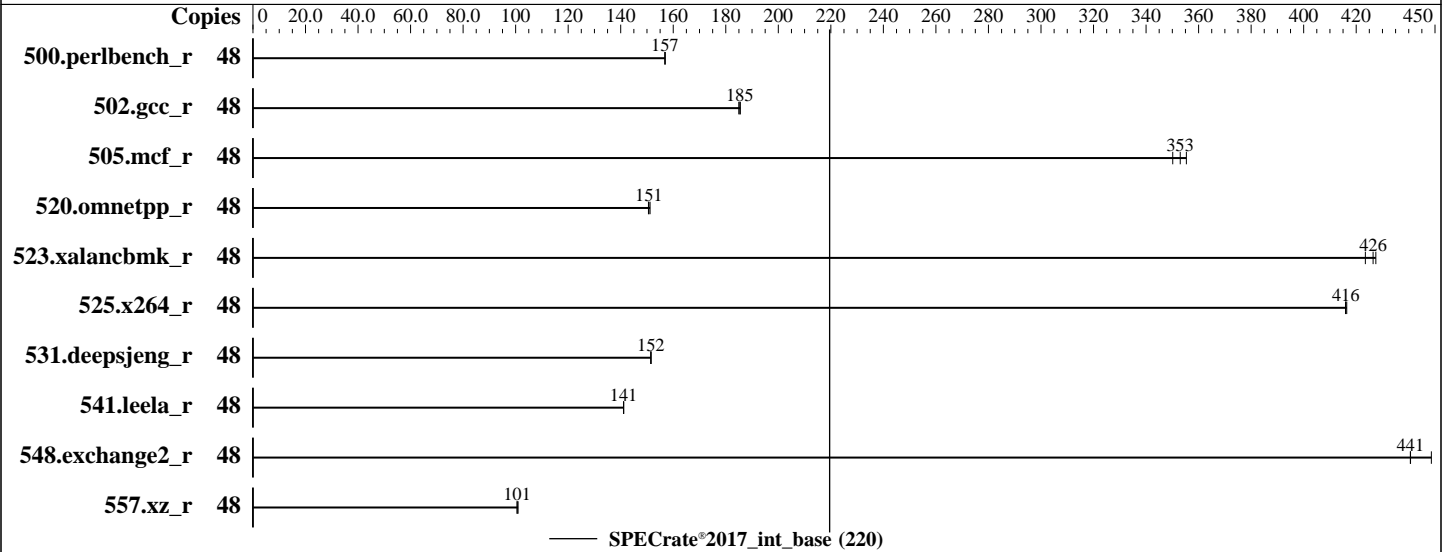
SPECrate®2017_int_peak = Not Run

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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	48	**487**	**157**	487	157	487	157							
502.gcc_r	48	367	185	**367**	**185**	366	186							
505.mcf_r	48	218	355	**220**	**353**	222	350							
520.omnetpp_r	48	417	151	418	151	**418**	**151**							
523.xalancbmk_r	48	**119**	**426**	119	427	120	423							
525.x264_r	48	202	416	**202**	**416**	202	416							
531.deepsjeng_r	48	363	152	**363**	**152**	363	151							
541.leela_r	48	563	141	564	141	**563**	**141**							
548.exchange2_r	48	280	449	**285**	**441**	285	441							
557.xz_r	48	**515**	**101**	515	101	514	101							
SPECrate®2017_int_base =	**220**													
SPECrate®2017_int_peak =	**Not Run**													

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

```
SPEC has ruled that the compiler used for this result was performing a compilation
that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s
benchmarks using a priori knowledge of the SPEC code and dataset to perform a
transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4
https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer
publish results using this optimization.

This result is left in the SPEC results database for historical reference.
```

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-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/lib/ia32:/home/cpu2017-1.1.9-ic
    2023.0/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

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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.
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
LLC Prefetch set to Disabled
C-state set to Legacy

 Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Thu Apr 27 01:31:05 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 (249.11+suse.124.g2bc0b2c447)
 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 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
   x86_64 x86_64 x86_64 GNU/Linux

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

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Platform Notes (Continued)

```
 2. w
   01:31:05 up  1:02,  1 user,  load average: 10.14, 35.03, 42.27
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                00:29    7.00s  0.86s  0.01s -bash

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

  ------------------------------------------------------------
 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) 1029719
   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) 1029719
   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
  -bash
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 -c
    ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
    --define no-numa --tune base -o all --define drop_caches intrate
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --configfile
    ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --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/CPU2017.297/templogs/preenv.intrate.297.0.log --lognum 297.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
  $SPEC = /home/cpu2017-1.1.9-ic2023.0

  ------------------------------------------------------------
 6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Gold 5412U
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
    microcode       : 0x2b000190
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 24
    siblings        : 48
    1 physical ids (chips)
    48 processors (hardware threads)
    physical id 0: core ids 0-23
    physical id 0: apicids 0-47
```

(Continued on next page)

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Platform Notes (Continued)

```
   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 2.37.2:
     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):                     48
     On-line CPU(s) list:        0-47
     Vendor ID:                  GenuineIntel
     Model name:                 Intel(R) Xeon(R) Gold 5412U
     CPU family:                 6
     Model:                      143
     Thread(s) per core:         2
     Core(s) per socket:         24
     Socket(s):                  1
     Stepping:                   8
     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 monitor
                                 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 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 split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                                 arat pln pts 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:                  1.1 MiB (24 instances)
     L1i cache:                  768 KiB (24 instances)
     L2 cache:                   48 MiB (24 instances)
     L3 cache:                   45 MiB (1 instance)
     NUMA node(s):               1
     NUMA node0 CPU(s):          0-47
     Vulnerability Itlb multihit:   Not affected
     Vulnerability L1tf:            Not affected
     Vulnerability Mds:             Not affected
     Vulnerability Meltdown:        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
     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     1.1M   12 Data             1    64        1              64
       L1i       32K     768K    8 Instruction      1    64        1              64
```

(Continued on next page)

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Platform Notes (Continued)

```
    L2          2M       48M   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: 0-47
   node 0 size: 257453 MB
   node 0 free: 256184 MB
   node distances:
   node   0
     0:  10


    ------------------------------------------------------------
 9. /proc/meminfo
   MemTotal:       263632476 kB


    ------------------------------------------------------------
 10. who -r
   run-level 3 Apr 27 00:29


    ------------------------------------------------------------
 11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
   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@ haveged irqbalance
                    issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog
                    smartd sshd 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-switch-root ipmi ipmievd issue-add-ssh-keys kexec-load
                    lunmask man-db-create multipathd nfs nfs-blkmap rdisc 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-5.14.21-150400.22-default
   root=UUID=efe3d3bb-d17b-48bc-af3c-7ee429916327
   splash=silent
   mitigations=auto
   quiet
   security=apparmor


    ------------------------------------------------------------
 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            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
  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 SP4


----------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2023.0
  Filesystem      Type  Size  Used Avail Use% Mounted on
  /dev/sda2       xfs   894G   65G  830G   8% /


----------------------------------------------------------
20. /sys/devices/virtual/dmi/id
  Vendor:         Lenovo
  Product:        ThinkSystem SR630 V3 MB,EGS,DDR5,NY,1U
  Product Family: ThinkSystem
  Serial:         1234567890


----------------------------------------------------------
21. dmidecode
  Additional information from dmidecode 3.2 follows.  WARNING: Use caution when you interpret this section.
  The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately
```

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Platform Notes (Continued)

```
  determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the
  "DMTF SMBIOS" standard.
  Memory:
    8x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800, configured at 4400


  ---------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       Lenovo
    BIOS Version:      ESE113G-2.10
    BIOS Date:         03/16/2023
    BIOS Revision:     2.10
    Firmware Revision: 2.10
```

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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------


==============================================================================================================
Fortran | 548.exchange2_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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/usr/local/intel/compiler/2023.0.0/linux/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/usr/local/intel/compiler/2023.0.0/linux/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/usr/local/intel/compiler/2023.0.0/linux/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-P.html
http://www.spec.org/cpu2017/flags/Intel-ic2023-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-P.xml
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml

Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

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Software Availability: Dec-2022

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

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