SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SD530 V3
(2.20 GHz, Intel Xeon Gold 6538Y+)

SPECrate®2017_int_base =   314
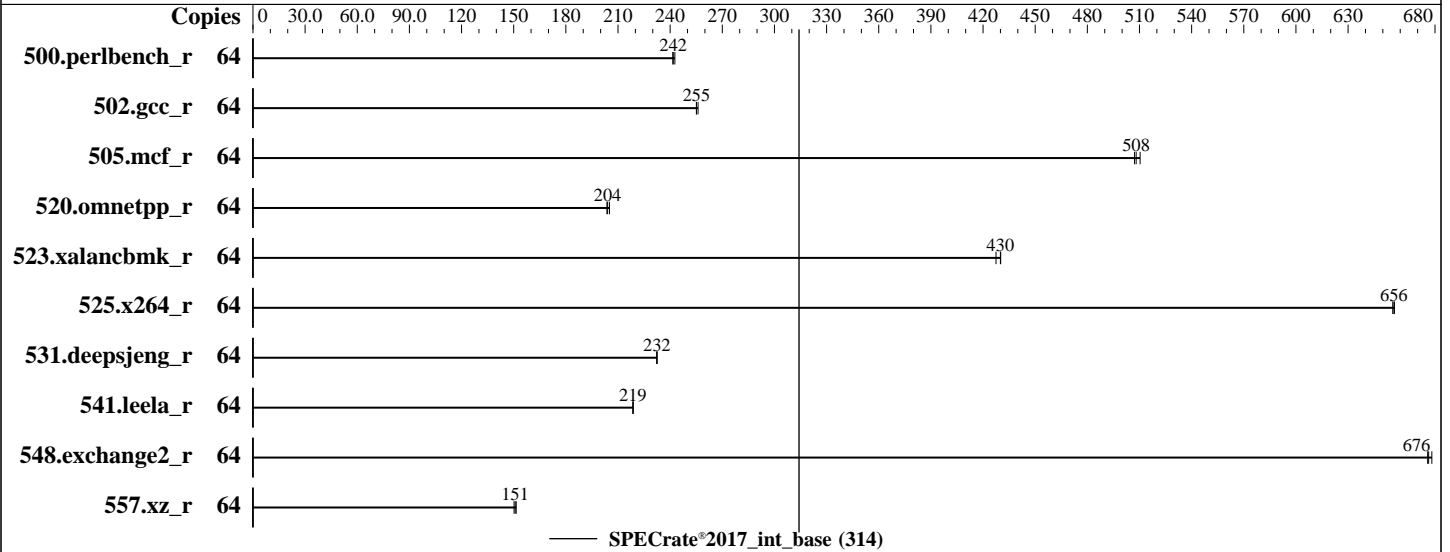
SPECrate®2017_int_peak = Not Run

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	64	242
502.gcc_r	64	255
505.mcf_r	64	508
520.omnetpp_r	64	204
523.xalancbmk_r	64	430
525.x264_r	64	656
531.deepsjeng_r	64	232
541.leela_r	64	219
548.exchange2_r	64	676
557.xz_r	64	151

SPECrate®2017_int_base (314)

Hardware

CPU Name: Intel Xeon Gold 6538Y+
 Max MHz: 4000
 Nominal: 2200
Enabled: 32 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: 60 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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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	420	243	**421**	**242**	422	242							
502.gcc_r	64	**355**	**255**	355	255	354	256							
505.mcf_r	64	**204**	**508**	204	507	203	510							
520.omnetpp_r	64	409	205	412	204	**412**	**204**							
523.xalancbmk_r	64	157	430	**157**	**430**	158	427							
525.x264_r	64	171	657	171	656	**171**	**656**							
531.deepsjeng_r	64	316	232	**316**	**232**	316	232							
541.leela_r	64	**485**	**219**	485	219	485	219							
548.exchange2_r	64	247	678	**248**	**676**	248	676							
557.xz_r	64	**458**	**151**	456	151	460	150							
SPECrate®2017_int_base =		**314**												
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 Wed Mar 20 08:15:49 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
    08:15:49 up 0 min,  1 user,  load average: 0.31, 0.10, 0.03
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1       08:15   13.00s  0.98s  0.01s /bin/bash ./rate_int.sh

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

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

(Continued on next page)

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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) 2062588
    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) 2062588
    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=64 -c
     ic2024.0.2-lin-sapphirerapids-rate-20231213.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
     ic2024.0.2-lin-sapphirerapids-rate-20231213.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/CPU2017.082/templogs/preenv.intrate.082.0.log --lognum 082.0 --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 6538Y+
    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          : 32
    siblings           : 64
    1 physical ids (chips)
    64 processors (hardware threads)
    physical id 0: core ids 0-31
    physical id 0: apicids 0-63
   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):                            64
On-line CPU(s) list:               0-63
Vendor ID:                         GenuineIntel
BIOS Vendor ID:                    Intel(R) Corporation
Model name:                        INTEL(R) XEON(R) GOLD 6538Y+
BIOS Model name:                   INTEL(R) XEON(R) GOLD 6538Y+
CPU family:                        6
Model:                             207
Thread(s) per core:                2
Core(s) per socket:                32
Socket(s):                         1
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 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:                         1.5 MiB (32 instances)
L1i cache:                         1 MiB (32 instances)
L2 cache:                          64 MiB (32 instances)
L3 cache:                          60 MiB (1 instance)
NUMA node(s):                      2
NUMA node0 CPU(s):                 0-15,32-47
NUMA node1 CPU(s):                 16-31,48-63
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     1.5M   12 Data            1    64        1             64
     L1i       32K       1M    8 Instruction     1    64        1             64
```

(Continued on next page)

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Platform Notes (Continued)

```
    L2          2M       64M   16 Unified          2  2048        1              64
    L3          60M      60M   15 Unified          3 65536        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: 0-15,32-47
    node 0 size: 257651 MB
    node 0 free: 256773 MB
    node 1 cpus: 16-31,48-63
    node 1 size: 258034 MB
    node 1 free: 257417 MB
    node distances:
    node   0   1
      0:  10  12
      1:  12  10


  -------------------------------------------------------------
  9. /proc/meminfo
    MemTotal:       528062620 kB


  -------------------------------------------------------------
  10. who -r
    run-level 3 Mar 20 08:15


  -------------------------------------------------------------
  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   40G  332G  11% /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 5200
       1x 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 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.

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