SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

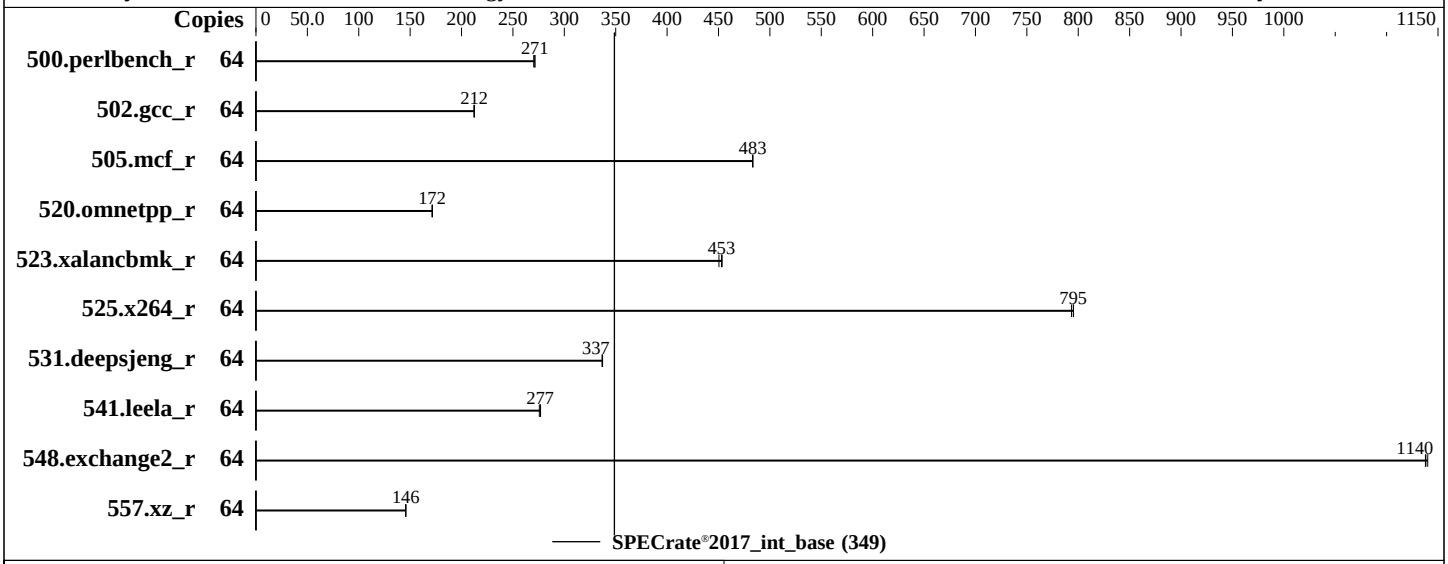
ThinkSystem SD520 V4
(2.40 GHz, Intel Xeon 6710E)

SPECrate®2017_int_base = 349

SPECrate®2017_int_peak = Not Run

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

Test Date: Sep-2024
Hardware Availability: Nov-2024
Software Availability: Jun-2024



Hardware

CPU Name:	Intel Xeon 6710E
Max MHz:	3200
Nominal:	2400
Enabled:	144 cores, 1 chip
Orderable:	1 chip
Cache L1:	64 KB I + 32 KB D on chip per core
L2:	64 MB I+D on chip per chip, 4 MB shared / 4 cores
L3:	96 MB I+D on chip per chip
Other:	None
Memory:	512 GB (8 x 64 GB 2Rx4 PC5-6400B-R, running at 5600)
Storage:	1 x 960 TB NVME SSD
Other:	CPU Cooling: Air

Software

OS:	SUSE Linux Enterprise Server 15 SP6 Kernel 6.4.0-150600.21-default
Compiler:	C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	Lenovo BIOS Version DBE103L 1.10 released Sep-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

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	375	271	377	270	**376**	**271**							
502.gcc_r	64	427	212	**427**	**212**	426	213							
505.mcf_r	64	**214**	**483**	214	483	214	483							
520.omnetpp_r	64	**490**	**172**	489	172	490	171							
523.xalancbmk_r	64	150	450	**149**	**453**	149	454							
525.x264_r	64	**141**	**795**	141	795	141	793							
531.deepsjeng_r	64	218	337	217	337	**218**	**337**							
541.leela_r	64	383	277	384	276	**383**	**277**							
548.exchange2_r	64	147	1140	147	1140	**147**	**1140**							
557.xz_r	64	475	146	**474**	**146**	474	146							

SPECrate®2017_int_base = 349

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-ic2024.1/lib/intel64:/home/cpu2017-1.1.9-ic2024.1/lib/ia32:/home/cpu2017-1.1.9-ic
     2024.1/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:
Workload Profile set to High Performance Computing and then set it to Custom
CPU P-state Control set to Cooperative Without Legacy
DCU Streamer Prefetcher set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-ic2024.1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Thu Sep 26 18:11:17 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 254 (254.10+suse.84.ge8d77af424)
 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 6.4.0-150600.21-default #1 SMP PREEMPT_DYNAMIC Thu May 16 11:09:22 UTC 2024 (36c1e09)
   x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    18:11:17 up 3 min,  1 user,  load average: 0.27, 0.20, 0.09
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT

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

 ------------------------------------------------------------
 4. ulimit -a
```

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Platform Notes (Continued)

```
  core file size          (blocks, -c) unlimited
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
  file size               (blocks, -f) unlimited
  pending signals                 (-i) 2062164
  max locked memory       (kbytes, -l) 8192
  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) 2062164
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize=42
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@notty
 /bin/bash ./02.remote_local_SPECcpu_1.01.sh
 sh Run702-compliant-ic2024.1-lin-sierraforest-rateint-base-20240308.sh
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 -c
   ic2024.1-lin-sierraforest-rate-20240308.cfg --define smt-on --define cores=64 --define physicalfirst
   --define no-numa --reportable --tune base -o all --define drop_caches intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 --configfile
   ic2024.1-lin-sierraforest-rate-20240308.cfg --define smt-on --define cores=64 --define physicalfirst
   --define no-numa --reportable --tune base --output_format all --define drop_caches --nopower --runmode
   rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.206/templogs/preenv.intrate.206.0.log --lognum 206.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-ic2024.1

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) 6710E
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 175
    stepping        : 3
    microcode       : 0x3000270
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs bhi
    cpu cores       : 64
    siblings        : 64
    1 physical ids (chips)
    64 processors (hardware threads)
    physical id 0: core ids 0-63
    physical id 0: apicids
    0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
    ,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110,112,114,116,118,120,122,124,126
  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 2.39.3:
```

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Platform Notes (Continued)

```
Architecture:                    x86_64
CPU op-mode(s):                  32-bit, 64-bit
Address sizes:                   52 bits physical, 48 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) 6710E
BIOS Model name:                 Intel(R) Xeon(R) 6710E UNKNOWN CPU @ 2.4GHz
BIOS CPU family:                 179
CPU family:                      6
Model:                           175
Thread(s) per core:              1
Core(s) per socket:              64
Socket(s):                       1
Stepping:                        3
CPU(s) scaling MHz:              25%
CPU max MHz:                     3200.0000
CPU min MHz:                     800.0000
BogoMIPS:                        4800.00
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 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 rdseed adx smap clflushopt clwb intel_pt sha_ni xsaveopt xsavec
                                 xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                                 split_lock_detect user_shstk avx_vnni lam wbnoinvd dtherm ida arat
                                 pln pts hwp hwp_act_window hwp_epp hwp_pkg_req vnmi umip pku ospke
                                 waitpkg gfni vaes vpclmulqdq tme rdpid bus_lock_detect cldemote
                                 movdiri movdir64b enqcmd fsrm md_clear serialize pconfig arch_lbr ibt
                                 flush_l1d arch_capabilities
Virtualization:                  VT-x
L1d cache:                       2 MiB (64 instances)
L1i cache:                       4 MiB (64 instances)
L2 cache:                        64 MiB (16 instances)
L3 cache:                        96 MiB (1 instance)
NUMA node(s):                    1
NUMA node0 CPU(s):               0-63
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 Reg file data sampling: Not affected
Vulnerability Retbleed:          Not affected
Vulnerability Spec rstack overflow:  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 Not affected; BHI BHI_DIS_S
Vulnerability Srbds:             Not affected
Vulnerability Tsx async abort:   Not affected
```

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Platform Notes (Continued)

```
From lscpu --cache:
     NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL   SETS PHY-LINE COHERENCY-SIZE
     L1d       32K       2M    8 Data            1     64        1             64
     L1i       64K       4M    8 Instruction     1    128        1             64
     L2         4M      64M   16 Unified         2   4096        1             64
     L3        96M      96M   12 Unified         3 131072        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: 0-63
  node 0 size: 515567 MB
  node 0 free: 514514 MB
  node distances:
  node   0
    0:  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527941284 kB

------------------------------------------------------------
10. who -r
  run-level 3 Sep 26 18:08

------------------------------------------------------------
11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)
  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 nvmf-autoconnect 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 fsidd gpm grub2-once haveged 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-confext
                  systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd udisks2
  indirect        systemd-userdbd wickedd

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
  root=UUID=003918da-aeca-4208-af37-126b2acc4e65
  splash=silent
  mitigations=auto
  quiet
  security=apparmor

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 11:
```

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Platform Notes (Continued)

```
    current policy: frequency should be within 800 MHz and 3.20 GHz.
                    The governor "powersave" may decide which speed to use
                    within this range.
    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
  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 SP6

------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2024.1
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p3 xfs   893G   48G  846G   6% /

------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
```

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Platform Notes (Continued)

```
     Product:        ThinkSystem SD520 V4 Planar
     Product Family: ThinkSystem
     Serial:         1234567890

 ------------------------------------------------------------
 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:
     3x SK Hynix HMCG94AHBRA480N 64 GB 2 rank 6400, configured at 5600
     2x SK Hynix HMCG94AHBRA481N 64 GB 2 rank 6400, configured at 5600
     3x SK Hynix HMCG94AHBRA486N 64 GB 2 rank 6400, configured at 5600


 ------------------------------------------------------------
 22. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:
    BIOS Version:      DBE103L-1.10
    BIOS Date:         09/12/2024
    BIOS Revision:     1.10
    Firmware Revision: 0.62
```

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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran | 548.exchange2_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

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Base Compiler Invocation (Continued)

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 -xsierraforest -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xsierraforest -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xsierraforest -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Birchstream-A.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Birchstream-A.xml

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