



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SD550 V3
(2.00 GHz, Intel Xeon Silver 4514Y)

SPECrate®2017_int_base = 266

SPECrate®2017_int_peak = Not Run

CPU2017 License: 9017

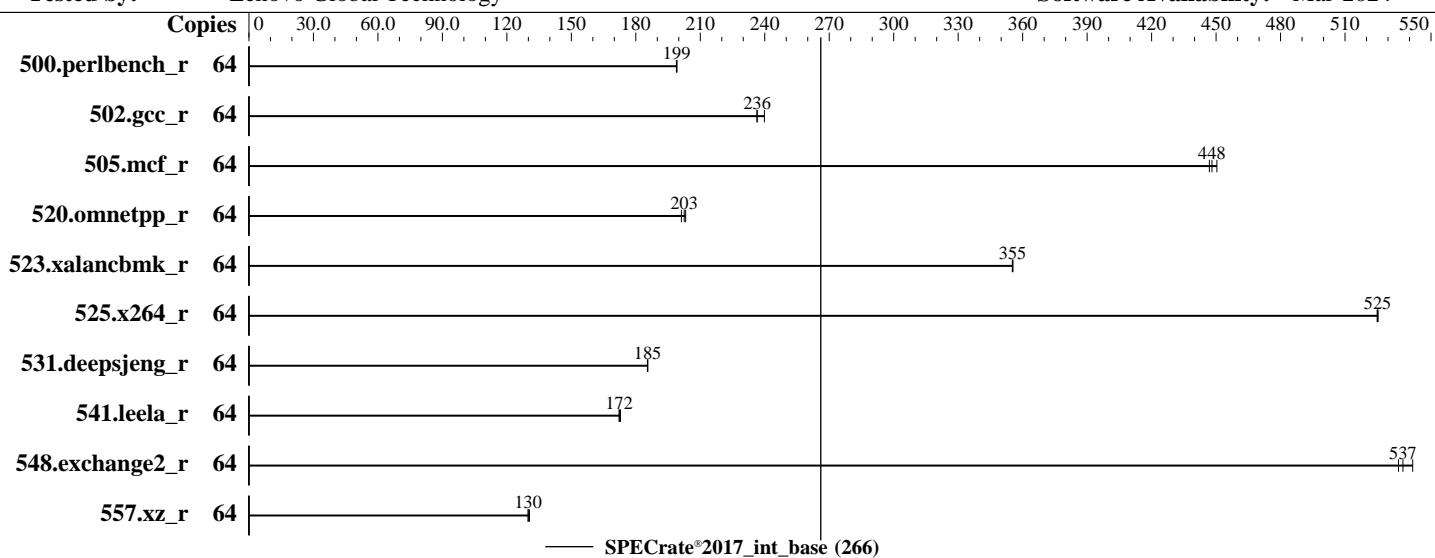
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Mar-2024

Hardware Availability: Mar-2024

Software Availability: Mar-2024



SPECrate®2017_int_base (266)

Hardware

CPU Name: Intel Xeon Silver 4514Y
Max MHz: 3400
Nominal: 2000
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: 30 MB I+D on chip per chip
Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 4400)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP5
Compiler: Kernel 5.14.21-150500.53-default
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 | Seconds | Ratio |
| 500.perlbench_r | 64 | 512 | 199 | 512 | 199 | 512 | 199 | | | | | | | | | |
| 502.gcc_r | 64 | 378 | 240 | 383 | 236 | 383 | 236 | | | | | | | | | |
| 505.mcf_r | 64 | 231 | 448 | 231 | 447 | 230 | 450 | | | | | | | | | |
| 520.omnetpp_r | 64 | 413 | 203 | 417 | 201 | 415 | 203 | | | | | | | | | |
| 523.xalancbmk_r | 64 | 190 | 355 | 190 | 355 | 190 | 355 | | | | | | | | | |
| 525.x264_r | 64 | 213 | 525 | 213 | 525 | 213 | 525 | | | | | | | | | |
| 531.deepsjeng_r | 64 | 395 | 185 | 396 | 185 | 395 | 186 | | | | | | | | | |
| 541.leela_r | 64 | 613 | 173 | 615 | 172 | 615 | 172 | | | | | | | | | |
| 548.exchange2_r | 64 | 313 | 535 | 312 | 537 | 310 | 541 | | | | | | | | | |
| 557.xz_r | 64 | 532 | 130 | 532 | 130 | 530 | 131 | | | | | | | | | |

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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.

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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 and then set it to Custom Mode

C-States set to Legacy

SNC set to SNC2

LLC Prefetch set to Disabled

UPI Link Disable set to Minimum Number of Links Enabled

```
Sysinfo program /home/cpu2017-1.1.9-ic2024.0.2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Mon Mar 18 08:05:07 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. Failed units, from systemctl list-units --state=failed
 - 13. Services, from systemctl list-unit-files
 - 14. Linux kernel boot-time arguments, from /proc/cmdline
 - 15. cpupower frequency-info
 - 16. sysctl
 - 17. /sys/kernel/mm/transparent_hugepage
 - 18. /sys/kernel/mm/transparent_hugepage/khugepaged
 - 19. OS release
 - 20. Disk information
 - 21. /sys/devices/virtual/dmi/id
 - 22. dmidecode
 - 23. 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
08:05:07 up 1 min, 1 user, load average: 0.43, 0.28, 0.11
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root tty1 - 08:03 43.00s 0.96s 0.01s sh
Run502-compliant-ic2024.0.2-lin-sapphirerapids-rateint-base-smt-on-20231213.sh
```

(Continued on next page)



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Platform Notes (Continued)

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) 4127016 |
| 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) 4127016 |
| 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 ./run_SD550V3_EMR_new.sh
sh Run502-compliant-ic2024.0.2-lin-sapphirerapids-rateint-base-smt-on-20231213.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 reframe intrate --nopreenv --note-preenv --logfile
  $SPEC/tmp/CPU2017.058/templogs/preenv.intrate.058.0.log --lognum 058.0 --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) SILVER 4514Y |
| vendor_id | : GenuineIntel |
| cpu family | : 6 |
| model | : 207 |
| stepping | : 2 |
| microcode | : 0x21000200 |
| bugs | : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrp_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.

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Platform Notes (Continued)

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): 64
On-line CPU(s) list: 0-63
Vendor ID: GenuineIntel
Model name: INTEL(R) XEON(R) SILVER 4514Y
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
Stepping: 2
BogoMIPS: 4000.00
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 aperf mperf 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 rdrandlahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cat_12 cdp_13 invpcid_single cdp_12 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 cqmt rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cq_m_llc cq_m_occup_llc cq_m_mb_m_total cq_m_mb_m_local avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hfi avx512vbmi umip pkumip 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: 60 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:

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Platform Notes (Continued)

| 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 |
| L3 | 30M | 60M | 15 | Unified | 3 | 32768 | 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: 257212 MB

node 1 cpus: 8-15,40-47

node 1 size: 258009 MB

node 1 free: 257456 MB

node 2 cpus: 16-23,48-55

node 2 size: 258043 MB

node 2 free: 257499 MB

node 3 cpus: 24-31,56-63

node 3 size: 258022 MB

node 3 free: 257555 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: 1056546840 kB

10. who -r

run-level 3 Mar 18 08:03

11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)

Default Target Status

multi-user degraded

12. Failed units, from systemctl list-units --state=failed

UNIT LOAD ACTIVE SUB DESCRIPTION

* ntp_sync.service loaded failed ntp_sync.service

13. Services, from systemctl list-unit-files

STATE UNIT FILES

enabled YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator
kdbsettings klog lvm2-monitor nsqd 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 ebttables exchange-bmc-os-info
firewalld gpm grub2-once haveged haveged-switch-root ipmi ipmievrd 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-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd

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Platform Notes (Continued)

```
generated      ntp_sync
indirect       wickedd

-----
14. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
    root=UUID=1f1165ee-d57c-4884-9a69-769de0319f56
    splash=silent
    mitigations=auto
    quiet
    security=apparmor

-----
15. cpupower frequency-info
    analyzing CPU 0:
        Unable to determine current policy
        boost state support:
            Supported: yes
            Active: yes

-----
16. 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

-----
17. /sys/kernel/mm/transparent_hugepage
    defrag           always defer+madvise [madvise] never
    enabled          [always] madvise never
    hpage_pmd_size  2097152
    shmem_enabled   always within_size advise [never] deny force

-----
18. /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
```

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Platform Notes (Continued)

19. OS release

```
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise Server 15 SP5
```

20. Disk information

```
SPEC is set to: /home/cpu2017-1.1.9-ic2024.0.2
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3        xfs   446G   69G  378G  16%  /
```

21. /sys/devices/virtual/dmi/id

```
Vendor:          Lenovo
Product:         ThinkSystem SD550 V3
Product Family: ThinkSystem
Serial:          1234567890
```

22. 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:

```
9x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 4400
7x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4400
```

23. 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.
```



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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
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 -lgkmalloc

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 -lgkmalloc

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 -lgkmalloc



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Software Availability: Mar-2024

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>

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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 2024-03-17 20:05:06-0400.

Report generated on 2024-04-09 15:54:46 by CPU2017 PDF formatter v6716.

Originally published on 2024-04-09.