



# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SD650 V3  
(2.20 GHz, Intel Xeon Platinum 8593Q)

SPECrate®2017\_int\_base = 1080

SPECrate®2017\_int\_peak = Not Run

CPU2017 License: 9017

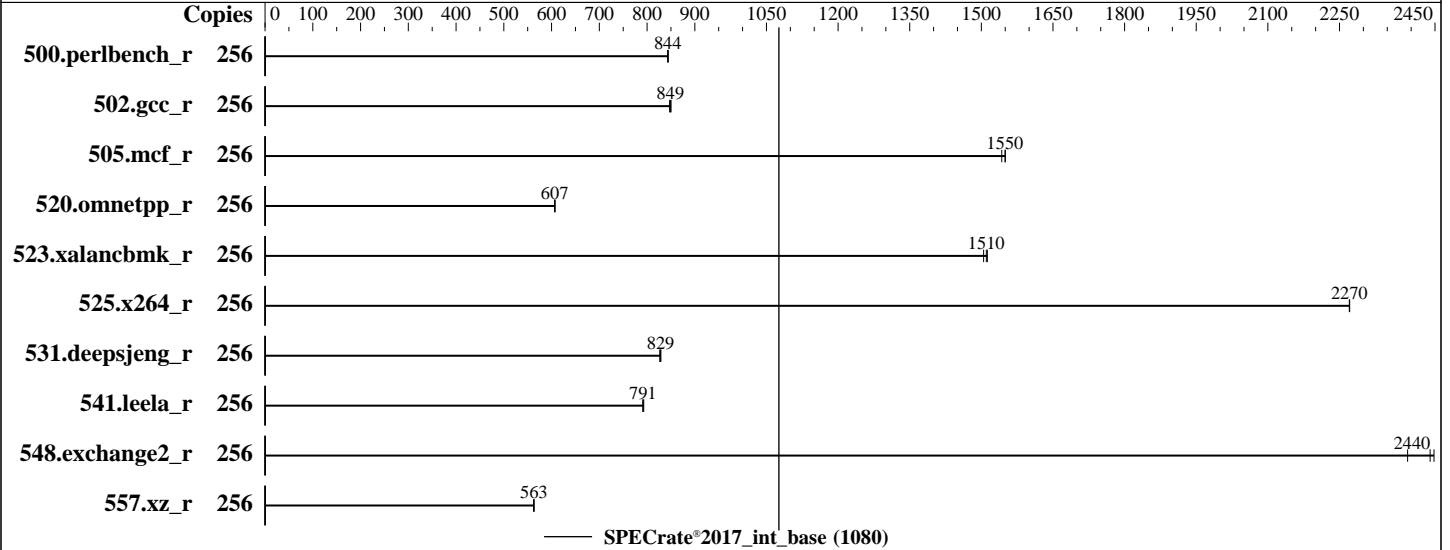
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Nov-2023

Hardware Availability: Feb-2024

Software Availability: Dec-2023



### Hardware

CPU Name: Intel Xeon Platinum 8593Q  
 Max MHz: 3900  
 Nominal: 2200  
 Enabled: 128 cores, 2 chips, 2 threads/core  
 Orderable: 2 chips  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 2 MB I+D on chip per core  
 L3: 320 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R)  
 Storage: 1 x 1.92 TB SATA 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 USE125B 4.10 released Nov-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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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	256	483	844	<b><u>483</u></b>	<b><u>844</u></b>	483	843							
502.gcc_r	256	428	847	426	850	<b><u>427</u></b>	<b><u>849</u></b>							
505.mcf_r	256	267	1550	268	1540	<b><u>267</u></b>	<b><u>1550</u></b>							
520.omnetpp_r	256	554	607	<b><u>554</u></b>	<b><u>607</u></b>	553	607							
523.xalancbmk_r	256	179	1510	180	1500	<b><u>179</u></b>	<b><u>1510</u></b>							
525.x264_r	256	<b><u>197</u></b>	<b><u>2270</u></b>	197	2270	197	2270							
531.deepsjeng_r	256	355	826	<b><u>354</u></b>	<b><u>829</u></b>	354	829							
541.leela_r	256	536	791	<b><u>536</u></b>	<b><u>791</u></b>	535	793							
548.exchange2_r	256	274	2450	<b><u>275</u></b>	<b><u>2440</u></b>	280	2390							
557.xz_r	256	<b><u>491</u></b>	<b><u>563</u></b>	491	563	492	562							

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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-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 and then set it to Custom Mode

UPI Link Disable set to Minimum Number of Links Enabled

SNC set to SNC2

Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on localhost Fri Nov 24 00:37:19 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 (249.16+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
00:37:19 up 2 min,  1 user,  load average: 0.26, 0.12, 0.04
USER      TTY      FROM          LOGIN@      IDLE   JCPU   PCPU   WHAT
root     tty1      -              00:36       7.00s  1.09s  0.02s  /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) 4126607
   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) 4126607
   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=256 -c
     ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=128 --define physicalfirst
     --define invoke_with_interleave --define drop_caches --tune base -o all intrate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=256 --configfile
     ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=128 --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/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --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) PLATINUM 8593Q
   vendor_id      : GenuineIntel
   cpu family     : 6
   model          : 207
   stepping       : 2
   microcode      : 0x21000190
   bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
   cpu cores      : 64
   siblings       : 128
   2 physical ids (chips)
   256 processors (hardware threads)
   physical id 0: core ids 0-63
   physical id 1: core ids 0-63
   physical id 0: apicids 0-127
   physical id 1: apicids 128-255
   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:

```

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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):                       256
On-line CPU(s) list:         0-255
Vendor ID:                    GenuineIntel
Model name:                   INTEL(R) XEON(R) PLATINUM 8593Q
CPU family:                   6
Model:                        207
Thread(s) per core:          2
Core(s) per socket:          64
Socket(s):                    2
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
                                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_lld arch_capabilities

Virtualization:              VT-x
L1d cache:                   6 MiB (128 instances)
L1i cache:                   4 MiB (128 instances)
L2 cache:                     256 MiB (128 instances)
L3 cache:                     640 MiB (2 instances)
NUMA node(s):                4
NUMA node0 CPU(s):           0-31,128-159
NUMA node1 CPU(s):           32-63,160-191
NUMA node2 CPU(s):           64-95,192-223
NUMA node3 CPU(s):           96-127,224-255
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, PBRSE-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	6M	12	Data	1	64	1	64
L1i	32K	4M	8	Instruction	1	64	1	64
L2	2M	256M	16	Unified	2	2048	1	64

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### Platform Notes (Continued)

L3 320M 640M 20 Unified 3 262144 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: 0-31,128-159
node 0 size: 257695 MB
node 0 free: 256882 MB
node 1 cpus: 32-63,160-191
node 1 size: 257997 MB
node 1 free: 257192 MB
node 2 cpus: 64-95,192-223
node 2 size: 258031 MB
node 2 free: 256951 MB
node 3 cpus: 96-127,224-255
node 3 size: 257957 MB
node 3 free: 257251 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: 1056442388 kB

#### 10. who -r

run-level 3 Nov 24 00:35

#### 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 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 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=d7791671-9fd7-462e-99cf-2cc433d1f618
splash=silent
mitigations=auto
quiet
```

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### Platform Notes (Continued)

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+madvice [madvice] never
enabled         [always] madvice 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
/dev/sda3       xfs   1.8T   57G  1.7T   4% /
-----

```

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### Platform Notes (Continued)

20. /sys/devices/virtual/dmi/id  
Vendor: Lenovo  
Product: ThinkSystem SD650 V3  
Product Family: ThinkSystem  
Serial: 123456789

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:  
15x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600  
1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600

22. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: Lenovo  
BIOS Version: USE125B-4.10  
BIOS Date: 11/02/2023  
BIOS Revision: 4.10  
Firmware Revision: 0.30

### 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 -xsaphirerapids -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 -xsaphirerapids -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 -xsaphirerapids -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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**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Nov-2023

**Hardware Availability:** Feb-2024

**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>

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