



# SPEC CPU®2017 Integer Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR650 V3  
(2.00 GHz, Intel Xeon Gold 6438N)

SPECspeed®2017\_int\_base = 14.3

SPECspeed®2017\_int\_peak = Not Run

CPU2017 License: 9017

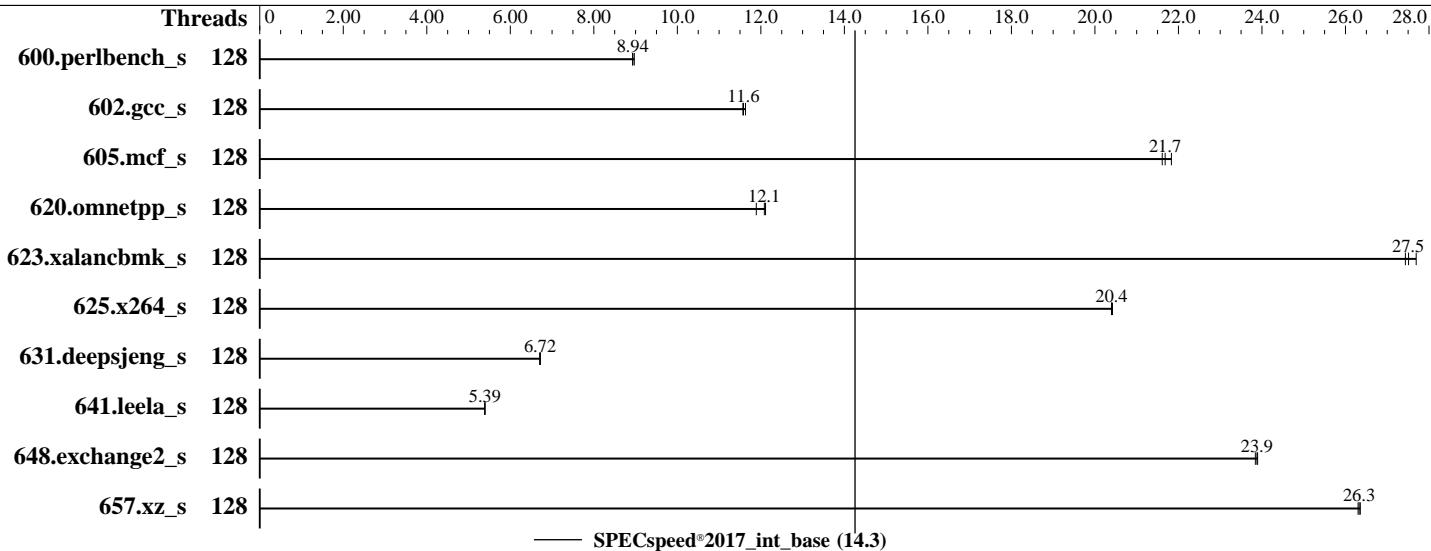
Test Date: Feb-2023

Test Sponsor: Lenovo Global Technology

Hardware Availability: Feb-2023

Tested by: Lenovo Global Technology

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Gold 6438N  
Max MHz: 3600  
Nominal: 2000  
Enabled: 64 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: 60 MB I+D on chip per chip  
Other: None  
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)  
Storage: 1 x 960 GB SATA SSD  
Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86\_64)  
Compiler: Kernel 5.14.21-150400.22-default  
C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;  
Fortran: Version 2023.0 of Intel Fortran Compiler  
Classic for Linux;  
C/C++: Version 2023.0 of Intel C/C++ Compiler  
Classic for Linux  
Parallel: Yes  
Firmware: Lenovo BIOS Version ESE109L 1.10 released Jan-2023  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: Not Applicable  
Other: jemalloc memory allocator V5.0.1  
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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	128	<b>199</b>	<b>8.94</b>	198	8.97	199	8.93							
602.gcc_s	128	344	11.6	342	11.6	<b>344</b>	<b>11.6</b>							
605.mcf_s	128	<b>218</b>	<b>21.7</b>	218	21.6	216	21.8							
620.omnetpp_s	128	137	11.9	<b>135</b>	<b>12.1</b>	135	12.1							
623.xalancbmk_s	128	51.6	27.4	51.2	27.7	<b>51.5</b>	<b>27.5</b>							
625.x264_s	128	86.4	20.4	<b>86.5</b>	<b>20.4</b>	86.5	20.4							
631.deepsjeng_s	128	214	6.70	<b>213</b>	<b>6.72</b>	213	6.72							
641.leela_s	128	317	5.39	316	5.39	<b>316</b>	<b>5.39</b>							
648.exchange2_s	128	<b>123</b>	<b>23.9</b>	123	23.8	123	23.9							
657.xz_s	128	235	26.3	235	26.4	<b>235</b>	<b>26.3</b>							

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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](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.

## 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:

```
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.9-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM  
memory using Redhat Enterprise Linux 8.0  
Transparent Huge Pages enabled by default  
Prior to runcpu invocation

(Continued on next page)



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## General Notes (Continued)

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.

jemalloc, a general purpose malloc implementation

built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

## Platform Notes

BIOS configuration:

Operating Mode set to Custom Mode

CPU P-State Control set to Legacy

```
Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Mon Feb 20 22:39:40 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. tuned-adm active  
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 5.14.21-150400.22-default #1 SMP PREEMPT\_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)  
x86\_64 x86\_64 x86\_64 GNU/Linux

-----  
2. w

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## Platform Notes (Continued)

```
22:39:40 up 2 min, 1 user, load average: 0.07, 0.07, 0.03
USER      TTY      FROM          LOGIN@     IDLE     JCPU     PCPU WHAT
root      ttysl     -           22:38    10.00s   1.74s   0.02s -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) 2062487
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) 2062487
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
-bash
runcpu --nobuild --action validate --define default-platform-flags -c
  ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=64 --tune base -o all --define
  intspeedaffinity --define smt-on --define drop_caches intspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile
  ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=64 --tune base --output_format all --define
  intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base --size
  refspeed intspeed --nopreenv --note-preenv --logfile
  $SPEC/tmp/CPU2017.053/templogs/preenv.intspeed.053.0.log --lognum 053.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu/cpu2017-1.1.9-ic2023.0
```

-----  
6. /proc/cpuinfo

```
model name      : Intel(R) Xeon(R) Gold 6438N
vendor_id       : GenuineIntel
cpu family     : 6
model          : 143
stepping        : 8
microcode       : 0x2b000161
bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 32
siblings        : 64
2 physical ids (chips)
128 processors (hardware threads)
physical id 0: core ids 0-31
physical id 1: core ids 0-31
```

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## Platform Notes (Continued)

```
physical id 0: apicids 0-63
physical id 1: apicids 128-191
```

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): 128
On-line CPU(s) list: 0-127
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) Gold 6438N
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
Stepping: 8
Frequency boost: enabled
CPU max MHz: 2001.0000
CPU min MHz: 800.0000
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 fmpf perf tsc_known_freq pni pclmulqdq dtes64 monitor
       ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrp 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_13 cat_12 cdp_13
       invpcid_single intel_ppin 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 cqm rdt_a avx512f avx512dq rdseed adx smap
       avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
       xsaveopt xsavec xgetbv1 xsavec 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_vpocntdq la57 rdpid
       bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
       tsxlptrk pconfig arch_lbr avx512_fp16 amx_tile flush_lld arch_capabilities
       VT-x
Virtualization:
L1d cache: 3 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 128 MiB (64 instances)
L3 cache: 120 MiB (2 instances)
NUMA node(s): 2
NUMA node0 CPU(s): 0-31,64-95
NUMA node1 CPU(s): 32-63,96-127
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
```

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## Platform Notes (Continued)

Vulnerability Tsx async abort: Not affected

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	3M	12	Data	1	64	1	64
L1i	32K	2M	8	Instruction	1	64	1	64
L2	2M	128M	16	Unified	2	2048	1	64
L3	60M	120M	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: 0-31,64-95  
node 0 size: 257660 MB  
node 0 free: 256155 MB  
node 1 cpus: 32-63,96-127  
node 1 size: 257985 MB  
node 1 free: 257162 MB  
node distances:  
node 0 1  
0: 10 21  
1: 21 10

-----  
9. /proc/meminfo

MemTotal: 528021204 kB

-----  
10. who -r  
run-level 3 Feb 20 22:37

-----  
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 nsqd postfix purge-kernels rollback rsyslog smartd sshd wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime	systemd-remount-fs
disabled	autofs autostart-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-switch-root ipmi ipmievfd issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rdisc rpcbind rpmconfigcheck rsyncd sapconf serial-getty@ smartd_generate_opts snmpd snmptrapd sysstat systemd-boot-check-no-failures systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd tuned
indirect	uuidd wickedd

-----  
13. Linux kernel boot-time arguments, from /proc/cmdline

BOOT\_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default  
root=UUID=461ffbd6-8da0-4c20-adb7-d9d3143b6aa5  
splash=silent  
mitigations=auto  
quiet

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## Platform Notes (Continued)

security=apparmor

```
-----  
14. cpupower frequency-info  
analyzing CPU 0:  
    current policy: frequency should be within 800 MHz and 2.00 GHz.  
        The governor "ondemand" may decide which speed to use  
        within this range.  
    boost state support:  
        Supported: yes  
        Active: yes
```

```
-----  
15. tuned-adm active  
It seems that tuned daemon is not running, preset profile is not activated.  
Preset profile: virtual-guest
```

```
-----  
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 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
```

```
-----  
19. OS release  
From /etc/*-release /etc/*-version  
os-release SUSE Linux Enterprise Server 15 SP4
```

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## Platform Notes (Continued)

### 20. Disk information

SPEC is set to: /home/cpu2017-1.1.9-ic2023.0  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda3 xfs 889G 102G 788G 12% /

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

Vendor: Lenovo  
Product: ThinkSystem SR650 V3 MB,EGS,DDR5,SH,2U  
Product Family: ThinkSystem  
Serial: 1234567890

### 22. 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 determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:  
16x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

### 23. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: Lenovo  
BIOS Version: ESE109L-1.10  
BIOS Date: 01/07/2023  
BIOS Revision: 1.10  
Firmware Revision: 1.0

## Compiler Version Notes

=====  
C | 600.perlbench\_s(base) 602.gcc\_s(base) 605.mcf\_s(base) 625.x264\_s(base) 657.xz\_s(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++ | 620.omnetpp\_s(base) 623.xalancbmk\_s(base) 631.deepsjeng\_s(base) 641.leela\_s(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 | 648.exchange2\_s(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.



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## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

## Base Portability Flags

600.perlbench\_s: -DSPEC\_LP64 -DSPEC\_LINUX\_X64  
602.gcc\_s: -DSPEC\_LP64  
605.mcf\_s: -DSPEC\_LP64  
620.omnetpp\_s: -DSPEC\_LP64  
623.xalancbmk\_s: -DSPEC\_LP64 -DSPEC\_LINUX  
625.x264\_s: -DSPEC\_LP64  
631.deepsjeng\_s: -DSPEC\_LP64  
641.leela\_s: -DSPEC\_LP64  
648.exchange2\_s: -DSPEC\_LP64  
657.xz\_s: -DSPEC\_LP64

## Base Optimization Flags

C benchmarks:

-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -fno-finite-math-only  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fopenmp  
-DSPEC\_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:

-m64 -std=c++14 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math  
-fno-finite-math-only -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

-m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -fno-finite-math-only  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-fno-standard-realloc-lhs -align array32byte  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc



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Test Sponsor: Lenovo Global Technology

Hardware Availability: Feb-2023

Tested by: Lenovo Global Technology

Software Availability: Dec-2022

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-0.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-0.xml>  
<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

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