## Lenovo Global Technology

**ThinkSystem SR650 V3**  
(2.00 GHz, Intel Xeon Gold 6414U)

CPU2017 License: 9017  
Test Sponsor: Lenovo Global Technology  
Tested by: Lenovo Global Technology  
Test Date: Apr-2023  
Hardware Availability: May-2023  
Software Availability: Dec-2022

### Copies

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</tbody>
</table>

### Hardware

**CPU Name:** Intel Xeon Gold 6414U  
**Max MHz:** 3400  
**Nominal:** 2000  
**Enabled:** 32 cores, 1 chip, 2 threads/core  
**Orderable:** 1 chip  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**Cache L2:** 2 MB I+D on chip per core  
**Cache L3:** 60 MB I+D on chip per chip  
**Memory:** 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R)  
**Storage:** 1 x 480 GB SATA SSD  
**Other:** None

### Software

**OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)  
**Kernel:** 5.14.21-150400.22-default  
**Compiler:** C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;  
**Parallel:** No  
**Firmware:** Lenovo BIOS Version ESE113G 2.10 released Mar-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
LENNOVO GLOBAL TECHNOLOGY
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Gold 6414U)

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

Software Availability: Dec-2022
Hardware Availability: May-2023
Test Date: Apr-2023

Results Table

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</tbody>
</table>

SPECrate®2017_int_base = 263
SPECrate®2017_int_peak = Not Run

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), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

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-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/lib/ia32:/home/cpu2017-1.1.9-ic2023.0/je5.0.1-32"
MALLOC_CONF = "retain:true"
Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Gold 6414U)

SPECrate®2017_int_base = 263
SPECrate®2017_int_peak = Not Run

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.
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:
Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
SNC set to SNC2
LLC Prefetch set to Disabled
UPI Link Disable set to Disabled 1 Link

Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Fri Apr 29 20:01:32 2022

SUT (System Under Test) info as seen by some common utilities.

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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. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/klugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

(Continued on next page)
### Lenovo Global Technology

**ThinkSystem SR650 V3**

(2.00 GHz, Intel Xeon Gold 6414U)

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**Platform Notes (Continued)**

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

   20:01:32 up 1 min, 1 user, load average: 2.68, 1.81, 0.71

<table>
<thead>
<tr>
<th>USER</th>
<th>TTY</th>
<th>FROM</th>
<th>LOGINO</th>
<th>IDLE</th>
<th>JCPU</th>
<th>PCPU</th>
<th>WHAT</th>
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<tbody>
<tr>
<td>root</td>
<td>tty1</td>
<td>-</td>
<td>20:01</td>
<td>11.00s</td>
<td>1.17s</td>
<td>0.01s</td>
<td>-bash</td>
</tr>
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</table>

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 (-l) 1030438
   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) 1030438
   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 --define numcopies=64 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.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
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=32 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all intrate
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2023.0

6. /proc/cpuinfo

   model name : Intel(R) Xeon(R) Gold 6414U
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   stepping : 8
   microcode : 0x2b000190
   bugs : spectre_v1 spectre_v2 spec_store_bypass swappgs
   cpu cores : 32

(Continued on next page)
## Platform Notes (Continued)

siblings : 64  
1 physical ids (chips)  
64 processors (hardware threads)  
physical id 0: core ids 0-31  
physical id 0: apic ids 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 2.37.2:

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<tr>
<th>Field</th>
<th>Value</th>
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<tr>
<td>CPU op-mode(s)</td>
<td>32-bit, 64-bit</td>
</tr>
<tr>
<td>Address sizes</td>
<td>46 bits physical, 57 bits virtual</td>
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<tr>
<td>Byte Order</td>
<td>Little Endian</td>
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<td>CPU(s)</td>
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<td>On-line CPU(s) list:</td>
<td>0-63</td>
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<td>Core(s) per socket:</td>
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<td>Stepping:</td>
<td>8</td>
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<td>BogoMIPS:</td>
<td>4000.00</td>
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</table>

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 rdtrace lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperf perf 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 3nowprefetch cpuid_fault epb cat_13 cat_12 cpd_13 invpcid_single intel_pinn cpd_12 asb mba ibrs ibpb ibrs_enhanced tpr_shadow vmmi 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 xsavesopt xsaves xsaveopt xstate xsaveadv xsave xsmo cqm_11c cqm_occup_11c cqm_mbb_total cqm_mbb_local split_lock_detect avx_vnni avx512_bf16 dnbrv dtherm ida arat pinn pts avx512vbm uimp pkpu ospke waitpkg avx512_vbmi2 gfnv vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vopencntdq ia32 rdipd bus_lock_detect cidemote movdiri movdir64b enqcmd mrs clear serialize tsxtrc pconfig arch_bbr avx512_fp16 amx_tile flush_lid arch_capabilities

Virtualization:

VT-x

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<td>1.5 MiB (32 instances)</td>
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<tr>
<td>L1i cache</td>
<td>1 MiB (32 instances)</td>
</tr>
<tr>
<td>L2 cache</td>
<td>64 MiB (32 instances)</td>
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<td>L3 cache</td>
<td>60 MiB (1 instance)</td>
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<tr>
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<tr>
<td>NUMA node2 CPU(s):</td>
<td>16-23, 48-55</td>
</tr>
<tr>
<td>NUMA node3 CPU(s):</td>
<td>24-31, 56-63</td>
</tr>
</tbody>
</table>

Vulnerability Itlb multihit: Not affected
Vulnerability L1t: 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

(Continued on next page)
Lenovo Global Technology
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(2.00 GHz, Intel Xeon Gold 6414U)

SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

SPECrate®2017_int_base = 263

SPECrate®2017_int_peak = Not Run

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

Platform Notes (Continued)

Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

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<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>2M</td>
<td>64M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>60M</td>
<td>60M</td>
<td>15</td>
<td>Unified</td>
<td>3</td>
<td>65536</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

8. numactl --cache
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: 64173 MB
node 0 free: 63529 MB
node 1 cpus: 8-15,40-47
node 1 size: 64507 MB
node 1 free: 64163 MB
node 2 cpus: 16-23,48-55
node 2 size: 64473 MB
node 2 free: 64183 MB
node 3 cpus: 24-31,56-63
node 3 size: 64479 MB
node 3 free: 64229 MB

declared distances:
node 0 1 2 3
0:  10  12  12  12
1:  12  10  12  12
2:  12  12  10  12
3:  12  12  12  10

9. /proc/meminfo
MemTotal: 263816788 kB
MemFree: 623901168 kB
Buffers: 5770508 kB
Cached: 7507808 kB

10. who -r
run-level 3 Apr 29 20:00

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@ havedeg irbalance iscsi
issue-generator kbdsettings lvm2-monitor nscd postfix purge-kernels rollback rsyslog
smartd sshd 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-sheli ebtables exchange-bmc-os-info
firewalld gpm grub2-once havedeg-switch-root ipmi ipmiudev iscsi-init iscsid iscsiui
issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb rdisc
rpcbind rpmcheck nscd serial-getty@ smartd_generate_opts smb snmpd snmptrapd
systemd-boot-check-no-failures systemd-network-generator systemd-sysext

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Gold 6414U)

SPEC CPU®2017 Integer Rate Result
Copyright 2017-2024 Standard Performance Evaluation Corporation

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

Test Date: Apr-2023
Hardware Availability: May-2023
Software Availability: Dec-2022

SPECrate®2017_int_base = 263
SPECrate®2017_int_peak = Not Run

Platform Notes (Continued)

---
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
   root=UUID=cf0c8526-2665-4565-b656-0513c168d1bb
   splash=silent
   mitigations=auto
   quiet
   security=apparmor
---
14. cpupower frequency-info
   analyzing CPU 0:
   Unable to determine current policy
   boost state support:
   Supported: yes
   Active: yes
---
15. /sys
   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  150000
   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/transparent
   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
---
(Continued on next page)
**Lenovo Global Technology**

ThinkSystem SR650 V3  
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### Platform Notes (Continued)

18. OS release

   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP4

---

19. Disk information

   SPEC is set to: /home/cpu2017-1.1.9-ic2023.0
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda3      xfs   446G   59G  387G  14% /

---

20. /sys/devices/virtual/dmi/id

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

---

21. 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:
   4x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
   4x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

---

22. BIOS

   (This section combines info from /sys-devices and dmidecode.)
   BIOS Vendor:       Lenovo
   BIOS Version:      ESE113G-2.10
   BIOS Date:         03/16/2023
   BIOS Revision:     2.10
   Firmware Revision: 2.10
   System date/time for this result was not updated to right time
   and actual testing date can be referred to "spec.cpu2017.test_date"

---

### Compiler Version Notes

<table>
<thead>
<tr>
<th>Compiler</th>
<th>Version</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>C</td>
<td>500.perlbench_r(base) 502.qcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)</td>
<td>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.</td>
</tr>
<tr>
<td>C++</td>
<td>520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)</td>
<td>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.</td>
</tr>
<tr>
<td>Fortran</td>
<td>548.exchange2_r(base)</td>
<td>Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201</td>
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Hardware Availability: May-2023
Software Availability: Dec-2022

Compiler Version Notes (Continued)

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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

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## Lenovo Global Technology

**ThinkSystem SR650 V3**  
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### Base Optimization Flags (Continued)

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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin`  
- `-lqkmalloc`

The flags files that were used to format this result can be browsed at:

- [http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.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/Intel-ic2023-official-linux64.xml](http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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