## Lenovo Global Technology

**ThinkSystem SR630 V3**  
(2.60 GHz, Intel Xeon Gold 6442Y)

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

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base = 489</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>96</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>96</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>96</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>96</td>
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<tr>
<td>523.xalancbmk_r</td>
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<td>525.x264_r</td>
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<tr>
<td>531.deepsjeng_r</td>
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<tr>
<td>541.leela_r</td>
<td>96</td>
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<tr>
<td>548.exchange2_r</td>
<td>96</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>96</td>
</tr>
</tbody>
</table>

---

### Hardware

- **CPU Name:** Intel Xeon Gold 6442Y  
- **Max MHz:** 4000  
- **Nominal:** 2600  
- **Enabled:** 48 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)  
- **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 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:** None  
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
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Specrate®2017_int_base = 489
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>354</td>
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<td>945</td>
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<td>180</td>
<td>935</td>
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<td>938</td>
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<td>96</td>
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<td>993</td>
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<td>982</td>
<td>257</td>
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<td>461</td>
<td>225</td>
<td>464</td>
<td>223</td>
<td>466</td>
<td>223</td>
</tr>
</tbody>
</table>

Specrate®2017_int_base = 489
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/jre5.0.1-32"
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
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:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
SNC set to SNC2
LLC Prefetch set to Disabled
UPI Link Disable set to Disabled 1 Link
C-state set to Legacy

Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on test1 Tue Feb 21 17:57:45 2023

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

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3. Username
4. ulimit -a
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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/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

(Continued on next page)
Platform Notes (Continued)

Linux test1 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222) x86_64 x86_64 GNU/Linux

2. w

<table>
<thead>
<tr>
<th>USER</th>
<th>TTY</th>
<th>FROM</th>
<th>LOGIN@</th>
<th>IDLE</th>
<th>JCPU</th>
<th>PCPU</th>
<th>WHAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>root</td>
<td>tty1</td>
<td>-</td>
<td>17:56</td>
<td>6.00s</td>
<td>0.81s</td>
<td>0.01s</td>
<td>-bash</td>
</tr>
</tbody>
</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) 2062592
- 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) 2062592
- 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
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=96 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=48 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all intrate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=96 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=48 --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/CPU2017.117/templogs/preenv.intrate.117.0.log --lognum 117.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2023.0

6. /proc/cpuinfo

   model name : Intel(R) Xeon(R) Gold 6442Y
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   stepping : 8
   microcode : 0x2b000161
   bugs : spectre_v1 spectre_v2 spec_store_bypass swaps
   cpu cores : 24
   siblings : 48

(Continued on next page)
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<td>Feb-2023</td>
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</table>

#### SPEC CPU 2017 Integer Rate Result

<table>
<thead>
<tr>
<th>SPECRate 2017_int_base</th>
<th>Not Run</th>
</tr>
</thead>
</table>

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#### Platform Notes (Continued)

2 physical ids (chips)
96 processors (hardware threads)

- physical id 0: core ids 0-23
- physical id 1: core ids 0-23

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):** 96
- **On-line CPU(s) list:** 0-95
- **Vendor ID:** GenuineIntel
- **Model name:** Intel(R) Xeon(R) Gold 6442Y
- **CPU family:** 6
- **Model:** 143
- **Thread(s) per core:** 2
- **Core(s) per socket:** 24
- **Socket(s):** 2
- **Stepping:** 8
- **BogoMIPS:** 5200.00

### Flags:

- fpu vme de pse tsc msr pae mca cmov pat pse36 cmon pse37 clflush dtc clflushopt fxsr vsx pmxs ycr36 mxrs 4x8 64-bit
- clflushopt cs-table cxn44e445 dts perfmon perfmgmt pebs bts rep_good nopl x86ms nx cpu_meltdown fofl aem64 bpf cfi
- aem64 smp scpresent mtmsr htl tce mmx fxsr mda pdpe1gb mce mmxplus cmov mxset sse corpus arch_perfmon pebs bsbinfs rep_good

### Virtualization:

- VT-x

### L1d cache:

- 2.3 MiB (48 instances)
- 1.5 MiB (48 instances)

### L2 cache:

- 96 MiB (48 instances)
- 120 MiB (2 instances)

###NUMA node(s):

- 4

---

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

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**

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</tr>
<tr>
<td>SPECrate®2017_int_base =</td>
<td>489</td>
</tr>
<tr>
<td>SPECrate®2017_int_peak =</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

- **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
- **Vulnerability Tmx async abort:** Not affected

From `lscpu --cache`:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHYS-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>2.3M</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>1.5M</td>
<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>96M</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>120M</td>
<td>15</td>
<td>Unified</td>
<td>3</td>
<td>65536</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

---

8. `numactl --hardware`

NOTE: a `numactl 'node'` might or might not correspond to a physical chip.

- **available:** 4 nodes (0-3)
  - node 0 cpus: 0-11, 48-59
  - node 0 size: 128647 MB
  - node 0 free: 127858 MB
  - node 1 cpus: 12-23, 60-71
  - node 1 size: 129017 MB
  - node 1 free: 128486 MB
  - node 2 cpus: 24-35, 72-83
  - node 2 size: 129017 MB
  - node 2 free: 128691 MB
  - node 3 cpus: 36-47, 84-95
  - node 3 size: 128989 MB
  - node 3 free: 128660 MB

- **node distances:**
  - node 0: 10 12 21 21
  - node 1: 12 10 21 21
  - node 2: 21 21 10 12
  - node 3: 21 21 12 10

---

9. `/proc/meminfo`

- **MemTotal:** 528048084 kB

---

10. `who -r`

- **run-level 3 Feb 21 17:56**

---

11. `Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)`

- **Default Target:** multi-user
- **Status:** running

---

12. Services, from `systemctl list-unit-files`

<table>
<thead>
<tr>
<th>STATE</th>
<th>UNIT FILES</th>
</tr>
</thead>
<tbody>
<tr>
<td>enabled</td>
<td>YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ haveged irqbalance iscsi issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rayslog smartd sshd wicked wickedd-autos wickedd-dhcpcd wickedd-dhcp6 wickedd-nanny</td>
</tr>
<tr>
<td>enabled-runtime</td>
<td>systemd-remount-fs</td>
</tr>
<tr>
<td>disabled</td>
<td>autosfs autostart-linscripts blk-availability-boot-sysctl ca-certificates chrony-wait chronyd console-getty cups cups-browsed debug-shell etables exchange-bmc-os-info firewalld gpm grub2-once haveged-switch-root ipmi ipmiagent iscsi-init iscsid iscsiui0 issue-add-ssh-keys kekexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb nmbd nmbd-nanny rdisc rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts smb snmpd snmptrapd</td>
</tr>
</tbody>
</table>

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

SPECrate®2017_int_base = 489
SPECrate®2017_int_peak = Not Run

Platform Notes (Continued)

systemd-boot-check-no-failures systemd-network-generator systemd-sysext
systemd-time-wait-sync systemd-timesyncd

generated ntp_sync
indirect wickedd

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=f976c541-a329-4c54-ba84-4be16556ee18
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. 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+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_MILLISECONDS 60000
defrag 1
max_ptes_none 511
max_ptes_shared 256
max_ptes_swap 64
pages_to_scan 4096
scan_sleep_milliseconds 10000

(Continued on next page)
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SPECrater®2017_int_base = 489
SPECrater®2017_int_peak = Not Run

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/sda2      xfs   894G   92G  803G  11% /

20. /sys/devices/virtual/dmi/id
   Vendor:         Lenovo
   Product:        ThinkSystem SR630 V3
   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:
   1x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
   5x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800
   10x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

22. 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       | 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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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 2023.0.0 Build 20221201
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Fortran | 548.exchange2_r(base)
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(Continued on next page)
Lenovo Global Technology
ThinkSystem SR630 V3 (2.60 GHz, Intel Xeon Gold 6442Y)

SPECrate\textsuperscript{\textregistered}2017\textsubscript{int}_\texttt{base} = 489
SPECrate\textsuperscript{\textregistered}2017\textsubscript{int}_\texttt{peak} = \texttt{Not Run}

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

Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Dec-2022

Compiler Version Notes (Continued)

Intel\textsuperscript{(R)} Fortran Compiler for applications running on Intel\textsuperscript{(R)} 64, Version 2023.0.0 Build 20221201
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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
502gcc\_r: -DSPEC\_LP64
505.mcf\_r: -DSPEC\_LP64
520.ommntpp\_r: -DSPEC\_LP64
523.xalanchbmk\_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

(Continued on next page)
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SPECrate®2017_int_base = 489
SPECrate®2017_int_peak = Not Run

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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-O.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-O.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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