**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**

ThinkSystem SR650 V3
(2.60 GHz, Intel Xeon Silver 4509Y)

---

**SPECrate®2017_int_base = 172**

**SPECrate®2017_int_peak = Not Run**

---

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

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**Test Date:** Jan-2024

**Hardware Availability:** Feb-2024

**Software Availability:** Dec-2023

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<tr>
<td>502.gcc_r</td>
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<td>557.xz_r</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

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**Hardware**

- **CPU Name:** Intel Xeon Silver 4509Y
- **Max MHz:** 4100
- **Nominal:** 2600
- **Enabled:** 16 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:** 22.5 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 960 GB SATA SSD
- **Other:** None

---

**Software**

- **OS:** SUSE Linux Enterprise Server 15 SP4
  - Kernel 5.14.21-150400.22-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 ESE121V 3.10 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 and OS set to prefer performance at the cost of additional power usage
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Base Seconds</th>
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<th>Peak Seconds</th>
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<td>78.8</td>
</tr>
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</table>

**SPECrate®2017_int_base = 172**

**SPECrate®2017_int_peak = Not Run**

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:

```bash
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/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

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)
General Notes (Continued)

is mitigated in the system as tested and documented.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance

Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed35c6ae2c92cc097bec197
running on localhost Sun Jan 21 14:49:05 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. lsctl
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

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
14:49:05 up 4:49, 1 user, load average: 0.00, 0.00, 0.00
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root tty1 - 10:00 6.00s 0.94s 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

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jan-2024
Tested by: Lenovo Global Technology
Hardware Availability: Feb-2024
Software Availability: Dec-2023

Platform Notes (Continued)

scheduling priority (-e) 0
file size (blocks, -f) unlimited
pending signals (-i) 4127074
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) 4127074
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=32 -c
ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=16 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base -o all intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --configfile
ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=16 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
rate --tune base --size refrain intrate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.031/templogs/preenv.intrate.031.0.log --lognum 031.0 --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) SILVER 4509Y
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2b000571
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores : 8
siblings : 16
2 physical ids (chips)
32 processors (hardware threads)
physical id 0: core ids 0-7
physical id 1: core ids 0-7
physical id 0: apicids 0-15
physical id 1: apicids 64-79

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

(Continued on next page)
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SPECrade®2017_int_base = 172
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Platform Notes (Continued)

CPU(s): 32
On-line CPU(s) list: 0-31
Vendor ID: GenuineIntel
CPU family: INTEL(R) XEON(R) SILVER 4509Y
Model: 143
Thread(s) per core: 2
Core(s) per socket: 2
Stepping: 8
BogoMIPS: 5200.00

Flags:
fpu vme de pse tsc mce pop mtrr pge mca cmov pat pse36
clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtmp
cache size: 2.60 GHz, Intel Xeon Silver 4509Y
lenovo global technology

Virtualization:
VT-x

L1d cache:
768 KiB (16 instances)
L1i cache:
512 KiB (16 instances)
L2 cache:
32 MiB (16 instances)
L3 cache:
45 MiB (2 instances)

NUMA node(s):
2
NUMA node0 CPU(s):
0-7,16-23
NUMA node1 CPU(s):
8-15,24-31

Vulnerability Itlb multihit: Not affected
Vulnerability Lltf: 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/swapsbs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Tax async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d  48K  768K  12 Data  1  64  1  64
L1i  32K  512K  8 Instruction  1  64  1  64
L2   2M   32M  16 Unified  2  2048 1  64
L3  22.5M  45M  15 Unified  3  24576 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: 0-7,16-23
node 0 size: 515755 MB
node 0 free: 513257 MB

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**Platform Notes (Continued)**

```
node 1 cpus: 8-15,24-31
node 1 size: 516037 MB
node 1 free: 514762 MB
node distances:
  node 0 1
    0: 10 21
    1: 21 10

9. /proc/meminfo
   MemTotal: 1056555616 kB

10. who -r
   run-level 3 Jan 21 10:00

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 chrony cron getty@ haveged irqbalance
   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 autosys autostart-Initscripts blk-availability boot-sysctl ca-certificates chrony-wait
   console-getty cups cups-browsed debug-shell ebtables exchange-bmc-on-info firewall gpm
   grub2-once haveged-switch-root ipmi ipmi windy iscsi-init iscsid iscsiuiu issue-add-ssh-keys
   kexec-load ksm kvm_stat lunmask man-db-create multipathd nfs nfs-bkmap nmb ntp-wait ntpd
   rdisc rpcbind rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts smb snmpd snmptrapd
   svnserve systemd-boot-check-no-failures systemd-network-generator systemd-sysexit
   systemd-time-wait-sync systemd-timesyncd udisks2
   indirect wicked

13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
   root=UUID=d68daf13-caf1-4614-b0e5-f766f243d7c8
   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
```

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**Platform Notes (Continued)**

```markdown
test_data
```
# Lenovo Global Technology

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**SPECrated®2017_int_base = 172**  
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## Platform Notes (Continued)

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

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<td>BIOS Version</td>
<td>ESE121V-3.10</td>
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<tr>
<td>BIOS Date</td>
<td>01/09/2024</td>
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<tr>
<td>BIOS Revision</td>
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<tr>
<td>Firmware Revision</td>
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## Compiler Version Notes

<table>
<thead>
<tr>
<th>Language</th>
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<td>Copyright (C) 1985-2023 Intel Corporation. All rights reserved.</td>
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<td>Fortran</td>
<td>548.exchange2_r(base)</td>
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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`
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#### Base Portability Flags (Continued)

- 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/home/specdev/new_compilers/ic2023.2.3/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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`  
- `-lqkmalloc`

**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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`  
- `-lqkmalloc`

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


You can also download the XML flags sources by saving the following links:

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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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