# Lenovo Global Technology

**ThinkSystem SR650 V3**  
(2.00 GHz, Intel Xeon Platinum 8558U)

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**SPEC CPU®2017 Integer Rate Result**

| SPECrate®2017_int_base = 409 | SPECrate®2017_int_peak = Not Run |

| Lenovo Global Technology | Lenovo Global Technology |

**CPU2017 License:** 9017  
**Test Date:** Apr-2024  
**Hardware Availability:** Feb-2024  
**Test Sponsor:** Lenovo Global Technology  
**Software Availability:** Mar-2024  
**Tested by:** Lenovo Global Technology

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base (409)</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>500.perlbench_r 314</td>
</tr>
<tr>
<td>96</td>
<td>502.gcc_r 337</td>
</tr>
<tr>
<td>96</td>
<td>505.mcf_r 618</td>
</tr>
<tr>
<td>96</td>
<td>520.omnetpp_r 264</td>
</tr>
<tr>
<td>96</td>
<td>523.xalancbmk_r 573</td>
</tr>
<tr>
<td>96</td>
<td>525.x264_r 832</td>
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<tr>
<td>96</td>
<td>531.deepsjeng_r 293</td>
</tr>
<tr>
<td>96</td>
<td>541.leea_r 289</td>
</tr>
<tr>
<td>96</td>
<td>548.exchange2_r 887</td>
</tr>
<tr>
<td>96</td>
<td>557.xz_r 211</td>
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</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name:</th>
<th>Intel Xeon Platinum 8558U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz:</td>
<td>4000</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2000</td>
</tr>
<tr>
<td>Enabled:</td>
<td>48 cores, 1 chip, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1 chip</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>2 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>260 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>512 GB (8 x 64 GB 2Rx4 PC5-5600B-R, running at 4800)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>CPU Cooling: CLC</td>
</tr>
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### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux 9.2 (Plow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kernel:</td>
<td>5.14.0-284.11.1.el9_2.x86_64</td>
</tr>
<tr>
<td>Compiler:</td>
<td>C/C++ Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux;</td>
</tr>
<tr>
<td>Firmware:</td>
<td>Lenovo BIOS Version ESE123C 3.12 released Feb-2024</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>Not Applicable</td>
</tr>
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<td>Other:</td>
<td>None</td>
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<tr>
<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
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</table>
Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8558U)

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

Test Date: Apr-2024
Hardware Availability: Feb-2024
Software Availability: Mar-2024

Results Table

<table>
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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<tr>
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<td>485</td>
<td>315</td>
<td>487</td>
<td>314</td>
<td>488</td>
<td>313</td>
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<tr>
<td>502.gcc_r</td>
<td>96</td>
<td>403</td>
<td>338</td>
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<tr>
<td>505.mcf_r</td>
<td>96</td>
<td>251</td>
<td>618</td>
<td>251</td>
<td>617</td>
<td>251</td>
<td>619</td>
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<tr>
<td>520.omnetpp_r</td>
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<td>264</td>
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<td>523.xalanbmk_r</td>
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<td>177</td>
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<tr>
<td>548.exchange2_r</td>
<td>96</td>
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<td>888</td>
<td>286</td>
<td>880</td>
<td>283</td>
<td>887</td>
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<tr>
<td>557.xz_r</td>
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<td>492</td>
<td>211</td>
<td>487</td>
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<td>497</td>
<td>209</td>
</tr>
</tbody>
</table>

SPECrate®2017_int_base = 409
SPECrate®2017_int_peak = Not Run

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-ic2024.0.2/lib/intel64:/home/cpu2017-1.1.9-ic2024.0.2/lib/ia32:/home/cpu2017-1.1.9-ic2024.0.2/lib/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 <eto>
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.

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8588U)

SPECrate®2017_int_base = 409
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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
C-States set to Legacy
LLC Prefetch set to Disabled
SNC set to SNC2

Sysinfo program /home/cpu2017-1.1.9-ic2024.0.2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Tue Apr 16 04:20:01 2024

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

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4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numacl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 252 (252-13.el9_2)
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. sysestl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/transparent
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

1. uname -a
Linux localhost.localdomain 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT 2023 x86_64 x86_64 x86_64 GNU/Linux

2. w
04:20:01 up 1 min,  1 user,  load average: 0.32, 0.17, 0.06
USER   TTY LOGNAME IDLE   JCPU   PCPU WHAT
root  tty1 04:19  8.00s  0.82s  0.01s -bash

3. Username
From environment variable $USER: root

(Continued on next page)
Platform Notes (Continued)

4. ulimit -a
   real-time non-blocking time (microseconds, -R) unlimited
   core file size (blocks, -c) 0
   data seg size (kbytes, -d) unlimited
   scheduling priority (seconds, -e) 0
   file size (blocks, -f) unlimited
   pending signals (signals, -i) 2062609
   max locked memory (kbytes, -l) 64
   max memory size (kbytes, -m) unlimited
   open files (files, -n) 1024
   pipe size (512 bytes, -p) 8
   POSIX message queues (bytes, -q) 819200
   real-time priority (s) 0
   stack size (kbytes, -s) unlimited
   cpu time (seconds, -t) unlimited
   max user processes (processes, -u) 2062609
   virtual memory (kbytes, -v) unlimited
   file locks (locks, -x) unlimited

5. sysinfo process ancestry
   /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
   login -- root
   -bash
   -bash
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=96 -c
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=48 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -- all --intrate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=96 --configfile
   ic2024.0.2-lin-sapphirerapids-rate-20231213.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/CPU2017.092/tempslogs/preenv.intrate.092.0.log --lognum 092.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2024.0.2

6. /proc/cpuinfo
   vendor_id : GenuineIntel
   cpu family : 6
   model : 207
   stepping : 2
   microcode : 0x21000200
   bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
   cpu cores : 48
   siblings : 96
   physical id (chips):
   96 processors (hardware threads)
   physical id 0: core ids 0-47
   physical id 0: apicids 0-95
   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:

(Continued on next page)
Lenovo Global Technology

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CPU2017 License: 9017
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Test Date: Apr-2024
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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): 96
On-line CPU(s) list: 0-95
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: INTEL(R) XEON(R) PLATINUM 8558U
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 48
Socket(s): 1
Stepping: 2
BogoMIPS: 4000.00

Flags:

<table>
<thead>
<tr>
<th>Virtualization:</th>
<th>VT-x</th>
</tr>
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<tbody>
<tr>
<td>L1d cache:</td>
<td>2.3 MiB (48 instances)</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>1.5 MiB (48 instances)</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>96 MiB (48 instances)</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>260 MiB (1 instance)</td>
</tr>
<tr>
<td>NUMA node(s):</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-23,48-71</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>24-47,72-95</td>
</tr>
<tr>
<td>Vulnerability Itlb multihit:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Ltft:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Mds:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Mmio stale data:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Retbleed:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Spec store bypass:</td>
<td>Mitigation; Speculative Store Bypass disabled via prctl</td>
</tr>
<tr>
<td>Vulnerability Spectre v1:</td>
<td>Mitigation; usercopy/swaps barriers and __user pointer sanitization</td>
</tr>
<tr>
<td>Vulnerability Spectre v2:</td>
<td>Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence</td>
</tr>
<tr>
<td>Vulnerability Srbds:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Tlx async abort:</td>
<td>Not affected</td>
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From lscpu --cache:

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<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>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
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</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></td>
<td></td>
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<td>L1i</td>
<td>32K</td>
<td>1.5M</td>
<td>8</td>
<td>Instruction</td>
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<td>64</td>
<td>1</td>
<td></td>
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<td>L2</td>
<td>2M</td>
<td>96M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
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大国全球科技

ThinkSystem SR650 V3

(2.00 GHz, Intel Xeon Platinum 8558U)

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**Platform Notes (Continued)**

8. numactl --hardware
   
   NOTE: a numactl 'node' might or might not correspond to a physical chip.
   available: 2 nodes (0-1)
   node 0 cpus: 0-23,48-71
   node 0 size: 257701 MB
   node 0 free: 256830 MB
   node 1 cpus: 24-47,72-95
   node 1 size: 257993 MB
   node 1 free: 257256 MB

9. /proc/meminfo
   
   MemTotal: 528071160 kB

10. who -r
    
    run-level 3 Apr 16 04:18

11. Systemd service manager version: systemd 252 (252-13.el9_2)
    Default Target Status
    multi-user running

12. Services, from systemctl list-unit-files
    STATE UNIT FILES
    enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd bluetooth
    chronyd crond dbus-broker firewalld getty@ insights-client-boot irqbalance iscsi
    iscsi-onboot kdump libstoragemgmt low-memory-monitor lvm2-monitor mdmonitor
    microcode multipathd nis-domainname nvme=sci-boot-connections rhsmcertd rsyslog rtkit-daemon
    selinux-autorelabel-mark smartd sshd sssd systemd-boot-update systemd-network-generator
    tuned udisks2 upower
    enabled-runtime systemd-remount-fs
    disabled
    indirect

13. Linux kernel boot-time arguments, from /proc/cmdline
    root=/dev/mapper/rhel-root
    root=/dev/mapper/rhel-root
    root=/dev/mapper/rhel-root
    ro
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel/snap
    rhgb
    quiet

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

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Platform Notes (Continued)

14. cpupower frequency-info
   analyzing CPU 0:
   Unable to determine current policy
   boost state support:
      Supported: yes
      Active: yes

15. tuned-adm active
   Current active profile: throughput-performance

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 40
   vm.dirty_writeback_centisecs 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 10
   vm.watermark_boost_factor 15000
   vm.watermark_scale_factor 10
   vm.zone_reclaim_mode 0

17. /sys/kernel/mm/transparent_hugepage
   defrag always defer+madvice [madvice] never
   enabled [always] madvice 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 Red Hat Enterprise Linux 9.2 (Plow)
   redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
   system-release Red Hat Enterprise Linux release 9.2 (Plow)

20. Disk information

(Continued on next page)
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Platform Notes (Continued)

SPEC is set to: /home/cpu2017-1.1.9-ic2024.0.2
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 819G 69G 750G 9% /home

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 3.3 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:
2x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 4800
6x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4800

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: Lenovo
BIOS Version: ESE123C-3.12
BIOS Date: 02/22/2024
BIOS Revision: 3.12
Firmware Revision: 3.90

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 2024.0.2 Build 20231213
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 2024.0.2 Build 20231213
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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
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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
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/opt/intel/oneapi/compiler/2024.0/lib -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/opt/intel/oneapi/compiler/2024.0/lib -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/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc
Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8558U)

| SPECrate®2017_int_base = 409 |
| SPECrate®2017_int_peak = Not Run |

| CPU2017 License: 9017 | Test Date: Apr-2024 |
| Test Sponsor: Lenovo Global Technology | Hardware Availability: Feb-2024 |
| Tested by: Lenovo Global Technology | Software Availability: Mar-2024 |

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-ic2024-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-ic2024-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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