Lenovo Global Technology
ThinkSystem SR650 V3
(2.70 GHz, Intel Xeon Platinum 8458P)

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

SPECrat®2017_int_base = 765
SPECrat®2017_int_peak = Not Run

Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Jun-2022

Hardware
CPU Name: Intel Xeon Platinum 8458P
Max MHz: 3800
Nominal: 2700
Enabled: 88 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: 82.5 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 2022.1 of Intel oneAPI DPC++/C++
Compiler for Linux;
Fortran: Version 2022.1 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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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td>176</td>
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<tr>
<td>525.x264_r</td>
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<td>548.exchange2_r</td>
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<td>501</td>
<td>379</td>
<td>501</td>
<td>379</td>
<td>502</td>
<td>379</td>
</tr>
</tbody>
</table>

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.xalanckmk_r / 623.xalanckmk_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This result is left in the SPEC results database for historical reference.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-ic2022.1/lib/intel64:/home/cpu2017-1.1.9-ic2022.1/lib/ia32:/home/cpu2017-1.1.9-ic2022.1/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
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 SNC4
- LLC Prefetch set to Disabled
- UPI Link Disable set to Disabled 1 Link

**Sysinfo program** /home/cpu2017-1.1.9-ic2022.1/bin/sysinfo
Revt: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Sun Jan 29 23:59:35 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/cpuminfo
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/klugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS
------------------------------------------------------------

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

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`
   23:59:35 up 5:57,  1 user,  load average: 0.36, 39.33, 107.55
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                18:07    7.00s  1.14s  0.00s -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) 2062435
   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) 2062435
   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=176 -c
     ic2022.1-lin-core-avx2-rate-20220316.cfg --define smt-on --define cores=88 --define physicalfirst --define
     invoke_with_interleave --define drop_caches --tune base -- all intrate
     runcpu --nobuild --action validate --define default-platform-flags --define numcopies=176 --configfile
     ic2022.1-lin-core-avx2-rate-20220316.cfg --define smt-on --define cores=88 --define physicalfirst --define
     invoke_with_interleave --define drop_caches --tune base -- output_format all --nopower -- rummode rate
     --tune base --size refine intrate --nopreenv -- note-preenv -- logfile
     /SSP/tp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 -- from runcpu 2
     specper1 $SPEC/bin/sysinfo
     $SPEC = /home/cpu2017-1.1.9-ic2022.1

6. `/proc/cpuinfo`
   model name: Intel(R) Xeon(R) Platinum 8458P
   vendor_id: GenuineIntel
   cpu family: 6
   model: 143
   stepping: 8
   microcode: 0x2b000161
   bugs: spectre_v1 spectre_v2 spec_store_bypass swapgs

(Continued on next page)
Platform Notes (Continued)

cpu cores : 44
siblings : 88
2 physical ids (chips)
176 processors (hardware threads)
physical id 0: core ids 0-43
physical id 1: core ids 0-43
physical id 0: apic ids 0-87
physical id 1: apic ids 128-215
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): 176
On-line CPU(s) list: 0-175
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) Platinum 8458P
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 44
Socket(s): 2
Stepping: 8
BogoMIPS: 5400.00
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 pse syscall nx pdpe1gb rdsc
  pm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
  nonstop_tsc cpuid aperfnperf tsc_known_freq pni pclmulqdq dtscn
  monitor ds cpl vmx smx est tm2 ssbe sse3 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 3dnowprefetch cpuid_fault epb cat_13 cat_12
cdp_13
  invpcid_single intel_ppin cdp_12 sbbd mda ibrs ibpb 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 vmpversion gmxt
  avx512ifma ciflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl
  xsaves avxopt xsaves xgetbv xsavecaps cqm_llc cqm_occult llc
cqm_mm_total
cqm_mm_local split_lock_detect avx vnni avx512 bf16 wbnoinvd dtherm ida
  arat pnt pls avx512vbm unip kpu ospe waitpkg avx512_vbm 2 gfn vaes
  vpc_mulqdg avx512_vnni avx512 bitalg tme avx512 vpoptcdq lal7 rdpid
  bus_lock_detect cldemote movdiri movdir64b enqcmd form md_clear serialize
  tsx tmkr pconf arch_bbr avx512 fpi6 smx tile flush_ldt arch_capabilities

Virtualization: VT-x
L1d cache: 4.1 MiB (88 instances)
L1i cache: 2.8 MiB (88 instances)
L2 cache: 176 MiB (88 instances)
L3 cache: 165 MiB (2 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-10,88-98
NUMA node1 CPU(s): 11-21,99-109
NUMA node2 CPU(s): 22-32,110-120
NUMA node3 CPU(s): 33-43,121-131
NUMA node4 CPU(s): 44-54,132-142
NUMA node5 CPU(s): 55-65,143-153
NUMA node6 CPU(s): 66-76,154-164

(Continued on next page)
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Platform Notes (Continued)

NUMA node7 CPU(s): 77-87,165-175
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
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 4.1M 12 Data 1 64 1 64
L1i 32K 2.8M 8 Instruction 1 64 1 64
L2 2M 176M 16 Unified 2 2048 1 64
L3 82.5M 165M 15 Unified 3 90112 1 64

-----------------------------------------------------------------------------

8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 8 nodes (0-7)
node 0 cpus: 0-10,88-98
node 0 size: 64169 MB
node 0 free: 52761 MB
node 1 cpus: 11-21,99-109
node 1 size: 64506 MB
node 1 free: 59667 MB
node 2 cpus: 22-32,110-120
node 2 size: 64506 MB
node 2 free: 59517 MB
node 3 cpus: 33-43,121-131
node 3 size: 64471 MB
node 3 free: 59576 MB
node 4 cpus: 44-54,132-142
node 4 size: 64506 MB
node 4 free: 59650 MB
node 5 cpus: 55-65,143-153
node 5 size: 64506 MB
node 5 free: 59650 MB
node 6 cpus: 66-76,154-164
node 6 size: 64506 MB
node 6 free: 59678 MB
node 7 cpus: 77-87,165-175
node 7 size: 64459 MB
node 7 free: 59507 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 12 12 12 21 21 21 21
1: 12 10 12 12 21 21 21 21
2: 12 12 10 12 21 21 21 21
3: 12 12 12 10 21 21 21 21
4: 21 21 21 21 10 12 12 12
5: 21 21 21 21 12 10 12 12
6: 21 21 21 21 12 12 10 12
7: 21 21 21 21 12 12 12 10

--------------------------------------------------------------------------------

9. /proc/meminfo
MemTotal: 528008052 kB

(Continued on next page)
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Platform Notes (Continued)

10. who -r
   run-level 3 Jan 29 18:02

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 aparmor auditd cron getty@ haveged irqbalance
    issue-generator klog 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-1ntscripts blk-availability boot-sysctl ca-certificates chrony-wait
    chronyd console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
    firewall gpm grub2-once haveged-switch-root ipmi ipmi-evd issue-add-ssh-keys keexec-load
    lvm2-monitor man-db-create multipathd nfs nfs-bkmap rdisc rpcbind rpmconfigcheck rsyslog
    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 wicked

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
    security=apparmor

14. cpupower frequency-info
    analyzing CPU 0:
    Unable to determine current policy
    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

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Platform Notes (Continued)

vm.extrat\textquoteleft\textunderscore frag\textquoteright\_threshold 500
vm.min\_unmapped\_ratio 1
vm.nr\_hugepages 0
vm.nr\_hugepages\_mem\_policy 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+\textadvise [\textadvise] never
   enabled [always] \textadvise never
   hpage\_pmd\_size 2097152
   shmem\_enabled always within\_size \textadvise [never] deny force

18. /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

19. OS release
   From /etc\texthyphen\_*\texthyphen release /etc\texthyphen\_*\texthyphen version
   os\texthyphen release SUSE Linux Enterprise Server 15 SP4

20. Disk information
   SPEC is set to: /home/cpu2017-1.1.9-ic2022.1
   Filesystem Type Size Used Avail Use\% Mounted on
   /dev/sda3 xfs 889G 66G 823G 8\% /

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

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### Lenovo Global Technology

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

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**SPECrates**

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**Platform Notes (Continued)**

- BIOS Date: 01/07/2023
- BIOS Revision: 1.10
- Firmware Revision: 1.0

**Compiler Version Notes**

```plaintext
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 2022.1.0 Build 20220316
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 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------------------------
Fortran | 548.exchange2_r(base)
-----------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------------------------
```

**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

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Base Portability Flags (Continued)

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 -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/intel/compiler/2022.1.0/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-N.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-N.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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