SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SD550 V3
(2.10 GHz, Intel Xeon Platinum 8570)

$SPECrate^{®}2017\_int\_base = 958$

$SPECrate^{®}2017\_int\_peak = Not\ Run$

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

Test Date: Mar-2024
Hardware Availability: Mar-2024
Software Availability: Dec-2023

Benchmark	Copies	Result
500.perlbench_r	224	738
502.gcc_r	224	781
505.mcf_r	224	1420
520.omnetpp_r	224	589
523.xalancbmk_r	224	1320
525.x264_r	224	1970
531.deepsjeng_r	224	705
541.leela_r	224	694
548.exchange2_r	224	2140
557.xz_r	224	494

SPECrate®2017_int_base (958)

Hardware

CPU Name: Intel Xeon Platinum 8570
 Max MHz: 4000
 Nominal: 2100
Enabled: 112 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: 300 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R)
Storage: 1 x 480 GB SATA SSD
Other: Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP5
 Kernel 5.14.21-150500.53-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 FNE113F 2.20 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

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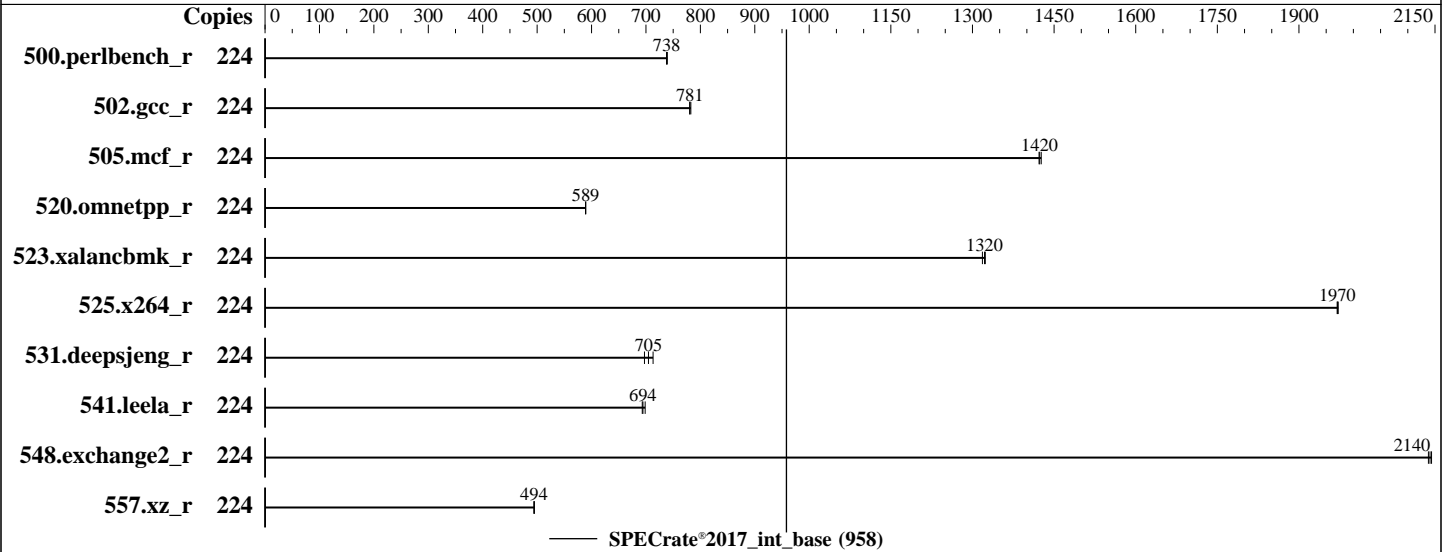
SPECrate®2017_int_peak = Not Run

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	224	482	739	483	738	**483**	**738**							
502.gcc_r	224	**406**	**781**	406	780	405	782							
505.mcf_r	224	**254**	**1420**	254	1420	254	1430							
520.omnetpp_r	224	499	589	499	589	**499**	**589**							
523.xalancbmk_r	224	179	1320	179	1320	**179**	**1320**							
525.x264_r	224	**199**	**1970**	199	1970	199	1970							
531.deepsjeng_r	224	**364**	**705**	368	697	360	713							
541.leela_r	224	535	693	**534**	**694**	531	699							
548.exchange2_r	224	275	2140	274	2140	**274**	**2140**							
557.xz_r	224	490	494	489	495	**489**	**494**							
SPECrate®2017_int_base =		**958**												
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:
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/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 <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.
```

(Continued on next page)

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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
SNC set to SNC2
LLC Prefetch set to Disabled
UPI Link Disable set to Minimum Number of Links Enabled

 Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Tue Mar  5 19:08:07 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. lscpu
  8. numactl --hardware
  9. /proc/meminfo
 10. who -r
 11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
 12. Failed units, from systemctl list-units --state=failed
 13. Services, from systemctl list-unit-files
 14. Linux kernel boot-time arguments, from /proc/cmdline
 15. cpupower frequency-info
 16. sysctl
 17. /sys/kernel/mm/transparent_hugepage
 18. /sys/kernel/mm/transparent_hugepage/khugepaged
 19. OS release
 20. Disk information
 21. /sys/devices/virtual/dmi/id
 22. dmidecode
 23. BIOS
 ------------------------------------------------------------


 ------------------------------------------------------------
 1. uname -a
   Linux localhost 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)
   x86_64 x86_64 x86_64 GNU/Linux


 ------------------------------------------------------------
 2. w
    19:08:07 up 3 min,  1 user,  load average: 0.18, 0.07, 0.02
   USER      TTY       FROM              LOGIN@   IDLE   JCPU   PCPU WHAT
   root      tty1      -                 19:06   39.00s  1.08s  0.01s sh
   Run302-compliant-ic2023.2.3-lin-sapphirerapids-rateint-base-smt-on-20231121.sh

 ------------------------------------------------------------
```

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Platform Notes (Continued)

```
 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) 4126786
   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) 4126786
   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
  /bin/bash ./run_SD550V3_EMR.sh
  sh Run302-compliant-ic2023.2.3-lin-sapphirerapids-rateint-base-smt-on-20231121.sh
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=224 -c
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=112 --define physicalfirst
    --define invoke_with_interleave --define drop_caches --tune base -o all intrate
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=224 --configfile
    ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=112 --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/CPU2017.414/templogs/preenv.intrate.414.0.log --lognum 414.0 --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) PLATINUM 8570
    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       : 56
    siblings        : 112
    2 physical ids (chips)
    224 processors (hardware threads)
    physical id 0: core ids 0-55
    physical id 1: core ids 0-55
    physical id 0: apicids 0-111
    physical id 1: apicids 128-239
   Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
   virtualized systems.  Use the above data carefully.
```

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Platform Notes (Continued)

```
     ----------------------------------------------------------------
     7. lscpu

     From lscpu from util-linux 2.37.4:
       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):                    224
       On-line CPU(s) list:       0-223
       Vendor ID:                 GenuineIntel
       Model name:                INTEL(R) XEON(R) PLATINUM 8570
       CPU family:                6
       Model:                     207
       Thread(s) per core:        2
       Core(s) per socket:        56
       Socket(s):                 2
       Stepping:                  2
       BogoMIPS:                  4200.00
       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 pbe syscall nx pdpe1gb rdtscp
                                  lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                                  nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 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 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3 invpcid_single
                                  cdp_l2 ssbd mba ibrs ibpb stibp 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 avx512dq rdseed adx smap avx512ifma clflushopt clwb
                                  intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves
                                  cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local avx_vnni avx512_bf16
                                  wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku ospke waitpkg
                                  avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
                                  avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
                                  enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16
                                  amx_tile flush_l1d arch_capabilities
       Virtualization:            VT-x
       L1d cache:                 5.3 MiB (112 instances)
       L1i cache:                 3.5 MiB (112 instances)
       L2 cache:                  224 MiB (112 instances)
       L3 cache:                  600 MiB (2 instances)
       NUMA node(s):              4
       NUMA node0 CPU(s):         0-27,112-139
       NUMA node1 CPU(s):         28-55,140-167
       NUMA node2 CPU(s):         56-83,168-195
       NUMA node3 CPU(s):         84-111,196-223
       Vulnerability Itlb multihit:   Not affected
       Vulnerability L1tf:        Not affected
       Vulnerability Mds:         Not affected
       Vulnerability Meltdown:    Not affected
       Vulnerability Mmio stale data:  Not affected
       Vulnerability Retbleed:    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, PBRSB-eIBRS SW
                                  sequence
       Vulnerability Srbds:       Not affected
       Vulnerability Tsx async abort:  Not affected

     From lscpu --cache:
```

(Continued on next page)

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Platform Notes (Continued)

```
    NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL    SETS PHY-LINE COHERENCY-SIZE
    L1d     48K     5.3M   12 Data            1      64       1            64
    L1i     32K     3.5M    8 Instruction     1      64       1            64
    L2       2M     224M   16 Unified         2    2048       1            64
    L3     300M     600M   20 Unified         3  245760       1            64

    ----------------------------------------------------------
    8. numactl --hardware
    NOTE: a numactl 'node' might or might not correspond to a physical chip.
      available: 4 nodes (0-3)
      node 0 cpus: 0-27,112-139
      node 0 size: 257698 MB
      node 0 free: 256848 MB
      node 1 cpus: 28-55,140-167
      node 1 size: 258033 MB
      node 1 free: 257380 MB
      node 2 cpus: 56-83,168-195
      node 2 size: 257999 MB
      node 2 free: 257076 MB
      node 3 cpus: 84-111,196-223
      node 3 size: 257995 MB
      node 3 free: 257279 MB
      node distances:
      node   0   1   2   3
        0:  10  12  21  21
        1:  12  10  21  21
        2:  21  21  10  12
        3:  21  21  12  10


    ----------------------------------------------------------
    9. /proc/meminfo
       MemTotal:       1056488016 kB


    ----------------------------------------------------------
    10. who -r
       run-level 3 Mar 5 19:05


    ----------------------------------------------------------
    11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
       Default Target  Status
       multi-user      degraded


    ----------------------------------------------------------
    12. Failed units, from systemctl list-units --state=failed
        UNIT             LOAD   ACTIVE SUB    DESCRIPTION
      * ntp_sync.service loaded failed failed ntp_sync.service


    ----------------------------------------------------------
    13. Services, from systemctl list-unit-files
       STATE           UNIT FILES
       enabled         YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator
                       kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd
                       systemd-pstore 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-shell ebtables exchange-bmc-os-info
                       firewalld gpm grub2-once haveged haveged-switch-root ipmi ipmievd issue-add-ssh-keys
                       kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rpcbind rpmconfigcheck rsyncd
                       serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                       systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd
```

(Continued on next page)

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Platform Notes (Continued)

```
    generated       ntp_sync
    indirect        wickedd


    -------------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
    root=UUID=1f1165ee-d57c-4884-9a69-769de0319f56
    splash=silent
    mitigations=auto
    quiet
    security=apparmor


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


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

    -------------------------------------------------------------
17. /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


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

    -------------------------------------------------------------
```

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Platform Notes (Continued)

```
 19. OS release
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP5

   ----------------------------------------------------------
 20. Disk information
 SPEC is set to: /home/cpu2017-1.1.9-ic2023.2.3
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda3      xfs   446G   42G  404G  10% /

   ----------------------------------------------------------
 21. /sys/devices/virtual/dmi/id
     Vendor:         Lenovo
     Product:        ThinkSystem SD550 V3
     Product Family: ThinkSystem
     Serial:         1234567890

   ----------------------------------------------------------
 22. dmidecode
   Additional information from dmidecode 3.4 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:
     9x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600
     7x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600


   ----------------------------------------------------------
 23. BIOS
 (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:     Lenovo
     BIOS Version:    FNE113F-2.20
     BIOS Date:       01/02/2024
     BIOS Revision:   2.20
     Firmware Revision: 1.10
```

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 2023.2.3 Build x
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 2023.2.3 Build x
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 2023.2.3 Build x
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/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
```

Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SD550 V3
(2.10 GHz, Intel Xeon Platinum 8570)

SPECrate®2017_int_base =   958

SPECrate®2017_int_peak = Not Run

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

Test Date: Mar-2024
Hardware Availability: Mar-2024
Software Availability: Dec-2023

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-ic2023p2-official-linux64.html

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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-ic2023p2-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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