SPEC CPU®2017 Integer Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

$SPECspeed^{®}2017\_int\_base = \quad 14.5$

ThinkSystem SR650 V3
(2.70 GHz, Intel Xeon Platinum 8558P)

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

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

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

Threads		
600.perlbench_s	192	9.67
602.gcc_s	192	12.5
605.mcf_s	192	24.0
620.omnetpp_s	192	12.4
623.xalancbmk_s	192	13.5
625.x264_s	192	22.9
631.deepsjeng_s	192	7.19
641.leela_s	192	6.04
648.exchange2_s	192	26.8
657.xz_s	192	31.4

Scale: 0 2.00 4.00 6.00 8.00 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0

—— SPECspeed®2017_int_base (14.5)

Hardware

CPU Name: Intel Xeon Platinum 8558P
Max MHz: 4000
Nominal: 2700
Enabled: 96 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: 260 MB I+D on chip per chip
Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R)
Storage: 1 x 960 GB SATA SSD
Other: Cooling: Air

Software

OS: Red Hat Enterprise Linux 9.2 (Plow)
 Kernel 5.14.0-284.11.1.el9_2.x86_64
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: Yes
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: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost
 of additional power usage

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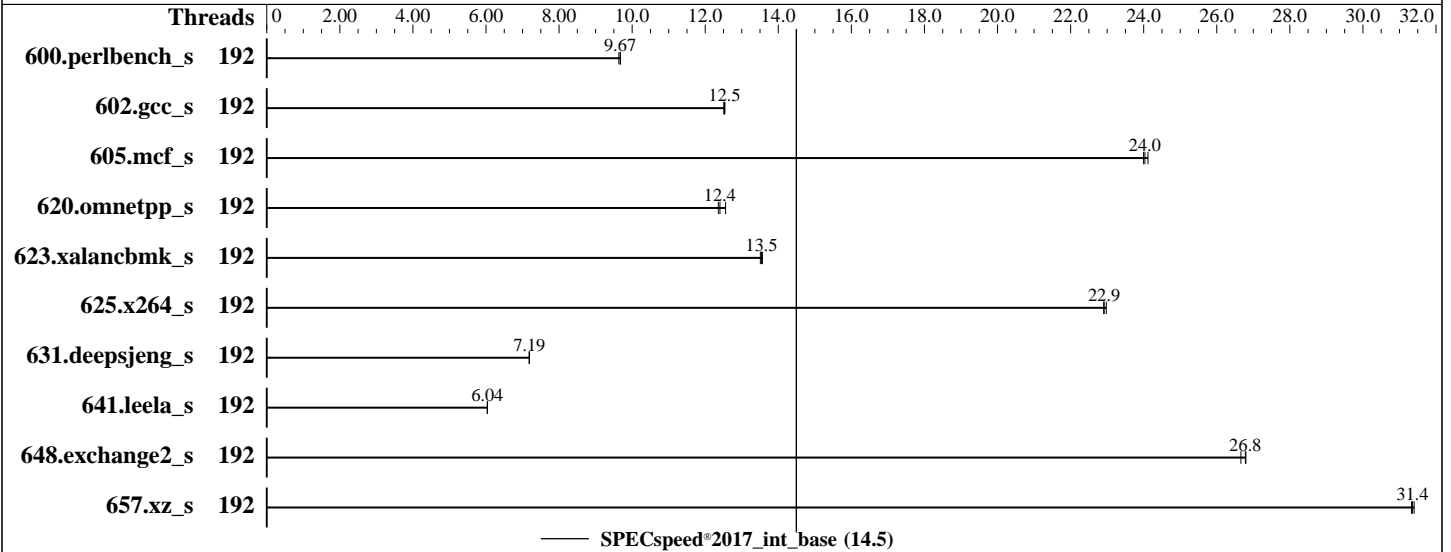
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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	192	183	9.68	184	9.64	**183**	**9.67**							
602.gcc_s	192	318	12.5	318	12.5	**318**	**12.5**							
605.mcf_s	192	**196**	**24.0**	196	24.1	197	24.0							
620.omnetpp_s	192	**132**	**12.4**	132	12.4	130	12.6							
623.xalancbmk_s	192	105	13.5	**105**	**13.5**	104	13.6							
625.x264_s	192	**77.0**	**22.9**	76.8	23.0	77.0	22.9							
631.deepsjeng_s	192	**199**	**7.19**	199	7.19	200	7.18							
641.leela_s	192	283	6.04	**282**	**6.04**	282	6.04							
648.exchange2_s	192	**110**	**26.8**	110	26.7	110	26.8							
657.xz_s	192	**197**	**31.4**	197	31.3	197	31.4							
SPECspeed®2017_int_base =			**14.5**											
SPECspeed®2017_int_peak =			**Not Run**											

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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:
    KMP_AFFINITY = "granularity=fine,scatter"
    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/je5.0.1-64"
    MALLOC_CONF = "retain:true"
    OMP_STACKSIZE = "192M"

General Notes

     Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
     memory using Redhat Enterprise Linux 8.0
     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
    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.
     jemalloc, a general purpose malloc implementation
     built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
     sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

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Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-states set to Legacy

 Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Mon Mar  4 22:13:22 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 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. 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.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
   22:13:22 up 0 min,  1 user,  load average: 0.51, 0.17, 0.06
  USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1       22:13   10.00s  0.81s  0.00s -bash


 ------------------------------------------------------------
 3. Username
   From environment variable $USER:  root


 ------------------------------------------------------------
 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              (-e) 0
   file size                   (blocks, -f) unlimited
```

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

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Platform Notes (Continued)

```
  pending signals                    (-i) 4126873
  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) 4126873
  virtual memory          (kbytes, -v) unlimited
  file 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 -c
    ic2023.2.3-lin-sapphirerapids-speed-20231121.cfg --define cores=96 --tune base -o all --define
    intspeedaffinity --define smt-on --define drop_caches intspeed
  runcpu --nobuild --action validate --define default-platform-flags --configfile
    ic2023.2.3-lin-sapphirerapids-speed-20231121.cfg --define cores=96 --tune base --output_format all
    --define intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base
    --size refspeed intspeed --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.265/templogs/preenv.intspeed.265.0.log --lognum 265.0 --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 8558P
    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
    2 physical ids (chips)
    192 processors (hardware threads)
    physical id 0: core ids 0-47
    physical id 1: core ids 0-47
    physical id 0: apicids 0-95
    physical id 1: apicids 128-223
  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:
    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):                    192
    On-line CPU(s) list:       0-191
```

(Continued on next page)

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Platform Notes (Continued)

```
Vendor ID:                     GenuineIntel
BIOS Vendor ID:                Intel(R) Corporation
Model name:                    INTEL(R) XEON(R) PLATINUM 8558P
BIOS Model name:               INTEL(R) XEON(R) PLATINUM 8558P
CPU family:                    6
Model:                         207
Thread(s) per core:            2
Core(s) per socket:            48
Socket(s):                     2
Stepping:                      2
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 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 monitor
                               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 avx2 smep bmi2
                               erms invpcid 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 hfi 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 ibt amx_bf16
                               avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities
Virtualization:                VT-x
L1d cache:                     4.5 MiB (96 instances)
L1i cache:                     3 MiB (96 instances)
L2 cache:                      192 MiB (96 instances)
L3 cache:                      520 MiB (2 instances)
NUMA node(s):                  2
NUMA node0 CPU(s):             0-47,96-143
NUMA node1 CPU(s):             48-95,144-191
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
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:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL   SETS PHY-LINE COHERENCY-SIZE
    L1d      48K      4.5M   12 Data            1     64        1             64
    L1i      32K        3M    8 Instruction     1     64        1             64
    L2        2M      192M   16 Unified         2   2048        1             64
    L3      260M      520M   20 Unified         3 212992        1             64

    ------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 2 nodes (0-1)
```

(Continued on next page)

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Platform Notes (Continued)

```
  node 0 cpus: 0-47,96-143
  node 0 size: 515738 MB
  node 0 free: 514454 MB
  node 1 cpus: 48-95,144-191
  node 1 size: 516021 MB
  node 1 free: 514911 MB
  node distances:
  node   0   1
    0:  10  21
    1:  21  10

  ----------------------------------------------------------
  9. /proc/meminfo
     MemTotal:     1056522764 kB


  ----------------------------------------------------------
  10. who -r
    run-level 3 Mar 4 22:12


  ----------------------------------------------------------
  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 mcelog mdmonitor
                     microcode multipathd nis-domainname nvmefc-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        arp-ethers blk-availability canberra-system-bootup canberra-system-shutdown
                     canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell
                     dnf-system-upgrade iprdump iprinit iprupdate iscsid iscsiuio kpatch kvm_stat ledmon
                     man-db-restart-cache-update nftables nvmf-autoconnect pesign psacct rdisc rhcd rhsm
                     rhsm-facts rpmdb-rebuild selinux-check-proper-disable serial-getty@ sshd-keygen@
                     systemd-boot-check-no-failures systemd-pstore systemd-sysext
     indirect        sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo systemd-sysupdate
                     systemd-sysupdate-reboot

  ----------------------------------------------------------
  13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd3,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
    root=/dev/mapper/rhel-root
    ro
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel/swap
    rhgb
    quiet


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

(Continued on next page)

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Platform Notes (Continued)

```
      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   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                   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 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


    ----------------------------------------------------------
    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
    SPEC is set to: /home/cpu2017-1.1.9-ic2023.2.3
      Filesystem              Type  Size  Used Avail Use% Mounted on
      /dev/mapper/rhel-home xfs   819G   54G  765G   7% /home


    ----------------------------------------------------------
    21. /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
     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:
    5x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600
    11x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600



  --------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       Lenovo
    BIOS Version:      ESE121V-3.10
    BIOS Date:         01/09/2024
    BIOS Revision:     3.10
    Firmware Revision: 3.90
```

Compiler Version Notes

```
==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(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++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base) 641.leela_s(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 | 648.exchange2_s(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.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
icx
```

C++ benchmarks:
```
icpx
```

(Continued on next page)

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Base Compiler Invocation (Continued)

Fortran benchmarks:
`ifx`

Base Portability Flags

600.perlbench_s: `-DSPEC_LP64 -DSPEC_LINUX_X64`
602.gcc_s: `-DSPEC_LP64`
605.mcf_s: `-DSPEC_LP64`
620.omnetpp_s: `-DSPEC_LP64`
623.xalancbmk_s: `-DSPEC_LP64 -DSPEC_LINUX`
625.x264_s: `-DSPEC_LP64`
631.deepsjeng_s: `-DSPEC_LP64`
641.leela_s: `-DSPEC_LP64`
648.exchange2_s: `-DSPEC_LP64`
657.xz_s: `-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 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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/jemalloc64-5.0.1/lib -ljemalloc
```

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
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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

SPEC CPU®2017 Integer Speed Result

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Lenovo Global Technology

ThinkSystem SR650 V3
(2.70 GHz, Intel Xeon Platinum 8558P)

SPECspeed®2017_int_base =   14.5

SPECspeed®2017_int_peak = Not Run

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

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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