# SPEC CPU®2017 Integer Speed Result

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## Lenovo Global Technology

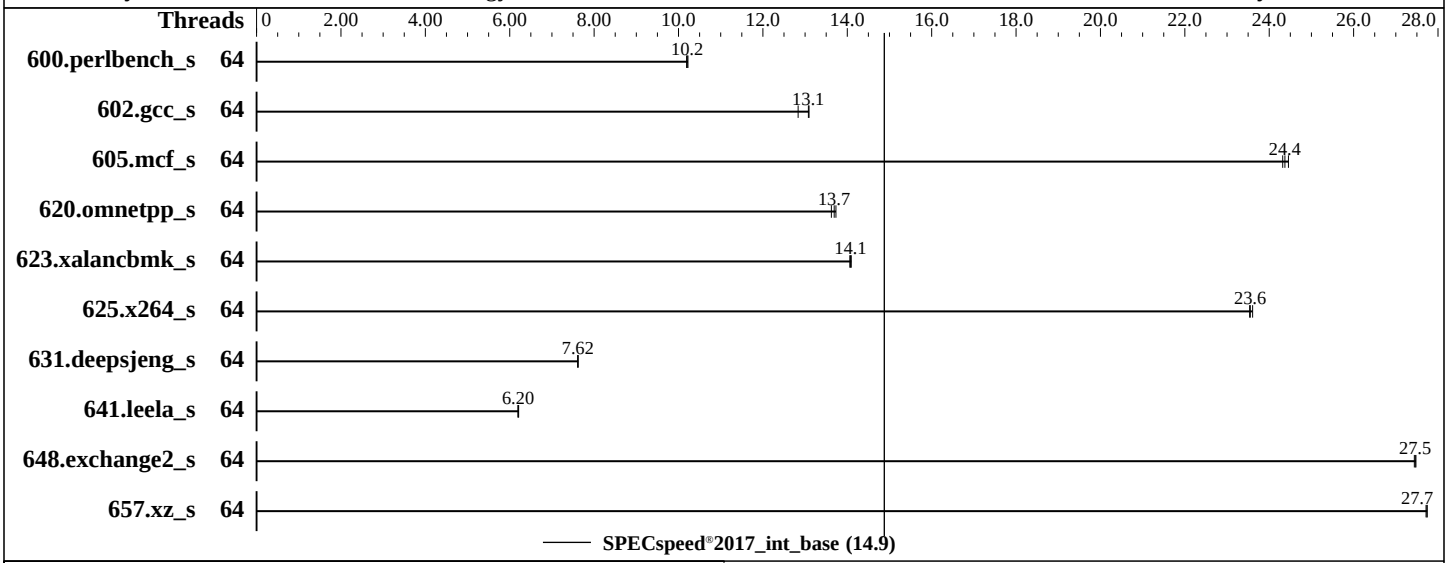
ThinkSystem SD530 V3
(2.80 GHz, Intel Xeon Platinum 8562Y+)

SPECspeed®2017_int_base = 14.9

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:** Mar-2024
**Software Availability:** Dec-2023




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Platinum 8562Y+ |
| Max MHz: | 4100 |
| Nominal: | 2800 |
| Enabled: | 32 cores, 1 chip, 2 threads/core |
| Orderable: | 1 chip |
| Cache L1: | 32 KB I + 48 KB D on chip per core |
| L2: | 2 MB I+D on chip per core |
| L3: | 60 MB I+D on chip per chip |
| Other: | None |
| Memory: | 512 GB (8 x 64 GB 2Rx4 PC5-5600B-R) |
| Storage: | 1 x 480 GB M.2 SATA SSD |
| Other: | Cooling: Air |

## Software

| | |
|---|---|
| OS: | Red Hat Enterprise Linux 9.3 (Plow)<br>Kernel 5.14.0-362.8.1.el9_3.x86_64 |
| Compiler: | C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux;<br>Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux; |
| Parallel: | Yes |
| 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: | 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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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 600.perlbench_s | 64 | **174** | **10.2** | 174 | 10.2 | 174 | 10.2 | | | | | | | |
| 602.gcc_s | 64 | **304** | **13.1** | 304 | 13.1 | 310 | 12.8 | | | | | | | |
| 605.mcf_s | 64 | 193 | 24.5 | 194 | 24.3 | **194** | **24.4** | | | | | | | |
| 620.omnetpp_s | 64 | 120 | 13.6 | 119 | 13.7 | **119** | **13.7** | | | | | | | |
| 623.xalancbmk_s | 64 | 101 | 14.1 | **101** | **14.1** | 101 | 14.1 | | | | | | | |
| 625.x264_s | 64 | 75.0 | 23.5 | **74.9** | **23.6** | 74.7 | 23.6 | | | | | | | |
| 631.deepsjeng_s | 64 | 188 | 7.61 | **188** | **7.62** | 188 | 7.62 | | | | | | | |
| 641.leela_s | 64 | **275** | **6.20** | 275 | 6.20 | 275 | 6.21 | | | | | | | |
| 648.exchange2_s | 64 | **107** | **27.5** | 107 | 27.4 | 107 | 27.5 | | | | | | | |
| 657.xz_s | 64 | 223 | 27.7 | **223** | **27.7** | 223 | 27.7 | | | | | | | |

**SPECspeed®2017_int_base = 14.9**

**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
```

## 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 Thu Mar  7 04:51:51 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 (252-18.el9)
 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.localdomain 5.14.0-362.8.1.el9_3.x86_64 #1 SMP PREEMPT_DYNAMIC Tue Oct 3 11:12:36 EDT 2023
   x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    04:51:51 up 1 day,  4:15,  1 user,  load average: 0.00, 0.00, 0.20
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1      Wed00    7.00s  0.74s  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
```

**(Continued on next page)**

## Platform Notes (Continued)

```
   pending signals                 (-i) 2061820
   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) 2061820
   virtual memory              (kbytes, -v) unlimited
   file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 31
 login -- root
 -bash
 -bash
 -bash
 runcpu --nobuild --action validate --define default-platform-flags -c
   ic2023.2.3-lin-sapphirerapids-speed-20231121.cfg --define cores=32 --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=32 --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/CPU2017.504/templogs/preenv.intspeed.504.0.log --lognum 504.0 --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 8562Y+
    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       : 32
    siblings        : 64
    1 physical ids (chips)
    64 processors (hardware threads)
    physical id 0: core ids 0-31
    physical id 0: apicids 0-63
  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):                             64
  On-line CPU(s) list:                0-63
  Vendor ID:                          GenuineIntel
```

**(Continued on next page)**

## Platform Notes (Continued)

```
  BIOS Vendor ID:                    Intel(R) Corporation
  Model name:                        INTEL(R) XEON(R) PLATINUM 8562Y+
  BIOS Model name:                   INTEL(R) XEON(R) PLATINUM 8562Y+
  CPU family:                        6
  Model:                             207
  Thread(s) per core:                2
  Core(s) per socket:                32
  Socket(s):                         1
  Stepping:                          2
  BogoMIPS:                          5600.00
  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 intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp
                                     ibrs_enhanced tpr_shadow 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 split_lock_detect avx_vnni avx512_bf16
                                     wbnoinvd dtherm ida arat pln pts hfi vnmi 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:                         1.5 MiB (32 instances)
  L1i cache:                         1 MiB (32 instances)
  L2 cache:                          64 MiB (32 instances)
  L3 cache:                          60 MiB (1 instance)
  NUMA node(s):                      1
  NUMA node0 CPU(s):                 0-63
  Vulnerability Gather data sampling: Not affected
  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 / Automatic 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     1.5M   12 Data            1    64        1             64
     L1i       32K       1M    8 Instruction     1    64        1             64
     L2         2M      64M   16 Unified         2  2048        1             64
     L3        60M      60M   15 Unified         3 65536        1             64

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

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## Platform Notes (Continued)

```
  node 0 cpus: 0-63
  node 0 size: 515494 MB
  node 0 free: 513783 MB
  node distances:
  node   0
    0:  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527866208 kB

------------------------------------------------------------
10. who -r
  run-level 3 Mar 6 00:36

------------------------------------------------------------
11. Systemd service manager version: systemd 252 (252-18.el9)
  Default Target  Status
  multi-user      degraded

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

------------------------------------------------------------
13. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                   dbus-broker firewalld getty@ insights-client-boot irqbalance kdump low-memory-monitor
                   mdmonitor microcode nis-domainname rhsmcertd rsyslog rtkit-daemon selinux-autorelabel-mark
                   sshd sssd systemd-boot-update systemd-network-generator udisks2 upower
  enabled-runtime  systemd-remount-fs
  disabled         canberra-system-bootup canberra-system-shutdown canberra-system-shutdown-reboot
                   console-getty cpupower debug-shell dnf-system-upgrade kvm_stat man-db-restart-cache-update
                   nftables pesign 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

------------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd0,gpt3)/boot/vmlinuz-5.14.0-362.8.1.el9_3.x86_64
  root=UUID=be3ee7bd-6dba-4efc-8d0a-4f4f123b4865
  ro
  resume=UUID=8de8c2d1-84ee-4c60-9038-a9e1ae2929c4

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

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing               0
  kernel.randomize_va_space           2
  vm.compaction_proactiveness        20
```

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## Platform Notes (Continued)

```
  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

------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release     Red Hat Enterprise Linux 9.3 (Plow)
  redhat-release Red Hat Enterprise Linux release 9.3 (Plow)
  system-release Red Hat Enterprise Linux release 9.3 (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/sda4      xfs   372G   25G  347G   7% /home

------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        ThinkSystem SD530 V3
    Product Family: ThinkSystem
    Serial:         PASDVMK006

------------------------------------------------------------
22. dmidecode
  Additional information from dmidecode 3.5 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.
```

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## Platform Notes (Continued)

```
  Memory:
    7x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600
    1x 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       | 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

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

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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