# SPEC CPU®2017 Integer Rate Result

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## Lenovo Global Technology

$SPECrate^{®}2017\_int\_base = 741$

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

$SPECrate^{®}2017\_int\_peak = 760$
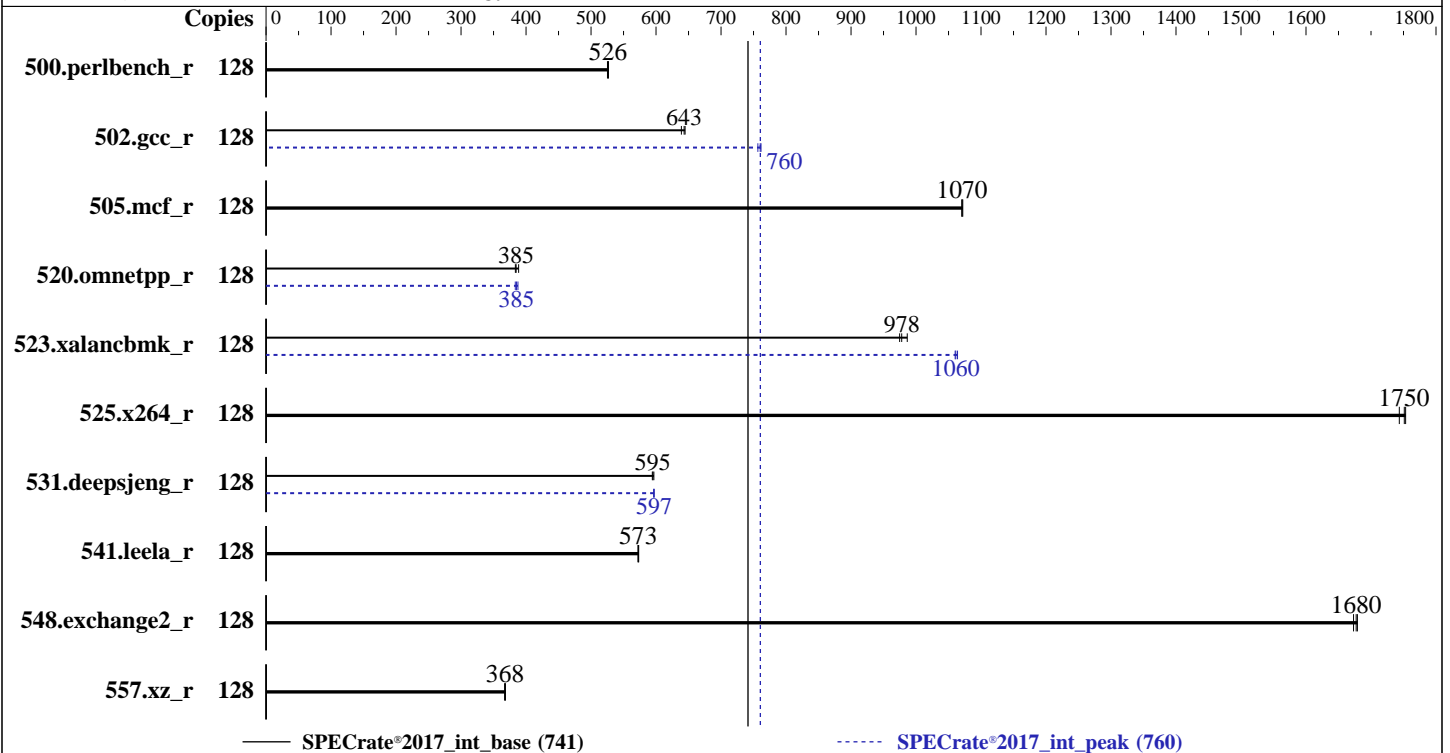
**CPU2017 License:** 9017
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

**Test Date:** Feb-2023
**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022



Copies scale: 0 to 1800

- 500.perlbench_r  128  526
- 502.gcc_r  128  643 / 760
- 505.mcf_r  128  1070
- 520.omnetpp_r  128  385 / 385
- 523.xalancbmk_r  128  978 / 1060
- 525.x264_r  128  1750
- 531.deepsjeng_r  128  595 / 597
- 541.leela_r  128  573
- 548.exchange2_r  128  1680
- 557.xz_r  128  368

SPECrate®2017_int_base (741)          SPECrate®2017_int_peak (760)

## Hardware

CPU Name: AMD EPYC 9354
 Max MHz: 3800
 Nominal: 3250
Enabled: 64 cores, 2 chips, 2 threads/core
Orderable: 1,2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 256 MB I+D on chip per chip,
    32 MB shared / 4 cores
 Other: None
Memory: 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 960 GB SATA SSD
Other: None

## Software

OS: Ubuntu 22.04.1 LTS
   Kernel 5.15.0-43-generic
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version KAE105L 1.20 released Dec-2022
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: None
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 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 500.perlbench_r | 128 | 388 | 525 | **387** | **526** | 387 | 527 | 128 | 388 | 525 | **387** | **526** | 387 | 527 |
| 502.gcc_r | 128 | 281 | 645 | **282** | **643** | 284 | 639 | 128 | **238** | **760** | 240 | 757 | 238 | 762 |
| 505.mcf_r | 128 | 193 | 1070 | **193** | **1070** | 193 | 1070 | 128 | 193 | 1070 | **193** | **1070** | 193 | 1070 |
| 520.omnetpp_r | 128 | 438 | 384 | **436** | **385** | 432 | 389 | 128 | **436** | **385** | 433 | 388 | 438 | 383 |
| 523.xalancbmk_r | 128 | 139 | 975 | 137 | 987 | **138** | **978** | 128 | 127 | 1060 | 127 | 1060 | **127** | **1060** |
| 525.x264_r | 128 | **128** | **1750** | 128 | 1750 | 129 | 1740 | 128 | **128** | **1750** | 128 | 1750 | 129 | 1740 |
| 531.deepsjeng_r | 128 | 247 | 594 | **246** | **595** | 246 | 597 | 128 | **246** | **597** | 246 | 596 | 246 | 597 |
| 541.leela_r | 128 | 370 | 572 | 370 | 573 | **370** | **573** | 128 | 370 | 572 | 370 | 573 | **370** | **573** |
| 548.exchange2_r | 128 | 200 | 1680 | 200 | 1670 | **200** | **1680** | 128 | 200 | 1680 | 200 | 1670 | **200** | **1680** |
| 557.xz_r | 128 | 375 | 368 | **376** | **368** | 377 | 367 | 128 | 375 | 368 | **376** | **368** | 377 | 367 |
| **SPECrate®2017_int_base =** | **741** | | | | | | | | | | | | | |
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Compiler Notes

```
The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/
```

## Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.
```

## Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.
```

**(Continued on next page)**

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## Operating System Notes (Continued)

```
To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

## Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/cpu2017-1.1.9-amd-aocc400-genoa-B1c/amd_rate_aocc400_genoa_B_lib/
      lib:/home/cpu2017-1.1.9-amd-aocc400-genoa-B1c/amd_rate_aocc400_genoa_B_l
      ib/lib32:"
MALLOC_CONF = "retain:true"

Environment variables set by runcpu during the 523.xalancbmk_r peak run:
MALLOC_CONF = "thp:never"
```

## General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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
NUMA Nodes per Socket set to NPS4

 Sysinfo program /home/cpu2017-1.1.9-amd-aocc400-genoa-B1c/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on perf Mon Jun 27 18:41:57 2022

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

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## Platform Notes (Continued)

```
---------------------------------------------------------------
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 (249.11-0ubuntu3.4)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 16. /sys/kernel/mm/transparent_hugepage
 17. /sys/kernel/mm/transparent_hugepage/khugepaged
 18. OS release
 19. Disk information
 20. /sys/devices/virtual/dmi/id
 21. dmidecode
 22. BIOS
---------------------------------------------------------------


---------------------------------------------------------------
1. uname -a
  Linux perf 5.15.0-43-generic #46-Ubuntu SMP Tue Jul 12 10:30:17 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux


---------------------------------------------------------------
2. w
   18:41:57 up 13 min,  1 user,  load average: 0.15, 0.10, 0.12
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1     -                18:39    2:16   1.13s  0.12s /bin/bash ./amd_rate_aocc400_genoa_B1.sh

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


---------------------------------------------------------------
4. ulimit -a
  time(seconds)        unlimited
  file(blocks)         unlimited
  data(kbytes)         unlimited
  stack(kbytes)        unlimited
```

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## Platform Notes (Continued)

```
   coredump(blocks)       0
   memory(kbytes)         unlimited
   locked memory(kbytes)  2097152
   process                3094274
   nofiles                1024
   vmemory(kbytes)        unlimited
   locks                  unlimited
   rtprio                 0


  ------------------------------------------------------------
 5. sysinfo process ancestry
  /sbin/init
  /bin/login -p --
  -bash
  /bin/bash ./run_SR645V3_genoa_rxy.sh
  /bin/bash ./Run025-compliant-amd-rateint.sh
  python3 ./run_amd_rate_aocc400_genoa_B1.py
  /bin/bash ./amd_rate_aocc400_genoa_B1.sh
  runcpu --config amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 intrate
 runcpu --configfile amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower --runmode
    rate --tune base:peak --size test:train:refrate intrate --nopreenv --note-preenv --logfile
     $SPEC/tmp/CPU2017.017/templogs/preenv.intrate.017.0.log --lognum 017.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-amd-aocc400-genoa-B1c


  ------------------------------------------------------------
 6. /proc/cpuinfo
    model name      : AMD EPYC 9354 32-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 25
    model           : 17
    stepping        : 1
    microcode       : 0xa101111
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 3584 4K pages
    cpu cores       : 32
    siblings        : 64
    2 physical ids (chips)
    128 processors (hardware threads)
    physical id 0: core ids 0-3,8-11,16-19,24-27,32-35,40-43,48-51,56-59
    physical id 1: core ids 0-3,8-11,16-19,24-27,32-35,40-43,48-51,56-59
    physical id 0: apicids 0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119
    physical id 1: apicids 128-135,144-151,160-167,176-183,192-199,208-215,224-231,240-247
  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 2.37.2:
   Architecture:            x86_64
   CPU op-mode(s):          32-bit, 64-bit
   Address sizes:           52 bits physical, 57 bits virtual
   Byte Order:              Little Endian
   CPU(s):                  128
   On-line CPU(s) list:     0-127
   Vendor ID:               AuthenticAMD
   Model name:              AMD EPYC 9354 32-Core Processor
   CPU family:              25
   Model:                   17
   Thread(s) per core:      2
   Core(s) per socket:      32
   Socket(s):               2
   Stepping:                1
   Frequency boost:         enabled
   CPU max MHz:             3800.0000
   CPU min MHz:             400.0000
   BogoMIPS:                6490.30
  Flags:                    fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                            clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                            constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl
                            pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
                            popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy
                            abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext
                            perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3
                            invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1
                            avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                            avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt
                            xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                            avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat npt
                            lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
                            pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi
                            umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                            avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
   Virtualization:          AMD-V
   L1d cache:               2 MiB (64 instances)
   L1i cache:               2 MiB (64 instances)
   L2 cache:                64 MiB (64 instances)
   L3 cache:                512 MiB (16 instances)
   NUMA node(s):            8
   NUMA node0 CPU(s):       0-7,64-71
   NUMA node1 CPU(s):       8-15,72-79
   NUMA node2 CPU(s):       16-23,80-87
   NUMA node3 CPU(s):       24-31,88-95
```

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```
   NUMA node4 CPU(s):              32-39,96-103
   NUMA node5 CPU(s):              40-47,104-111
   NUMA node6 CPU(s):              48-55,112-119
   NUMA node7 CPU(s):              56-63,120-127
   Vulnerability Itlb multihit:    Not affected
   Vulnerability L1tf:             Not affected
   Vulnerability Mds:              Not affected
   Vulnerability Meltdown:         Not affected
   Vulnerability Mmio stale data:  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; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, 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       32K       2M   8 Data            1     64        1              64
     L1i       32K       2M   8 Instruction     1     64        1              64
     L2         1M      64M   8 Unified         2   2048        1              64
     L3        32M     512M  16 Unified         3  32768        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: 0-7,64-71
   node 0 size: 96505 MB
   node 0 free: 95707 MB
   node 1 cpus: 8-15,72-79
   node 1 size: 96719 MB
   node 1 free: 96025 MB
   node 2 cpus: 16-23,80-87
   node 2 size: 96752 MB
   node 2 free: 96070 MB
   node 3 cpus: 24-31,88-95
   node 3 size: 96752 MB
   node 3 free: 95980 MB
   node 4 cpus: 32-39,96-103
   node 4 size: 96752 MB
   node 4 free: 96162 MB
   node 5 cpus: 40-47,104-111
   node 5 size: 96752 MB
   node 5 free: 96026 MB
   node 6 cpus: 48-55,112-119
   node 6 size: 96752 MB
```

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## Platform Notes (Continued)

```
   node 6 free: 96156 MB
   node 7 cpus: 56-63,120-127
   node 7 size: 96689 MB
   node 7 free: 96095 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  12  12  12  32  32  32  32
     1:  12  10  12  12  32  32  32  32
     2:  12  12  10  12  32  32  32  32
     3:  12  12  12  10  32  32  32  32
     4:  32  32  32  32  10  12  12  12
     5:  32  32  32  32  12  10  12  12
     6:  32  32  32  32  12  12  10  12
     7:  32  32  32  32  12  12  12  10


   ----------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       792246620 kB


   ----------------------------------------------------------------
10. who -r
   run-level 5 Jun 27 18:29


   ----------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.4)
   Default Target  Status
   graphical        running


   ----------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          ModemManager apparmor blk-availability cloud-config cloud-final cloud-init
                    cloud-init-local console-setup cron dmesg e2scrub_reap finalrd getty@ gpu-manager
                    grub-common grub-initrd-fallback irqbalance keyboard-setup lvm2-monitor lxd-agent
                    multipathd networkd-dispatcher open-iscsi open-vm-tools pollinate rsyslog secureboot-db
                    setvtrgb snapd ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
                    systemd-resolved systemd-timesyncd thermald ua-reboot-cmds ubuntu-advantage udisks2 ufw
                    unattended-upgrades vgauth
   enabled-runtime  netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
   disabled         console-getty debug-shell ipmievd iscsid nftables rsync serial-getty@
                    systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                    systemd-time-wait-sync upower
   generated        apport openipmi
   indirect         uuidd
   masked           cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
                    x11-common
```

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## Platform Notes (Continued)

```
-------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.15.0-43-generic
   root=UUID=7616761d-0c8a-469d-9659-4d1de0180e8a
   ro


-------------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 0:
     current policy: frequency should be within 400 MHz and 3.80 GHz.
                     The governor "performance" may decide which speed to use
                     within this range.
   boost state support:
     Supported: yes
     Active: yes
     Boost States: 0
     Total States: 3
     Pstate-P0:  3250MHz


-------------------------------------------------------------
15. sysctl
   kernel.numa_balancing           1
   kernel.randomize_va_space       0
   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                  8
   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                   1
   vm.watermark_boost_factor   15000
   vm.watermark_scale_factor      10
   vm.zone_reclaim_mode            1


-------------------------------------------------------------
16. /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
```

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## Platform Notes (Continued)

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


   ----------------------------------------------------------------
   18. OS release
     From /etc/*-release /etc/*-version
     os-release Ubuntu 22.04.1 LTS


   ----------------------------------------------------------------
   19. Disk information
   SPEC is set to: /home/cpu2017-1.1.9-amd-aocc400-genoa-B1c
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sda2       ext4  878G   60G  773G   8% /


   ----------------------------------------------------------------
   20. /sys/devices/virtual/dmi/id
       Vendor:         Lenovo
       Product:        ThinkSystem SR645 V3 MB,Genoa,DDR5,Oahu,1U
       Product Family: ThinkSystem
       Serial:         1234567890


   ----------------------------------------------------------------
   21. 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:
       7x SK Hynix HMCG88AEBRA115N 32 GB 2 rank 4800
       17x SK Hynix HMCG88AEBRA168N 32 GB 2 rank 4800



   ----------------------------------------------------------------
   22. BIOS
   (This section combines info from /sys/devices and dmidecode.)
       BIOS Vendor:       Lenovo
       BIOS Version:      KAE105L-1.20
       BIOS Date:         12/29/2022
       BIOS Revision:     1.20
```

**(Continued on next page)**

## Lenovo Global Technology

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

SPECrate®2017_int_base = 741

SPECrate®2017_int_peak = 760

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

**Test Date:** Feb-2023
**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022

## Platform Notes (Continued)

```
     Firmware Revision: 1.20
```

## Compiler Version Notes

```
==============================================================================
 C       | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
 C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
 C       | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
 C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------
```

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## Lenovo Global Technology

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**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022

## Compiler Version Notes (Continued)

```
==============================================================================
C++      | 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++      | 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
```

**(Continued on next page)**

# SPEC CPU®2017 Integer Rate Result

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## Lenovo Global Technology

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

SPECrate®2017_int_base = 741

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**Test Date:** Feb-2023
**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022

## Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

## Base Portability Flags

500.perlbench_r: `-DSPEC_LINUX_X64 -DSPEC_LP64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LINUX -DSPEC_LP64`
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:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc
```

**(Continued on next page)**

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

## Lenovo Global Technology

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

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**Test Date:** Feb-2023
**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022

# Base Optimization Flags (Continued)

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -z muldefs -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
-lamdalloc-ext
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -z muldefs -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc
```

# Base Other Flags

C benchmarks:
```
-Wno-unused-command-line-argument
```

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

Fortran benchmarks:
```
-Wno-unused-command-line-argument
```

# Peak Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

Fortran benchmarks:
```
flang
```

## Lenovo Global Technology

ThinkSystem SR645 V3
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**Tested by:** Lenovo Global Technology

**Test Date:** Feb-2023
**Hardware Availability:** Feb-2023
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# Peak Portability Flags

500.perlbench_r: `-DSPEC_LINUX_X64 -DSPEC_LP64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LINUX -DSPEC_LP64`
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`

# Peak Optimization Flags

C benchmarks:

500.perlbench_r: `basepeak = yes`

502.gcc_r: `-m32 -flto -z muldefs -Ofast -march=znver4`
`-fveclib=AMDLIBM -ffast-math -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`
`-mllvm -reduce-array-computations=3 -zopt -fgnu89-inline`
`-lamdalloc`

505.mcf_r: `basepeak = yes`

525.x264_r: `basepeak = yes`

557.xz_r: `basepeak = yes`

C++ benchmarks:

520.omnetpp_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`
`-march=znver4 -fveclib=AMDLIBM -ffast-math`
`-finline-aggressive -mllvm -unroll-threshold=100`
`-mllvm -reduce-array-computations=3 -zopt`
`-fvirtual-function-elimination -fvisibility=hidden`
`-lamdlibm -lamdalloc-ext`

523.xalancbmk_r: `-m32 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-do-block-reorder=aggressive`
`-fno-loop-reroll -Ofast -march=znver4 -fveclib=AMDLIBM`

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## Lenovo Global Technology

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

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**Hardware Availability:** Feb-2023
**Software Availability:** Nov-2022

# Peak Optimization Flags (Continued)

523.xalancbmk_r (continued):
```
-ffast-math -finline-aggressive
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-lamdalloc-ext
```

531.deepsjeng_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -lamdalloc-ext
```

541.leela_r: `basepeak = yes`

Fortran benchmarks:

548.exchange2_r: `basepeak = yes`

# Peak Other Flags

C benchmarks (except as noted below):
`-Wno-unused-command-line-argument`

502.gcc_r: `-L/usr/lib32 -Wno-unused-command-line-argument`
`-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32`

C++ benchmarks (except as noted below):
`-Wno-unused-command-line-argument`

523.xalancbmk_r: `-L/usr/lib32 -Wno-unused-command-line-argument`
`-L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32`

Fortran benchmarks:
`-Wno-unused-command-line-argument`

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-Genoa-Q.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html

# SPEC CPU®2017 Integer Rate Result

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## Lenovo Global Technology

ThinkSystem SR645 V3
(3.25 GHz,AMD EPYC 9354)

SPECrate®2017_int_base = 741

SPECrate®2017_int_peak = 760

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

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**Hardware Availability:** Feb-2023

**Software Availability:** Nov-2022

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-Genoa-Q.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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