SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SR635 V3
(2.30 GHz, AMD EPYC 9645)

$SPECrate®2017\_int\_base = 1000$

$SPECrate®2017\_int\_peak = 1030$

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

Test Date: Feb-2025
Hardware Availability: Feb-2025
Software Availability: Oct-2024

Copies — scale 0 to 2750

- 500.perlbench_r 192 base 729
- 502.gcc_r 192 base 651, peak 835
- 505.mcf_r 192 base 1420, peak 1430
- 520.omnetpp_r 192 base 437
- 523.xalancbmk_r 192 base 1610
- 525.x264_r 192 base 2350
- 531.deepsjeng_r 192 base 901
- 541.leela_r 192 base 793, peak 794
- 548.exchange2_r 192 base 2720, peak 2730
- 557.xz_r 192 base 461

—— SPECrate®2017_int_base (1000)   ······ SPECrate®2017_int_peak (1030)

Hardware

CPU Name: AMD EPYC 9645
 Max MHz: 3700
 Nominal: 2300
Enabled: 96 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 48 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 / 12 cores
 Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC5-6400B-R, running at 6000)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: Air

Software

OS: Red Hat Enterprise Linux 9.4 (Plow)
  Kernel 5.14.0-427.13.1.el9_4.x86_64
Compiler: C/C++/Fortran: Version 5.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version KAE131I 5.30 released Dec-2024
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage

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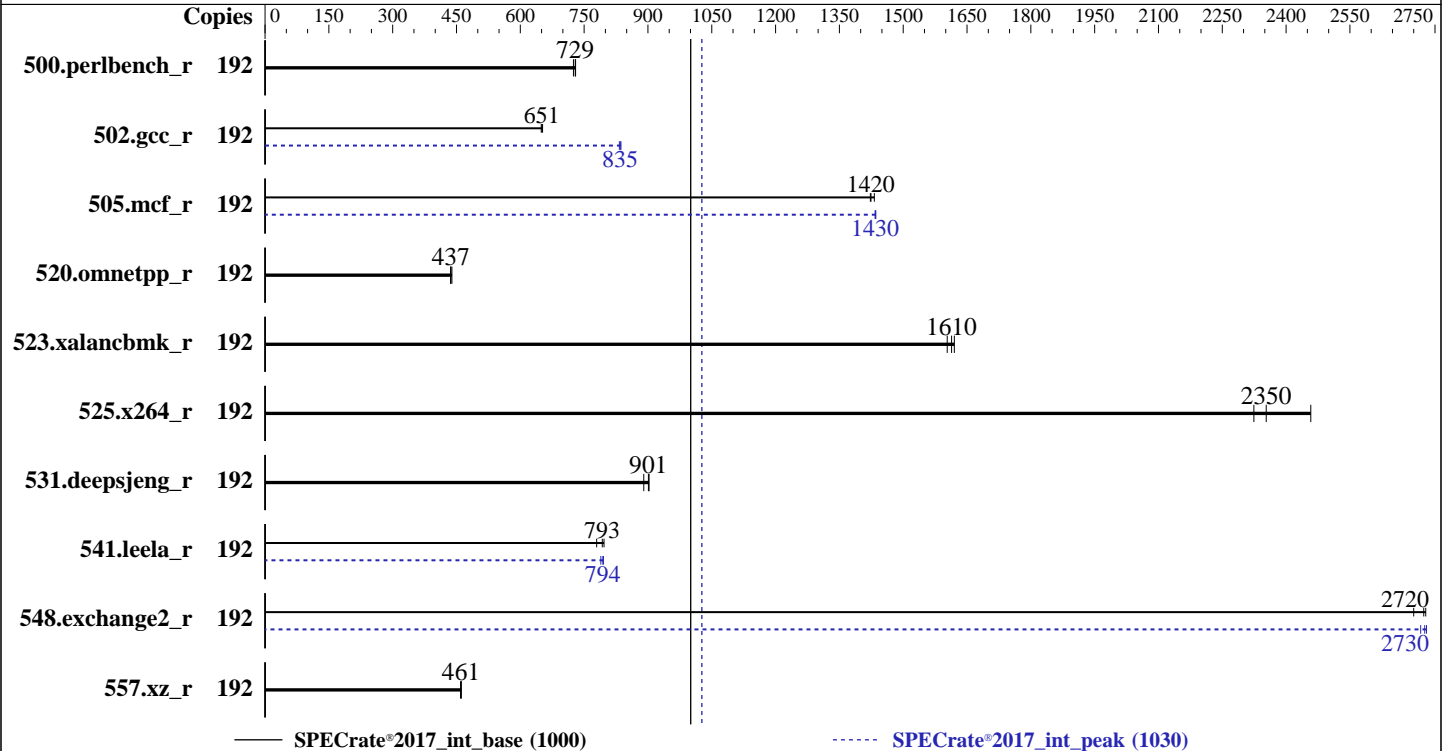
SPECrate®2017_int_peak = 1030

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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	192	419	730	**419**	**729**	422	725	192	419	730	**419**	**729**	422	725
502.gcc_r	192	417	652	**418**	**651**	419	649	192	325	837	**326**	**835**	326	833
505.mcf_r	192	217	1430	218	1420	**218**	**1420**	192	216	1430	**216**	**1430**	216	1440
520.omnetpp_r	192	574	439	**577**	**437**	578	436	192	574	439	**577**	**437**	578	436
523.xalancbmk_r	192	**126**	**1610**	126	1600	125	1620	192	**126**	**1610**	126	1600	125	1620
525.x264_r	192	145	2320	**143**	**2350**	137	2460	192	145	2320	**143**	**2350**	137	2460
531.deepsjeng_r	192	247	890	**244**	**901**	244	903	192	247	890	**244**	**901**	244	903
541.leela_r	192	408	779	399	797	**401**	**793**	192	403	789	**400**	**794**	400	795
548.exchange2_r	192	186	2700	184	2730	**185**	**2720**	192	184	2730	**185**	**2730**	185	2720
557.xz_r	192	**450**	**461**	451	460	450	461	192	**450**	**461**	451	460	450	461
SPECrate®2017_int_base =	**1000**													
SPECrate®2017_int_peak =	**1030**													

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.

To enable Transparent Hugepages (THP) for all allocations:
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

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Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
    "/home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2/amd_rate_aocc500_znver5_A_lib/lib:/home/cpu2017-1.1.9-amd
    -aocc500_znver5_A1.2/amd_rate_aocc500_znver5_A_lib/lib32:"
MALLOC_CONF = "retain:true"
```

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:
Choose 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-aocc500_znver5_A1.2/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sat Feb 22 09:12:34 2025

 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 (252-32.el9_4)
 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
 ------------------------------------------------------------
```

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Platform Notes (Continued)

```
    ------------------------------------------------------------
    1. uname -a
       Linux localhost.localdomain 5.14.0-427.13.1.el9_4.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 10 10:29:16 EDT
       2024 x86_64 x86_64 x86_64 GNU/Linux

    ------------------------------------------------------------
    2. w
        09:12:34 up 3 min,  0 users,  load average: 0.05, 0.14, 0.07
       USER     TTY         LOGIN@   IDLE   JCPU   PCPU WHAT

    ------------------------------------------------------------
    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
       pending signals                  (-i) 1545795
       max locked memory           (kbytes, -l) 2097152
       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) 1545795
       virtual memory              (kbytes, -v) unlimited
       file locks                       (-x) unlimited

    ------------------------------------------------------------
    5. sysinfo process ancestry
     /usr/lib/systemd/systemd --switched-root --system --deserialize 31
     sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
     sshd: root [priv]
     sshd: root@notty
     /bin/bash ./02.remote_local_SPECcpu_1.01.sh
     /bin/bash ./Run025-compliant-amd-rateint.sh
     python3 ./run_amd_rate_aocc500_znver5_A1.py
     /bin/bash ./amd_rate_aocc500_znver5_A1.sh
     runcpu --config amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 intrate
     runcpu --configfile amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 --nopower
       --runmode rate --tune base:peak --size test:train:refrate intrate --nopreenv --note-preenv --logfile
       $SPEC/tmp/CPU2017.301/templogs/preenv.intrate.301.0.log --lognum 301.0 --from_runcpu 2
     specperl $SPEC/bin/sysinfo
     $SPEC = /home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2

    ------------------------------------------------------------
    6. /proc/cpuinfo
         model name      : AMD EPYC 9645 96-Core Processor
         vendor_id       : AuthenticAMD
         cpu family      : 26
         model           : 17
         stepping        : 0
         microcode       : 0xb101025
```

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Platform Notes (Continued)

```
     bugs              : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
     TLB size          : 192 4K pages
     cpu cores         : 96
     siblings          : 192
     1 physical ids (chips)
     192 processors (hardware threads)
     physical id 0: core ids 0-11,16-27,32-43,48-59,64-75,80-91,96-107,112-123
     physical id 0: apicids 0-23,32-55,64-87,96-119,128-151,160-183,192-215,224-247
  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:           52 bits physical, 57 bits virtual
    Byte Order:              Little Endian
    CPU(s):                  192
    On-line CPU(s) list:     0-191
    Vendor ID:               AuthenticAMD
    BIOS Vendor ID:          Advanced Micro Devices, Inc.
    Model name:              AMD EPYC 9645 96-Core Processor
    BIOS Model name:         AMD EPYC 9645 96-Core Processor
    CPU family:              26
    Model:                   17
    Thread(s) per core:      2
    Core(s) per socket:      96
    Socket(s):               1
    Stepping:                0
    BogoMIPS:                4592.98
    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 amd_lbr_v2 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 hw_pstate ssbd mba perfmon_v2 ibrs ibpb stibp
                             ibrs_enhanced vmmcall fsgsbase tsc_adjust 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
                             avx_vnni 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 x2avic
                             v_spec_ctrl vnmi avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes
                             vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid
                             bus_lock_detect movdiri movdir64b overflow_recov succor smca fsrm
                             avx512_vp2intersect flush_l1d debug_swap
    Virtualization:          AMD-V
    L1d cache:               4.5 MiB (96 instances)
    L1i cache:               3 MiB (96 instances)
    L2 cache:                96 MiB (96 instances)
    L3 cache:                256 MiB (8 instances)
    NUMA node(s):            4
    NUMA node0 CPU(s):       0-23,96-119
    NUMA node1 CPU(s):       24-47,120-143
    NUMA node2 CPU(s):       48-71,144-167
```

(Continued on next page)

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Platform Notes (Continued)

```
  NUMA node3 CPU(s):                 72-95,168-191
  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 rstack overflow: 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, STIBP
                                     always-on, RSB filling, PBRSB-eIBRS Not affected
  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        1M      96M   16 Unified         2  1024        1              64
      L3       32M     256M   16 Unified         3 32768        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: 0-23,96-119
  node 0 size: 96336 MB
  node 0 free: 95603 MB
  node 1 cpus: 24-47,120-143
  node 1 size: 96714 MB
  node 1 free: 95639 MB
  node 2 cpus: 48-71,144-167
  node 2 size: 96755 MB
  node 2 free: 95974 MB
  node 3 cpus: 72-95,168-191
  node 3 size: 96681 MB
  node 3 free: 95970 MB
  node distances:
  node   0   1   2   3
    0:  10  12  12  12
    1:  12  10  12  12
    2:  12  12  10  12
    3:  12  12  12  10

  ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       395763712 kB

  ------------------------------------------------------------
10. who -r
   run-level 3 Feb 22 09:10

  ------------------------------------------------------------
11. Systemd service manager version: systemd 252 (252-32.el9_4)
   Default Target  Status
   multi-user      degraded

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

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Platform Notes (Continued)

```
  12. Failed units, from systemctl list-units --state=failed
       UNIT                            LOAD   ACTIVE SUB    DESCRIPTION
     * NetworkManager-wait-online.service loaded failed failed Network Manager Wait Online

     ----------------------------------------------------------------
  13. Services, from systemctl list-unit-files
       STATE            UNIT FILES
       enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd chronyd 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
                        chrony-wait chronyd-restricted console-getty cpupower debug-shell dnf-system-upgrade
                        hwloc-dump-hwdata 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=(hd3,gpt3)/boot/vmlinuz-5.14.0-427.13.1.el9_4.x86_64
       root=UUID=273c79f3-13a9-4ae6-9c36-e82799318ef8
       ro
       resume=UUID=19c8733f-555f-4142-8f61-7554d0dc64ae

     ----------------------------------------------------------------
  15. cpupower frequency-info
       analyzing CPU 29:
         Unable to determine current policy
         boost state support:
           Supported: yes
           Active: yes
           Boost States: 0
           Total States: 3
           Pstate-P0:  40800MHz

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

(Continued on next page)

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Platform Notes (Continued)

```
    -----------------------------------------------------------
    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 9.4 (Plow)
      redhat-release Red Hat Enterprise Linux release 9.4 (Plow)
      system-release Red Hat Enterprise Linux release 9.4 (Plow)


    -----------------------------------------------------------
    20. Disk information
    SPEC is set to: /home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2
      Filesystem     Type  Size  Used Avail Use% Mounted on
      /dev/sda4      xfs   372G  106G  266G  29% /home


    -----------------------------------------------------------
    21. /sys/devices/virtual/dmi/id
        Vendor:         Lenovo
        Product:        ThinkSystem SR635V3
        Product Family: ThinkSystem
        Serial:         1234567890


    -----------------------------------------------------------
    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.
      Memory:
        12x SK Hynix HMCG88AHBRA290N 32 GB 2 rank 6400, configured at 6000



    -----------------------------------------------------------
    23. BIOS
    (This section combines info from /sys/devices and dmidecode.)
      BIOS Vendor:       Lenovo
      BIOS Version:      KAE131I-5.30
      BIOS Date:         12/17/2024
      BIOS Revision:     5.30
      Firmware Revision: 54.6
```

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Compiler Version Notes

```
==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/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 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/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 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
         | 541.leela_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------
```

SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SR635 V3
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_int_base = 1000

SPECrate®2017_int_peak = 1030

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

Test Date: Feb-2025
Hardware Availability: Feb-2025
Software Availability: Oct-2024

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 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-Wl,-mllvm -Wl,-extra-inliner -z muldefs -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc-ext -ldl
```

C++ benchmarks:
```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=advanced -z muldefs -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -flto -mllvm -unroll-threshold=100
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -fno-PIE -no-pie
```

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-fvirtual-function-elimination -fvisibility=hidden
-mllvm -do-block-reorder=advanced -lamdlibm -lflang -lamdalloc-ext
-ldl
```

Fortran benchmarks:
```
-m64 -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=znver5
-fveclib=AMDLIBM -ffast-math -flto
-fepilog-vectorization-of-inductions -mllvm -optimize-strided-mem-cost
-floop-transform -mllvm -unroll-aggressive -mllvm -unroll-threshold=500
-lamdlibm -lflang -lamdalloc -ldl
```

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
```

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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 -Wl,-mllvm -Wl,-ldist-scalar-expand`
`-fenable-aggressive-gather -Wl,-mllvm -Wl,-extra-inliner`
`-z muldefs -Ofast -march=znver5 -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: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-extra-inliner -Ofast -march=znver5`
`-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`
`-mllvm -reduce-array-computations=3 -zopt -lamdlibm`
`-lflang -lamdalloc-ext -ldl`

525.x264_r: `basepeak = yes`

557.xz_r: `basepeak = yes`

C++ benchmarks:

520.omnetpp_r: `basepeak = yes`

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Peak Optimization Flags (Continued)

523.xalancbmk_r: `basepeak = yes`

531.deepsjeng_r: `basepeak = yes`

541.leela_r: `-m64 -std=c++14`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-do-block-reorder=advanced -Ofast`
`-march=znver5 -fveclib=AMDLIBM -ffast-math -flto`
`-mllvm -unroll-threshold=100`
`-mllvm -reduce-array-computations=3 -zopt -fno-PIE`
`-no-pie -fvirtual-function-elimination -fvisibility=hidden`
`-mllvm -do-block-reorder=advanced -lamdlibm -lflang`
`-lamdalloc-ext -ldl`

Fortran benchmarks:
`-m64 -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 -O3 -march=znver5 -fveclib=AMDLIBM`
`-ffast-math -flto -fepilog-vectorization-of-inductions`
`-mllvm -optimize-strided-mem-cost -floop-transform`
`-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm`
`-lflang -lamdalloc -ldl`

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/v119/aocc5/1316/amd_rate_aocc500_znver5_A_lib/lib32`

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

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-Turin-E.html
http://www.spec.org/cpu2017/flags/aocc500-flags.2024-10-10.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-Turin-E.xml
http://www.spec.org/cpu2017/flags/aocc500-flags.2024-10-10.xml

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

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