SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR635 V3
(2.10 GHz, AMD EPYC 9845)

SPECrate®2017_int_base = 1260
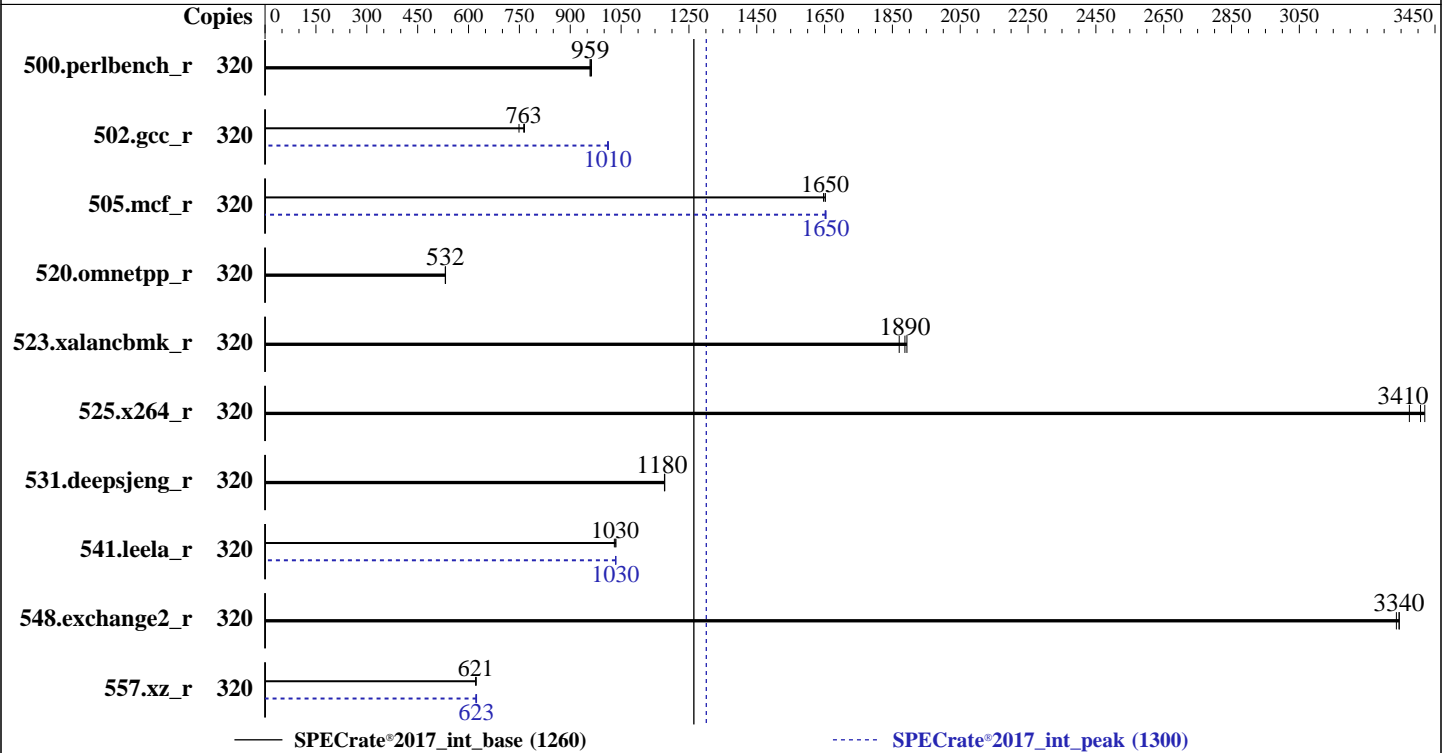
SPECrate®2017_int_peak = 1300

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

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

Benchmark results graph. Copies = 320 for all benchmarks.

Benchmark	Base	Peak
500.perlbench_r	959	
502.gcc_r	763	1010
505.mcf_r	1650	1650
520.omnetpp_r	532	
523.xalancbmk_r	1890	
525.x264_r	3410	
531.deepsjeng_r	1180	
541.leela_r	1030	1030
548.exchange2_r	3340	
557.xz_r	621	623

—— SPECrate®2017_int_base (1260)   ------ SPECrate®2017_int_peak (1300)

Hardware

CPU Name: AMD EPYC 9845
Max MHz: 3700
Nominal: 2100
Enabled: 160 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: 320 MB I+D on chip per chip,
32 MB shared / 16 cores
Other: None
Memory: 768 GB (12 x 64 GB 2Rx4 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 KAE131A 5.30 released Oct-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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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	320	529	963	**531**	**959**	531	959	320	529	963	**531**	**959**	531	959
502.gcc_r	320	605	749	592	765	**594**	**763**	320	447	1010	449	1010	**448**	**1010**
505.mcf_r	320	**313**	**1650**	313	1650	314	1650	320	313	1650	**313**	**1650**	313	1650
520.omnetpp_r	320	790	532	**789**	**532**	789	532	320	790	532	**789**	**532**	789	532
523.xalancbmk_r	320	**179**	**1890**	181	1870	179	1890	320	**179**	**1890**	181	1870	179	1890
525.x264_r	320	166	3370	164	3420	**164**	**3410**	320	166	3370	164	3420	**164**	**3410**
531.deepsjeng_r	320	**311**	**1180**	311	1180	311	1180	320	**311**	**1180**	311	1180	311	1180
541.leela_r	320	514	1030	**513**	**1030**	512	1030	320	513	1030	512	1030	**513**	**1030**
548.exchange2_r	320	**251**	**3340**	251	3340	251	3340	320	**251**	**3340**	251	3340	251	3340
557.xz_r	320	557	621	555	623	**556**	**621**	320	554	624	**555**	**623**	556	621
SPECrate®2017_int_base =	**1260**													
SPECrate®2017_int_peak =	**1300**													

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/amd_rate_aocc500_znver5_A_lib/lib:/home/cpu2017-1.1.9-amd-a
    occ500_znver5_A1/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
NUMA Nodes per Socket set to NPS2
L1 Stride Prefetcher set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-amd-aocc500_znver5_A1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sat Nov 30 18:43:59 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 (252-32.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
```

(Continued on next page)

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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
           18:43:59 up 3 min,  0 users,  load average: 0.03, 0.12, 0.06
          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) 3093632
          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) 3093632
          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/CPU2017.115/templogs/preenv.intrate.115.0.log --lognum 115.0 --from_runcpu 2
         specperl $SPEC/bin/sysinfo
        $SPEC = /home/cpu2017-1.1.9-amd-aocc500_znver5_A1

        ----------------------------------------------------------
        6. /proc/cpuinfo
            model name      : AMD EPYC 9845 160-Core Processor
            vendor_id       : AuthenticAMD
            cpu family      : 26
            model           : 17
            stepping        : 0
```

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Platform Notes (Continued)

```
      microcode       : 0xb101021
      bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
      TLB size        : 192 4K pages
      cpu cores       : 160
      siblings        : 320
      1 physical ids (chips)
      320 processors (hardware threads)
      physical id 0: core ids 0-159
      physical id 0: apicids 0-319
   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):                   320
     On-line CPU(s) list:      0-319
     Vendor ID:                AuthenticAMD
     BIOS Vendor ID:           Advanced Micro Devices, Inc.
     Model name:               AMD EPYC 9845 160-Core Processor
     BIOS Model name:          AMD EPYC 9845 160-Core Processor
     CPU family:               26
     Model:                    17
     Thread(s) per core:       2
     Core(s) per socket:       160
     Socket(s):                1
     Stepping:                 0
     BogoMIPS:                 4193.72
     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:                7.5 MiB (160 instances)
     L1i cache:                5 MiB (160 instances)
     L2 cache:                 160 MiB (160 instances)
     L3 cache:                 320 MiB (10 instances)
     NUMA node(s):             2
     NUMA node0 CPU(s):        0-79,160-239
     NUMA node1 CPU(s):        80-159,240-319
```

(Continued on next page)

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Platform Notes (Continued)

```
  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     7.5M   12 Data            1    64        1             64
     L1i       32K       5M    8 Instruction     1    64        1             64
     L2         1M     160M   16 Unified         2  1024        1             64
     L3        32M     320M   16 Unified         3 32768        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0-79,160-239
  node 0 size: 386504 MB
  node 0 free: 383998 MB
  node 1 cpus: 80-159,240-319
  node 1 size: 386943 MB
  node 1 free: 384834 MB
  node distances:
  node   0   1
    0:  10  12
    1:  12  10

------------------------------------------------------------
9. /proc/meminfo
  MemTotal:       792010048 kB

------------------------------------------------------------
10. who -r
  run-level 3 Nov 30 18:41

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

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

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Platform Notes (Continued)

```
                   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 237:
       Unable to determine current policy
       boost state support:
         Supported: yes
         Active: yes
         Boost States: 0
         Total States: 3
         Pstate-P0:  32800MHz

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

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

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Platform Notes (Continued)

```
   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
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/sda4      xfs   372G  101G  272G  27% /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:
       1x Samsung M321R8GA0PB1-CCPPC 64 GB 2 rank 6400, configured at 6000
       11x Samsung M321R8GA0PB2-CCPPC 64 GB 2 rank 6400, configured at 6000


   -----------------------------------------------------------
   23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
       BIOS Vendor:      Lenovo
       BIOS Version:     KAE131A-5.30
       BIOS Date:        10/16/2024
       BIOS Revision:    5.30
       Firmware Revision: 54.2
```

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

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Compiler Version Notes (Continued)

```
==============================================================================
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
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
clang
```

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

(Continued on next page)

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SPECrate®2017_int_peak = 1300

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

Base Compiler Invocation (Continued)

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
-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
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-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
```

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`

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Peak Portability Flags (Continued)

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: `-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`
`-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`

C++ benchmarks:

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

SPEC CPU®2017 Integer Rate Result

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Peak Optimization Flags (Continued)

520.omnetpp_r: `basepeak = yes`

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:

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/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-C.html
http://www.spec.org/cpu2017/flags/aocc500-flags.2024-10-10.html

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

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