# SPEC CPU®2017 Floating Point Rate Result

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## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

$SPECrate^{®}2017\_fp\_base = 133$

$SPECrate^{®}2017\_fp\_peak = 142$

**CPU2017 License:** 5416

**Test Sponsor:** ASRock Rack Inc.

**Tested by:** ASRock Rack Inc.

**Test Date:** Apr-2024

**Hardware Availability:** Jun-2023

**Software Availability:** Apr-2024

| Copies | | |
|---|---|---|
| 503.bwaves_r | 16 | 127 |
| | 32 | 126 |
| 507.cactuBSSN_r | 16 | 136 |
| | | 135 |
| 508.namd_r | 16 | 147 |
| | 32 | 158 |
| 510.parest_r | 16 | 170 |
| | 8 | 136 |
| 511.povray_r | 16 | 192 |
| | 32 | 229 |
| 519.lbm_r | 16 | 51.2 |
| | | 50.9 |
| 521.wrf_r | 16 | 90.6 |
| | 8 | 116 |
| 526.blender_r | 16 | 163 |
| | 32 | 191 |
| 527.cam4_r | 16 | 172 |
| | | 173 |
| 538.imagick_r | 16 | 690 |
| | 32 | 830 |
| 544.nab_r | 16 | 284 |
| | 32 | 350 |
| 549.fotonik3d_r | 16 | 44.2 |
| | | 44.0 |
| 554.roms_r | 16 | 42.5 |
| | 8 | 47.6 |

SPECrate®2017_fp_base (133) ----- SPECrate®2017_fp_peak (142)

## Hardware

CPU Name: AMD EPYC 4564P
 Max MHz: 5700
 Nominal: 4500
Enabled: 16 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 64 MB I+D on chip per chip, 32 MB shared / 8 cores
 Other: None
Memory: 64 GB (2 x 32 GB 2Rx8 PC5-5200B-R)

Storage: 1 x 960 GB NVMe M.2
Other: CPU Cooling: Air

## Software

OS: Ubuntu 22.04.4 LTS
 kernel version
 5.15.0-105-generic
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: BIOS version 10.14 released Feb-2024
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

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

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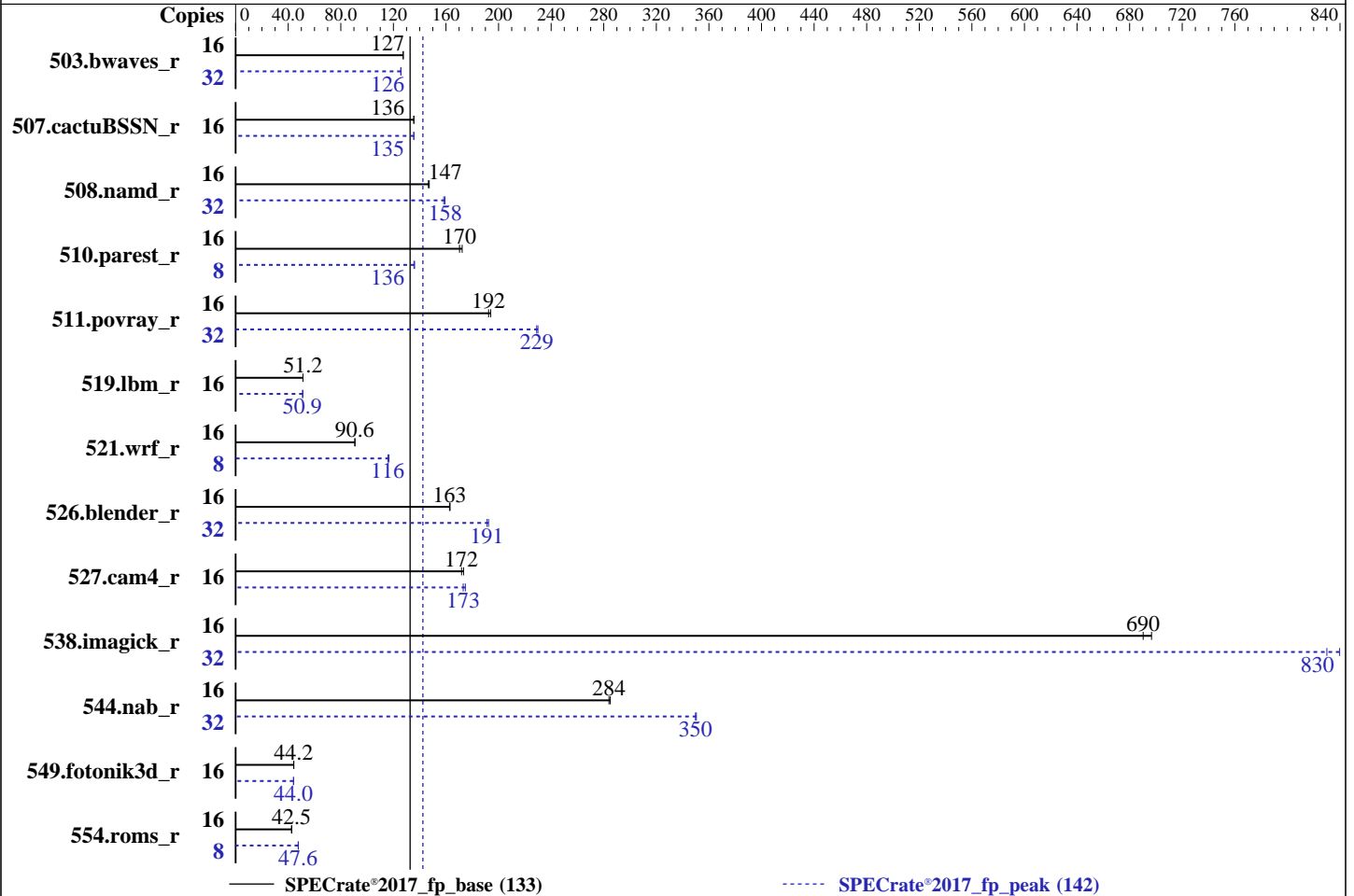
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## Results Table

| Benchmark | Base Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Peak Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 503.bwaves_r | 16 | 1258 | 128 | **1259** | **127** | | | 32 | 2553 | 126 | **2553** | **126** | | |
| 507.cactuBSSN_r | 16 | **149** | **136** | 149 | 136 | | | 16 | **150** | **135** | 149 | 136 | | |
| 508.namd_r | 16 | **104** | **147** | 103 | 147 | | | 32 | **192** | **158** | 191 | 159 | | |
| 510.parest_r | 16 | 243 | 172 | **246** | **170** | | | 8 | **154** | **136** | 154 | 136 | | |
| 511.povray_r | 16 | **194** | **192** | 193 | 194 | | | 32 | **326** | **229** | 325 | 230 | | |
| 519.lbm_r | 16 | 329 | 51.3 | **329** | **51.2** | | | 16 | **332** | **50.9** | 330 | 51.2 | | |
| 521.wrf_r | 16 | **395** | **90.6** | 395 | 90.8 | | | 8 | **155** | **116** | 154 | 117 | | |
| 526.blender_r | 16 | **150** | **163** | 149 | 163 | | | 32 | **255** | **191** | 253 | 192 | | |
| 527.cam4_r | 16 | **163** | **172** | 161 | 173 | | | 16 | **162** | **173** | 160 | 175 | | |
| 538.imagick_r | 16 | 57.1 | 697 | **57.6** | **690** | | | 32 | 94.8 | 840 | **95.9** | **830** | | |
| 544.nab_r | 16 | **94.8** | **284** | 94.5 | 285 | | | 32 | **154** | **350** | 154 | 350 | | |
| 549.fotonik3d_r | 16 | 1409 | 44.3 | **1410** | **44.2** | | | 16 | **1416** | **44.0** | 1416 | 44.0 | | |
| 554.roms_r | 16 | **599** | **42.5** | 595 | 42.7 | | | 8 | 266 | 47.7 | **267** | **47.6** | | |

SPECrate®2017_fp_base = **133**

SPECrate®2017_fp_peak = **142**

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
```

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## Operating System Notes (Continued)

```
'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/asrr/A1/amd_rate_aocc400_znver4_A_lib/lib:/home/asrr/A1/amd_rate_aocc400_znver4_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 settings :
  Precision Boost Overdrive : Enabled

 Sysinfo program /home/asrr/A1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on asrr Mon Apr 22 06:10:08 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 249 (249.11-0ubuntu3.12)
 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
```

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## Platform Notes (Continued)

```
   20. /sys/devices/virtual/dmi/id
   21. dmidecode
   22. BIOS
   ------------------------------------------------------------

   ------------------------------------------------------------
   1. uname -a
     Linux asrr 5.15.0-105-generic #115-Ubuntu SMP Mon Apr 15 09:52:04 UTC 2024 x86_64 x86_64 x86_64 GNU/Linux

   ------------------------------------------------------------
   2. w
      06:10:08 up  3:22,  2 users,  load average: 22.89, 29.70, 30.93
      USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
      asrr     tty1     -                02:47    3:19m  1.09s  0.03s -bash
      asrr     pts/1    -                02:50    3:19m  0.71s  1.02s sudo ./asrr_run.sh

   ------------------------------------------------------------
   3. Username
     From environment variable $USER:  root
     From the command 'logname':       asrr

   ------------------------------------------------------------
   4. ulimit -a
     time(seconds)        unlimited
     file(blocks)         unlimited
     data(kbytes)         unlimited
     stack(kbytes)        unlimited
     coredump(blocks)     0
     memory(kbytes)       unlimited
     locked memory(kbytes) 2097152
     process              253567
     nofiles              1024
     vmemory(kbytes)      unlimited
     locks                unlimited
     rtprio               0

   ------------------------------------------------------------
   5. sysinfo process ancestry
    /sbin/init
    /bin/login -p --
    -bash
    sudo ./asrr_run.sh
    sudo ./asrr_run.sh
    sh ./asrr_run.sh
    python3 ./run_amd_rate_aocc400_znver4_A1.py
    /bin/bash ./amd_rate_aocc400_znver4_A1.sh
    runcpu --config amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 1 fprate
    runcpu --configfile amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 1 --nopower
      --runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
      $SPEC/tmp/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
    specperl $SPEC/bin/sysinfo
   $SPEC = /home/asrr/A1

   ------------------------------------------------------------
   6. /proc/cpuinfo
      model name      : AMD EPYC 4564P 16-Core Processor
      vendor_id       : AuthenticAMD
      cpu family      : 25
      model           : 97
      stepping        : 2
```

(Continued on next page)

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## Platform Notes (Continued)

```
      microcode       : 0xa601206
      bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass srso
      TLB size        : 3584 4K pages
      cpu cores       : 16
      siblings        : 32
      1 physical ids (chips)
      32 processors (hardware threads)
      physical id 0: core ids 0-15
      physical id 0: apicids 0-31
  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 2.37.2:
  Architecture:                   x86_64
  CPU op-mode(s):                 32-bit, 64-bit
  Address sizes:                  48 bits physical, 48 bits virtual
  Byte Order:                     Little Endian
  CPU(s):                         32
  On-line CPU(s) list:            0-31
  Vendor ID:                      AuthenticAMD
  Model name:                     AMD EPYC 4564P 16-Core Processor
  CPU family:                     25
  Model:                          97
  Thread(s) per core:             2
  Core(s) per socket:             16
  Socket(s):                      1
  Stepping:                       2
  Frequency boost:                enabled
  CPU max MHz:                    5879.8818
  CPU min MHz:                    3000.0000
  BogoMIPS:                       9000.28
  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 sse4_1 sse4_2 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 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 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 rdpid overflow_recov succor smca fsrm
                                  flush_l1d
  Virtualization:                 AMD-V
  L1d cache:                      512 KiB (16 instances)
  L1i cache:                      512 KiB (16 instances)
  L2 cache:                       16 MiB (16 instances)
  L3 cache:                       64 MiB (2 instances)
  NUMA node(s):                   1
  NUMA node0 CPU(s):              0-31
  Vulnerability Gather data sampling: Not affected
  Vulnerability Itlb multihit:        Not affected
```

*(Continued on next page)*

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## Platform Notes (Continued)

```
  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: Mitigation; safe RET
  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, 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       32K     512K    8 Data             1    64        1             64
      L1i       32K     512K    8 Instruction      1    64        1             64
      L2         1M      16M    8 Unified          2  2048        1             64
      L3        32M      64M   16 Unified          3 32768        1             64


  ------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0-31
    node 0 size: 63505 MB
    node 0 free: 62710 MB
    node distances:
    node   0
      0:  10


  ------------------------------------------------------------
  9. /proc/meminfo
     MemTotal:       65029364 kB


  ------------------------------------------------------------
  10. who -r
    run-level 5 Apr 22 02:47


  ------------------------------------------------------------
  11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.12)
    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
```

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## Platform Notes (Continued)

```
    masked          cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
                    x11-common

    ----------------------------------------------------------------
    13. Linux kernel boot-time arguments, from /proc/cmdline
      BOOT_IMAGE=/vmlinuz-5.15.0-105-generic
      root=UUID=d47cad3b-93a2-4ee6-9b75-5cb5f72fe94c
      ro

    ----------------------------------------------------------------
    14. cpupower frequency-info
      analyzing CPU 0:
        current policy: frequency should be within 3.00 GHz and 4.50 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: 2
        Pstate-P0:  4500MHz

    ----------------------------------------------------------------
    15. sysctl
      kernel.numa_balancing              0
      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

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

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## Platform Notes (Continued)

```
      ----------------------------------------------------------
      18. OS release
        From /etc/*-release /etc/*-version
        os-release Ubuntu 22.04.4 LTS

      ----------------------------------------------------------
      19. Disk information
      SPEC is set to: /home/asrr/Al
        Filesystem      Type  Size  Used Avail Use% Mounted on
        /dev/nvme0n1p4 ext4  874G   12G  818G   2% /

      ----------------------------------------------------------
      20. /sys/devices/virtual/dmi/id
          Vendor:         AsrockRack
          Product:        1U4LW-B650/2L2T RPSU

      ----------------------------------------------------------
      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:
          2x Unknown CT32G52C42U5.M16G1 32 GB 2 rank 5200
          2x Unknown Unknown


      ----------------------------------------------------------
      22. BIOS
      (This section combines info from /sys/devices and dmidecode.)
        BIOS Vendor:       American Megatrends International, LLC.
        BIOS Version:      10.14
        BIOS Date:         02/05/2024
        BIOS Revision:     5.32
```

## Compiler Version Notes

```
==============================================================================================
C              | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
----------------------------------------------------------------------------------------------


==============================================================================================
C++            | 508.namd_r(base, peak) 510.parest_r(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
----------------------------------------------------------------------------------------------


==============================================================================================
C++, C         | 511.povray_r(base, peak) 526.blender_r(base, peak)
----------------------------------------------------------------------------------------------
```

**(Continued on next page)**

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AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
------------------------------------------------------------------------------------------------


==================================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
------------------------------------------------------------------------------------------------


==================================================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
------------------------------------------------------------------------------------------------


==================================================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
------------------------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
```
clang
```

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

**(Continued on next page)**

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

**CPU2017 License:** 5416        **Test Date:** Apr-2024
**Test Sponsor:** ASRock Rack Inc.        **Hardware Availability:** Jun-2023
**Tested by:** ASRock Rack Inc.        **Software Availability:** Apr-2024

# Base Compiler Invocation (Continued)

Fortran benchmarks:
```
flang
```

Benchmarks using both Fortran and C:
```
flang clang
```

Benchmarks using both C and C++:
```
clang++ clang
```

Benchmarks using Fortran, C, and C++:
```
clang++ clang flang
```

# Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
526.blender_r: `-funsigned-char -DSPEC_LP64`
527.cam4_r: `-DSPEC_CASE_FLAG -DSPEC_LP64`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_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 -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 -lamdalloc -lflang
```

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

| | |
|---|---|
| **CPU2017 License:** 5416 | **Test Date:** Apr-2024 |
| **Test Sponsor:** ASRock Rack Inc. | **Hardware Availability:** Jun-2023 |
| **Tested by:** ASRock Rack Inc. | **Software Availability:** Apr-2024 |

# Base Optimization Flags (Continued)

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -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 -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Benchmarks using both C and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -mllvm -unroll-threshold=100 -finline-aggressive
```

# SPEC CPU®2017 Floating Point Rate Result

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## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

**CPU2017 License:** 5416

**Test Sponsor:** ASRock Rack Inc.

**Tested by:** ASRock Rack Inc.

**Test Date:** Apr-2024

**Hardware Availability:** Jun-2023

**Software Availability:** Apr-2024

## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
```
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

## Base Other Flags

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

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

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

Benchmarks using both Fortran and C:
```
-Wno-unused-command-line-argument
```

Benchmarks using both C and C++:
```
-Wno-unused-command-line-argument
```

Benchmarks using Fortran, C, and C++:
```
-Wno-unused-command-line-argument
```

## Peak Compiler Invocation

C benchmarks:
```
clang
```

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

Fortran benchmarks:
```
flang
```

Benchmarks using both Fortran and C:
```
flang clang
```

Benchmarks using both C and C++:
```
clang++ clang
```

**(Continued on next page)**

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

| | | | |
|---|---|---|---|
| **CPU2017 License:** 5416 | | **Test Date:** | Apr-2024 |
| **Test Sponsor:** | ASRock Rack Inc. | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | ASRock Rack Inc. | **Software Availability:** | Apr-2024 |

# Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
```
clang++ clang flang
```

# Peak Portability Flags

```
Same as Base Portability Flags
```

# Peak Optimization Flags

C benchmarks:

```
519.lbm_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
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

```
538.imagick_r: Same as 519.lbm_r
```

```
544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-ldist-scalar-expand
-fenable-aggressive-gather -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 -lamdlibm
-lamdalloc
```

C++ benchmarks:

```
508.namd_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

```
510.parest_r: -m64 -flto -Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
```

**(Continued on next page)**

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

| | | | |
|---|---|---|---|
| **CPU2017 License:** 5416 | | **Test Date:** | Apr-2024 |
| **Test Sponsor:** | ASRock Rack Inc. | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | ASRock Rack Inc. | **Software Availability:** | Apr-2024 |

# Peak Optimization Flags (Continued)

510.parest_r (continued):
```
-march=znver4 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

Fortran benchmarks:

503.bwaves_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm
-lamdalloc -lflang
```

549.fotonik3d_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -Kieee
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -lflang
```

554.roms_r: `Same as 503.bwaves_r`

Benchmarks using both Fortran and C:

521.wrf_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -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 -Mrecursive
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

527.cam4_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt
-Kieee -Mrecursive -funroll-loops
```

**(Continued on next page)**

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

| | | | |
|---|---|---|---|
| **CPU2017 License:** 5416 | | **Test Date:** | Apr-2024 |
| **Test Sponsor:** | ASRock Rack Inc. | **Hardware Availability:** | Jun-2023 |
| **Tested by:** | ASRock Rack Inc. | **Software Availability:** | Apr-2024 |

# Peak Optimization Flags (Continued)

527.cam4_r (continued):
```
-mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both C and C++:

511.povray_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm
-lamdalloc
```

526.blender_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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
-finline-aggressive -mllvm -unroll-threshold=100 -lamdlibm
-lamdalloc
```

Benchmarks using Fortran, C, and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-finline-aggressive -faggressive-loop-transform -fvector-transform
-fscalar-transform -Mrecursive -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang
```

# Peak Other Flags

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

**(Continued on next page)**

## ASRock Rack Inc.

1U4LW-B650/2L2T RPSU
AMD EPYC 4564P

SPECrate®2017_fp_base = 133

SPECrate®2017_fp_peak = 142

**CPU2017 License:** 5416
**Test Sponsor:** ASRock Rack Inc.
**Tested by:** ASRock Rack Inc.

**Test Date:** Apr-2024
**Hardware Availability:** Jun-2023
**Software Availability:** Apr-2024

# Peak Other Flags (Continued)

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

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

Benchmarks using both Fortran and C:
`-Wno-unused-command-line-argument`

Benchmarks using both C and C++:
`-Wno-unused-command-line-argument`

Benchmarks using Fortran, C, and C++:
`-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/aocc400-flags.html`
`http://www.spec.org/cpu2017/flags/ASRockRack_platform_amd_rate_aocc400_znver4_A.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/aocc400-flags.xml`
`http://www.spec.org/cpu2017/flags/ASRockRack_platform_amd_rate_aocc400_znver4_A.xml`

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

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