SPEC CPU®2017 Integer Rate Result

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Dell Inc.

PowerEdge R7615 (AMD EPYC 9634 84-Core Processor)

$SPECrate^{®}2017\_int\_base =$ 689

$SPECrate^{®}2017\_int\_peak =$ Not Run

Copies

Benchmark	Copies	Result
500.perlbench_r	168	522
502.gcc_r	168	542
505.mcf_r	168	866
520.omnetpp_r	168	365
523.xalancbmk_r	168	751
525.x264_r	168	1700
531.deepsjeng_r	168	598
541.leela_r	168	590
548.exchange2_r	168	1600
557.xz_r	168	377

SPECrate®2017_int_base (689)

Hardware

CPU Name: AMD EPYC 9634
Max MHz: 3700
Nominal: 2250
Enabled: 84 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: 384 MB I+D on chip per chip, 32 MB shared / 7 cores
Other: None
Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 125 GB on tmpfs
Other: None

Software

OS: Ubuntu 22.04.2 LTS
 5.15.0-67-generic
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Version 1.3.7 released Mar-2023
File System: tmpfs
System State: Run level 5 (graphical multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

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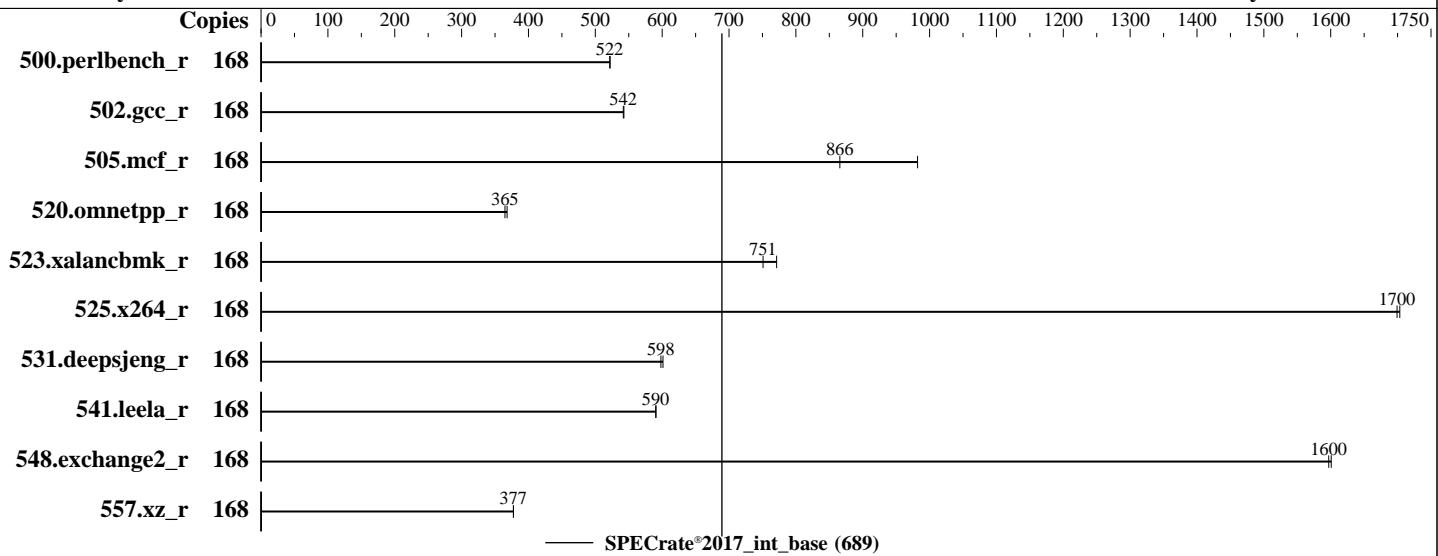
CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Mar-2023
Hardware Availability: Mar-2023
Software Availability: Mar-2023

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	168	512	522	**513**	**522**									
502.gcc_r	168	438	543	**439**	**542**									
505.mcf_r	168	276	982	**314**	**866**									
520.omnetpp_r	168	599	368	**604**	**365**									
523.xalancbmk_r	168	230	771	**236**	**751**									
525.x264_r	168	**173**	**1700**	173	1700									
531.deepsjeng_r	168	**322**	**598**	320	601									
541.leela_r	168	471	591	**471**	**590**									
548.exchange2_r	168	275	1600	**276**	**1600**									
557.xz_r	168	**481**	**377**	481	378									
SPECrate®2017_int_base =			**689**											
SPECrate®2017_int_peak =			**Not Run**											

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

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

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Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e/amd_rate_aocc400_genoa_B_lib/lib:/mnt/ramdisk/cpu2017-1.1.9-ao
     cc400-B1e/amd_rate_aocc400_genoa_B_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.


 Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"
```

Platform Notes

```
 BIOS settings:
             DRAM Refresh Delay : Performance
          DIMM Self Healing on
    Uncorrectable Memory Error : Disabled
     Virtualization Technology : Disabled
           NUMA Nodes per Socket : 4
       L3 Cache as NUMA Domain : Enabled

               System Profile : Custom
           Memory Patrol Scrub : Disabled
           PCI ASPM L1 Link
              Power Management : Disabled
             Determinism Slider : Power Determinism

 Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on amd-sut Tue Mar 21 04:25:03 2023

 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 (249.11-0ubuntu3.7)
```

(Continued on next page)

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Platform Notes (Continued)

```
 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. tuned-adm active
 17. sysctl
 18. /sys/kernel/mm/transparent_hugepage
 19. /sys/kernel/mm/transparent_hugepage/khugepaged
 20. OS release
 21. Disk information
 22. /sys/devices/virtual/dmi/id
 23. dmidecode
 24. BIOS
 ------------------------------------------------------------


 ------------------------------------------------------------
 1. uname -a
   Linux amd-sut 5.15.0-67-generic #74-Ubuntu SMP Wed Feb 22 14:14:39 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux


 ------------------------------------------------------------
 2. w
    04:25:03 up 5 min,  1 user,  load average: 0.12, 0.05, 0.01
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                04:22   39.00s  1.78s  0.29s /bin/bash ./amd_rate_aocc400_genoa_B1.sh


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


 ------------------------------------------------------------
 4. ulimit -a
   time(seconds)        unlimited
   file(blocks)         unlimited
   data(kbytes)         unlimited
   stack(kbytes)        unlimited
   coredump(blocks)     0
   memory(kbytes)       unlimited
   locked memory(kbytes) 2097152
   process              3093815
   nofiles              1024
   vmemory(kbytes)      unlimited
   locks                unlimited
   rtprio               0


 ------------------------------------------------------------
 5. sysinfo process ancestry
  /sbin/init
  /bin/login -p --
  -bash
  /bin/bash ./DELL_rate.sh
  /bin/bash ./dell-run-main.sh rate
  /bin/bash ./dell-run-main.sh rate
  /bin/bash ./dell-run-specrate.sh --output_format csv,html,pdf,txt -define Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc
  python3 ./run_amd_rate_aocc400_genoa_B1.py
  /bin/bash ./amd_rate_aocc400_genoa_B1.sh
  runcpu --config amd_rate_aocc400_genoa_B1.cfg --tune base --reportable --iterations 2 --output_format
    csv,html,pdf,txt -define Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc intrate
  runcpu --configfile amd_rate_aocc400_genoa_B1.cfg --tune base --reportable --iterations 2 --output_format
    csv,html,pdf,txt --define Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc --nopower --runmode rate --tune base --size
    test:train:refrate intrate --nopreenv --note-preenv --logfile
```

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Platform Notes (Continued)

```
    $SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e

    -------------------------------------------------------------
6. /proc/cpuinfo
    model name        : AMD EPYC 9634 84-Core Processor
    vendor_id         : AuthenticAMD
    cpu family        : 25
    model             : 17
    stepping          : 1
    microcode         : 0xa101116
    bugs              : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size          : 3584 4K pages
    cpu cores         : 84
    siblings          : 168
    1 physical ids (chips)
    168 processors (hardware threads)
    physical id 0: core ids 0-6,8-14,16-22,24-30,32-38,40-46,48-54,56-62,64-70,72-78,80-86,88-94
    physical id 0: apicids 0-13,16-29,32-45,48-61,64-77,80-93,96-109,112-125,128-141,144-157,160-173,176-189
  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:          52 bits physical, 57 bits virtual
  Byte Order:             Little Endian
  CPU(s):                 168
  On-line CPU(s) list:    0-167
  Vendor ID:              AuthenticAMD
  Model name:             AMD EPYC 9634 84-Core Processor
  CPU family:             25
  Model:                  17
  Thread(s) per core:     2
  Core(s) per socket:     84
  Socket(s):              1
  Stepping:               1
  Frequency boost:        enabled
  CPU max MHz:            3700.1951
  CPU min MHz:            1500.0000
  BogoMIPS:               4500.32
  Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                          clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                          constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl
                          pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
                          popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy
                          abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext
                          perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3
                          invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1
                          avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                          avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt
                          xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                          avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat npt
                          lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
                          pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi
                          umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
```

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Platform Notes (Continued)

```
                                 avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
  Virtualization:                AMD-V
  L1d cache:                     2.6 MiB (84 instances)
  L1i cache:                     2.6 MiB (84 instances)
  L2 cache:                      84 MiB (84 instances)
  L3 cache:                      384 MiB (12 instances)
  NUMA node(s):                  4
  NUMA node0 CPU(s):             0-6,28-34,56-62,84-90,112-118,140-146
  NUMA node1 CPU(s):             14-20,42-48,70-76,98-104,126-132,154-160
  NUMA node2 CPU(s):             21-27,49-55,77-83,105-111,133-139,161-167
  NUMA node3 CPU(s):             7-13,35-41,63-69,91-97,119-125,147-153
  Vulnerability Itlb multihit:   Not affected
  Vulnerability L1tf:            Not affected
  Vulnerability Mds:             Not affected
  Vulnerability Meltdown:        Not affected
  Vulnerability Mmio stale data: Not affected
  Vulnerability Retbleed:        Not affected
  Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl 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     2.6M    8 Data          1    64       1              64
    L1i        32K     2.6M    8 Instruction   1    64       1              64
    L2          1M      84M    8 Unified       2  2048       1              64
    L3         32M     384M   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: 0-6,28-34,56-62,84-90,112-118,140-146
  node 0 size: 193070 MB
  node 0 free: 188698 MB
  node 1 cpus: 14-20,42-48,70-76,98-104,126-132,154-160
  node 1 size: 193524 MB
  node 1 free: 192984 MB
  node 2 cpus: 21-27,49-55,77-83,105-111,133-139,161-167
  node 2 size: 193524 MB
  node 2 free: 192981 MB
  node 3 cpus: 7-13,35-41,63-69,91-97,119-125,147-153
  node 3 size: 193448 MB
  node 3 free: 192912 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:       792133312 kB


------------------------------------------------------------
10. who -r
```

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Dell Inc.

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Platform Notes (Continued)

```
  run-level 5 Mar 21 04:21

  ----------------------------------------------------------
  11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.7)
    Default Target  Status
    graphical       degraded

  ----------------------------------------------------------
  12. Failed units, from systemctl list-units --state=failed
    UNIT                               LOAD   ACTIVE SUB   DESCRIPTION
   * systemd-networkd-wait-online.service loaded failed failed Wait for Network to be Configured

  ----------------------------------------------------------
  13. Services, from systemctl list-unit-files
    STATE           UNIT FILES
    enabled         apparmor blk-availability cloud-config cloud-final cloud-init cloud-init-local
                    console-setup e2scrub_reap finalrd getty@ gpu-manager grub-common grub-initrd-fallback
                    keyboard-setup lvm2-monitor multipathd networkd-dispatcher open-iscsi pollinate
                    secureboot-db setvtrgb snapd ssh systemd-networkd systemd-networkd-wait-online
                    systemd-pstore systemd-resolved systemd-timesyncd thermald tuned unattended-upgrades
    enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
    disabled        console-getty debug-shell iscsid rsync serial-getty@ systemd-boot-check-no-failures
                    systemd-network-generator systemd-sysext systemd-time-wait-sync upower
    generated       apport
    masked          cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS sudo x11-common

  ----------------------------------------------------------
  14. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/vmlinuz-5.15.0-67-generic
    root=/dev/mapper/ubuntu--vg-ubuntu--lv
    ro

  ----------------------------------------------------------
  15. cpupower frequency-info
    analyzing CPU 0:
      current policy: frequency should be within 1.50 GHz and 2.25 GHz.
                      The governor "performance" may decide which speed to use
                      within this range.
    boost state support:
      Supported: yes
      Active: yes
      Boost States: 0
      Total States: 3
      Pstate-P0:  2250MHz

  ----------------------------------------------------------
  16. tuned-adm active
    Current active profile: latency-performance

  ----------------------------------------------------------
  17. sysctl
    kernel.numa_balancing             1
    kernel.randomize_va_space         0
    vm.compaction_proactiveness       20
    vm.dirty_background_bytes         0
    vm.dirty_background_ratio         3
    vm.dirty_bytes                    0
    vm.dirty_expire_centisecs         3000
    vm.dirty_ratio                    8
    vm.dirty_writeback_centisecs      500
```

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Platform Notes (Continued)

```
  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


------------------------------------------------------------
18. /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


------------------------------------------------------------
19. /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


------------------------------------------------------------
20. OS release
  From /etc/*-release /etc/*-version
  os-release Ubuntu 22.04.2 LTS


------------------------------------------------------------
21. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e
  Filesystem      Type   Size  Used Avail Use% Mounted on
  tmpfs           tmpfs  125G  3.5G  122G   3% /mnt/ramdisk


------------------------------------------------------------
22. /sys/devices/virtual/dmi/id
    Vendor:         Dell Inc.
    Product:        PowerEdge R7615
    Product Family: PowerEdge
    Serial:         CDC1234


------------------------------------------------------------
23. 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:
    12x 802C0000802C MTC40F2046S1RC48BA1 64 GB 2 rank 4800


------------------------------------------------------------
24. BIOS
(This section combines info from /sys/devices and dmidecode.)
  BIOS Vendor:     Dell Inc.
```

(Continued on next page)

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Platform Notes (Continued)

```
        BIOS Version:      1.3.7
        BIOS Date:         03/06/2023
        BIOS Revision:     1.3
```

Compiler Version Notes

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


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


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------
```

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`

(Continued on next page)

SPEC CPU®2017 Integer Rate Result

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Dell Inc.

PowerEdge R7615 (AMD EPYC 9634 84-Core Processor)

SPECrate®2017_int_base =   689

SPECrate®2017_int_peak = Not Run

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Mar-2023
Hardware Availability: Mar-2023
Software Availability: Mar-2023

Base Portability Flags (Continued)

505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LINUX -DSPEC_LP64`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc
```

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

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

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

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Base Other Flags

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

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/aocc400-flags.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.0.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/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.0.xml

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

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