



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017_fp_base = 638

PowerEdge R6615 (AMD EPYC 9634 84-Core Processor)

SPECrate®2017_fp_peak = 639

CPU2017 License: 6573

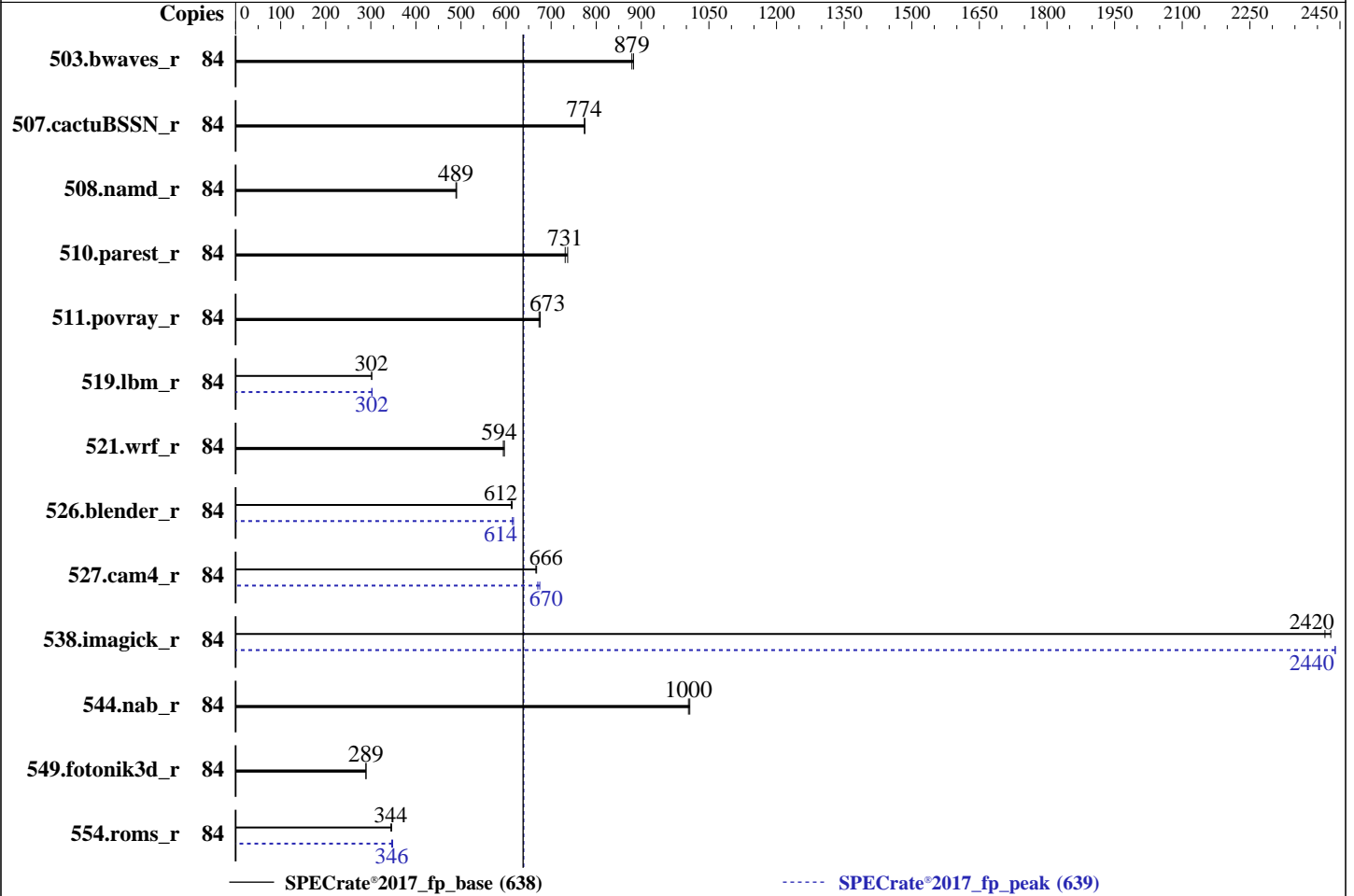
Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Jan-2024

Hardware Availability: May-2023

Software Availability: Sep-2023



Hardware

CPU Name: AMD EPYC 9634
 Max MHz: 3700
 Nominal: 2250
 Enabled: 84 cores, 1 chip
 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: 60 GB on tmpfs
 Other: None

Software

OS: Ubuntu 22.04.3 LTS
 5.15.0-84-generic
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
 Parallel: No
 Firmware: Version 1.4.6 released Jul-2023
 File System: tmpfs
 System State: Run level 5 (graphical 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.



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	84	954	883	958	879			84	954	883	958	879		
507.cactuBSSN_r	84	137	775	137	774			84	137	775	137	774		
508.namd_r	84	163	489	163	490			84	163	489	163	490		
510.parest_r	84	301	731	298	737			84	301	731	298	737		
511.povray_r	84	291	673	290	676			84	291	673	290	676		
519.lbm_r	84	293	302	293	302			84	293	302	293	302		
521.wrf_r	84	317	594	316	596			84	317	594	316	596		
526.blender_r	84	209	613	209	612			84	208	617	208	614		
527.cam4_r	84	220	668	221	666			84	219	670	218	675		
538.imagick_r	84	86.4	2420	86.0	2430			84	85.6	2440	85.6	2440		
544.nab_r	84	140	1010	141	1000			84	140	1010	141	1000		
549.fotonik3d_r	84	1132	289	1132	289			84	1132	289	1132	289		
554.roms_r	84	386	346	387	344			84	385	346	383	348		

SPECrate®2017_fp_base = **638**

SPECrate®2017_fp_peak = **639**

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,

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Operating System Notes (Continued)

'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH =  
  "/mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-Al.1/amd_rate_aocc400_znver4_A_lib/lib:/mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-Al.1/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.

Benchmark run from a 60 GB ramdisk created with the cmd: "mount -t tmpfs -o size=60G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:

DRAM Refresh Delay : Performance
DIMM Self Healing on
Uncorrectable Memory Error : Disabled

Logical Processor : Disabled
Virtualization Technology : Disabled
L1 Stride Prefetcher : Disabled
NUMA Nodes per Socket : 4

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

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-Al.1/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on amd-spa Wed Jan 10 14:49:34 2024

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

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Platform Notes (Continued)

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 (249.11-0ubuntu3.10)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
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

```
-----
1. uname -a
   Linux amd-spa 5.15.0-84-generic #93-Ubuntu SMP Tue Sep 5 17:16:10 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux
-----
```

```
-----
2. w
   14:49:34 up 2:37, 1 user, load average: 53.46, 76.19, 80.58
USER      TTY      FROM          LOGIN@      IDLE        JCPU   PCPU   WHAT
root      ttyl    -             12:12      2:36m      2.21s  0.45s /bin/bash ./amd_rate_aocc400_znver4_A1.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            3093844
nofiles            1024
vmemory(kbytes)    unlimited
locks              unlimited
rtprio             0
-----
```

```
-----
5. sysinfo process ancestry
   /sbin/init
   /bin/login -p --
   -bash
   /bin/bash ./DELL_rate.sh
-----
```

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Platform Notes (Continued)

```

/bin/bash ./dell-run-main.sh rate
/bin/bash ./dell-run-main.sh rate
/bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-adddcD=1
--define DL-VERS=v4.8.1 --output_format html,pdf,txt
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 2 --define DL-BIOS-NPS=4
--define DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-adddcD=1 --define DL-VERS=v4.8.1 --output_format
html,pdf,txt fprate
runcpu --configfile amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 2 --define
DL-BIOS-NPS=4 --define DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-adddcD=1 --define DL-VERS=v4.8.1
--output_format html,pdf,txt --nopower --runmode rate --tune base:peak --size test:train:refrate fprate
--nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.002/temlogs/preenv.fprate.002.0.log --lognum 002.0
--from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1.1

```

```

-----
6. /proc/cpuinfo
model name      : AMD EPYC 9634 84-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 25
model          : 17
stepping       : 1
microcode      : 0xa10113e
bugs           : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
TLB size      : 3584 4K pages
cpu cores     : 84
siblings      : 84
1 physical ids (chips)
84 processors (hardware threads)
physical id 0: core ids 0-6,16-22,32-38,48-54,64-70,80-86,96-102,112-118,128-134,144-150,160-166,176-182
physical id 0: apicids 0-6,16-22,32-38,48-54,64-70,80-86,96-102,112-118,128-134,144-150,160-166,176-182
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):                84
On-line CPU(s) list:   0-83
Vendor ID:             AuthenticAMD
Model name:            AMD EPYC 9634 84-Core Processor
CPU family:            25
Model:                 17
Thread(s) per core:    1
Core(s) per socket:    84
Socket(s):              1
Stepping:              1
BogoMIPS:              4501.07
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

```

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Platform Notes (Continued)

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 bmlil 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_omsave_vmload vgif v_spec_ctrl avx512vbmi umip pku ospke avx512_vbmi2
gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57
rdpid overflow_recov succor smca fsrm flush_lld

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): 0-20
NUMA node1 CPU(s): 21-41
NUMA node2 CPU(s): 42-62
NUMA node3 CPU(s): 63-83
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 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 disabled, RSB filling, PBRSE-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: 0-20
node 0 size: 193075 MB
node 0 free: 188494 MB
node 1 cpus: 21-41
node 1 size: 193529 MB
node 1 free: 192508 MB
node 2 cpus: 42-62
node 2 size: 193481 MB
node 2 free: 192327 MB
node 3 cpus: 63-83
node 3 size: 193488 MB
node 3 free: 192501 MB
node distances:

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Platform Notes (Continued)

```

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:      792140216 kB

```

```

-----
10. who -r
    run-level 5 Jan 10 12:12

```

```

-----
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.10)
    Default Target Status
    graphical      running

```

```

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

```

```

-----
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/vmlinuz-5.15.0-84-generic
root=/dev/mapper/ubuntu--vg-ubuntu--lv
ro

```

```

-----
14. cpupower frequency-info
analyzing CPU 0:
Unable to determine current policy
boost state support:
Supported: yes
Active: yes
Boost States: 0
Total States: 3
Pstate-P0: 2250MHz

```

```

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

```

```

-----
16. sysctl
kernel.numa_balancing 1

```

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Platform Notes (Continued)

```

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
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+madvise madvise never
enabled     [always] madvise never
hpage_pmd_size  2097152
shmem_enabled  always within_size advise [never] deny force

```

```

-----
18. /sys/kernel/mm/transparent_hugepage/khugepaged
alloc_sleep_millisecs  60000
defrag                  1
max_ptes_none          511
max_ptes_shared        256
max_ptes_swap          64
pages_to_scan          4096
scan_sleep_millisecs   10000

```

```

-----
19. OS release
From /etc/*-release /etc/*-version
os-release Ubuntu 22.04.3 LTS

```

```

-----
20. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1.1
Filesystem  Type  Size  Used Avail Use% Mounted on
tmpfs      tmpfs  60G  3.5G  57G   6% /mnt/ramdisk

```

```

-----
21. /sys/devices/virtual/dmi/id
Vendor:      Dell Inc.
Product:     PowerEdge R6615
Product Family: PowerEdge
Serial:      GLM4018

```

```

-----
22. 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.

```

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Platform Notes (Continued)

Memory:
12x 802C0000802C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: Dell Inc.
BIOS Version: 1.4.6
BIOS Date: 07/06/2023
BIOS Revision: 1.4

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)

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)
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Thread model: posix

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SPECrate®2017_fp_peak = 639

CPU2017 License: 6573
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Test Date: Jan-2024
Hardware Availability: May-2023
Software Availability: Sep-2023

Compiler Version Notes (Continued)

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++

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

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Base Portability Flags (Continued)

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
```

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
```

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-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
-freemap-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
-freemap-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
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-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
```

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Base Other Flags (Continued)

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

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
```

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Peak Optimization Flags (Continued)

519.lbm_r (continued):

-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: basepeak = yes

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_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

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

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
-mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang

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Peak Optimization Flags (Continued)

Benchmarks using both C and C++:

511.povray_r: basepeak = yes

```
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
-freemap-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++:

507.cactuBSSN_r: basepeak = yes

Peak 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

The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/aocc400-flags_A1.1.html

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.2.html>



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You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/aocc400-flags_A1.1.xml

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.2.xml>

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