



SPEC CPU®2017 Floating Point Rate Result

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Tyrone Systems

(Test Sponsor: Netweb Pte Ltd)

(Tyrone Camarero SDA200A2N-212)

(2.45 GHz, AMD EPYC 9534)

SPECrate®2017_fp_base = 861

SPECrate®2017_fp_peak = 934

CPU2017 License: 6042

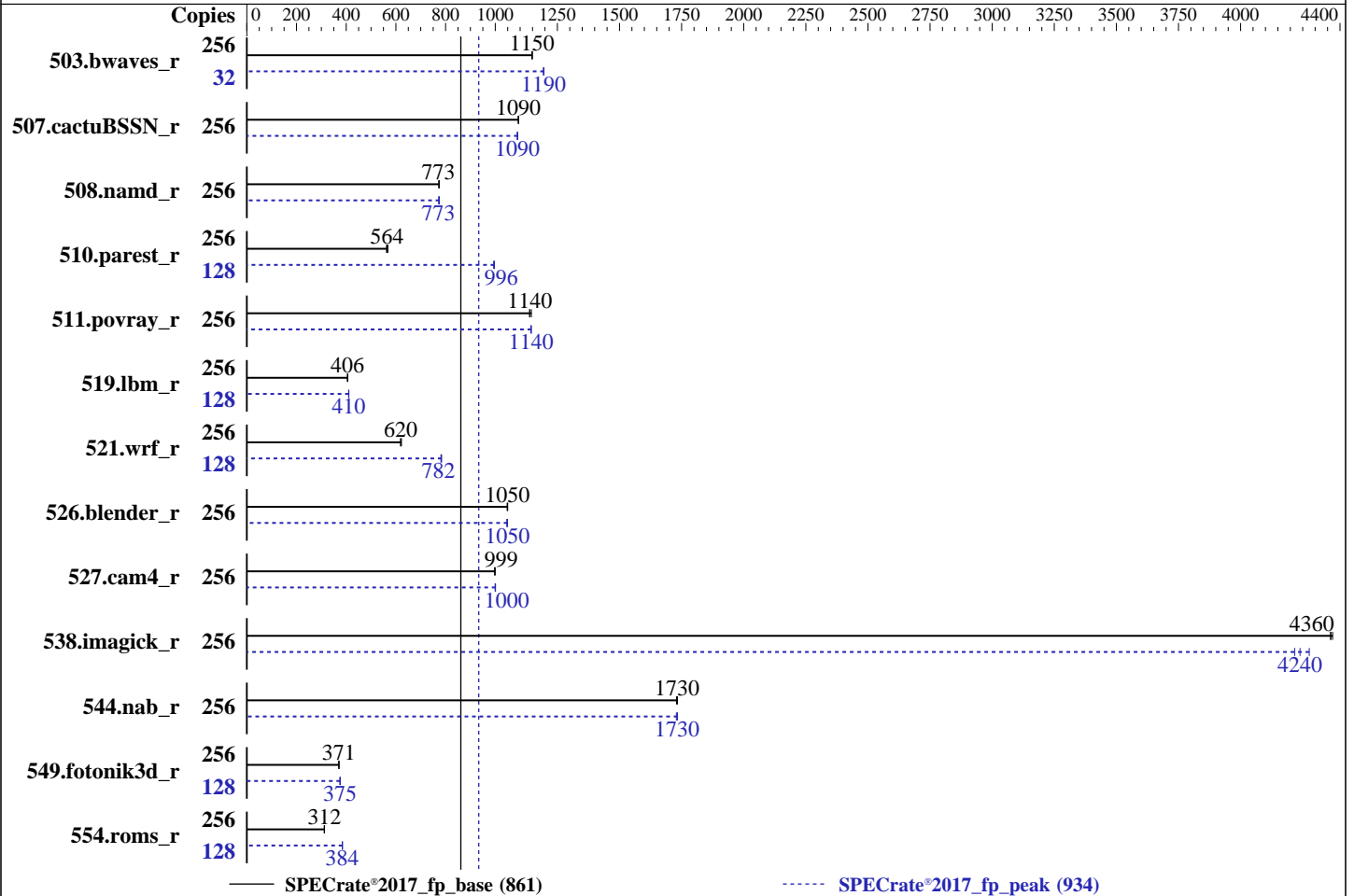
Test Sponsor: Netweb Pte Ltd

Tested by: Tyrone Systems

Test Date: Oct-2023

Hardware Availability: Jun-2023

Software Availability: Sep-2023



Hardware

CPU Name: AMD EPYC 9534
 Max MHz: 3700
 Nominal: 2450
 Enabled: 128 cores, 2 chips, 2 threads/core
 Orderable: 1,2 chips
 Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 256 MB I+D on chip per chip, 32 MB shared / 8 cores
 Other: None
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
 Storage: 1 x 960 GB NVMe
 Other: None

Software

OS: Ubuntu 20.04.4 LTS
 kernel version 5.15.0-86-generic
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
 Parallel: No
 Firmware: Version 1.4 released Apr-2023
 File System: ext4
 System State: Run level 5 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 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
503.bwaves_r	256	2236	1150	2234	1150	<u>2236</u>	<u>1150</u>	32	<u>269</u>	<u>1190</u>	269	1190	268	1200
507.cactuBSSN_r	256	297	1090	<u>296</u>	<u>1090</u>	296	1090	256	<u>297</u>	<u>1090</u>	297	1090	298	1090
508.namd_r	256	315	773	314	774	<u>315</u>	<u>773</u>	256	314	775	<u>315</u>	<u>773</u>	315	773
510.parest_r	256	<u>1187</u>	<u>564</u>	1191	562	1179	568	128	<u>336</u>	<u>996</u>	336	996	337	994
511.povray_r	256	522	1150	<u>525</u>	<u>1140</u>	525	1140	256	522	1150	<u>522</u>	<u>1140</u>	523	1140
519.lbm_r	256	665	405	<u>665</u>	<u>406</u>	665	406	128	329	410	<u>329</u>	<u>410</u>	329	411
521.wrf_r	256	922	622	<u>926</u>	<u>620</u>	926	619	128	366	784	367	782	<u>367</u>	<u>782</u>
526.blender_r	256	371	1050	372	1050	<u>372</u>	<u>1050</u>	256	373	1050	372	1050	<u>372</u>	<u>1050</u>
527.cam4_r	256	448	999	449	997	<u>448</u>	<u>999</u>	256	448	999	447	1000	<u>448</u>	<u>1000</u>
538.imagick_r	256	146	4370	146	4360	<u>146</u>	<u>4360</u>	256	151	4220	<u>150</u>	<u>4240</u>	149	4280
544.nab_r	256	249	1730	249	1730	<u>249</u>	<u>1730</u>	256	<u>249</u>	<u>1730</u>	249	1730	249	1730
549.fotonik3d_r	256	2689	371	2694	370	<u>2691</u>	<u>371</u>	128	1328	376	1329	375	<u>1329</u>	<u>375</u>
554.roms_r	256	1302	312	1304	312	<u>1303</u>	<u>312</u>	128	529	384	528	385	<u>529</u>	<u>384</u>

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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,

(Continued on next page)



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Operating System Notes (Continued)

```
'echo madwise > /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.
```

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/home/cpu2017/amd_rate_aocc400_znver4_A_lib/lib:/home/cpu2017/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:
cTDP: 360
Determinism Slider set to Power
Package Power: 360
EDC: 400
ACPI SRAT L3 Cache as NUMA Domain: enabled
Memory interleaving: Disabled
4-link xGMI max speed: 16Gbps
Fan Speed: Maximum

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on amd2-Super-Server Wed Oct 11 18:09:38 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

(Continued on next page)



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Platform Notes (Continued)

```

10. who -r
11. Systemd service manager version: systemd 245 (245.4-4ubuntu3.20)
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. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS
-----

1. uname -a
Linux amd2-Super-Server 5.15.0-86-generic #96~20.04.1-Ubuntu SMP Thu Sep 21 13:23:37 UTC 2023 x86_64 x86_64
x86_64 GNU/Linux
-----

2. w
 18:09:38 up 6:44, 1 user, load average: 115.06, 216.87, 239.95
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU   WHAT
amd2      tty2    -                Tue18    6:40m  2.18s  0.02s  -bash
-----

3. Username
From environment variable $USER:  root
From the command 'logname':      amd2
-----

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            4126393
nofiles            1024
vmemory(kbytes)    unlimited
locks              unlimited
rtprio             0
-----

5. sysinfo process ancestry
/sbin/init splash
/bin/login -p --
-bash
sudo su
su
bash
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 3 fprate
runcpu --configfile amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 --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

```

(Continued on next page)



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Platform Notes (Continued)

```
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017
```

```
-----
6. /proc/cpuinfo
model name      : AMD EPYC 9534 64-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 srso
TLB size       : 3584 4K pages
cpu cores      : 64
siblings       : 128
2 physical ids (chips)
256 processors (hardware threads)
physical id 0: core ids 0-63
physical id 1: core ids 0-63
physical id 0: apicids 0-127
physical id 1: apicids 128-255
```

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 2.34:
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
Address sizes:          52 bits physical, 57 bits virtual
CPU(s):                 256
On-line CPU(s) list:   0-255
Thread(s) per core:    2
Core(s) per socket:    64
Socket(s):              2
NUMA node(s):          2
Vendor ID:              AuthenticAMD
CPU family:             25
Model:                  17
Model name:             AMD EPYC 9534 64-Core Processor
Stepping:               1
Frequency boost:        enabled
CPU MHz:                1500.000
CPU max MHz:            3718.0659
CPU min MHz:            1500.0000
BogoMIPS:               4899.85
Virtualization:         AMD-V
L1d cache:              4 MiB
L1i cache:              4 MiB
L2 cache:               128 MiB
L3 cache:               512 MiB
NUMA node0 CPU(s):     0-63,128-191
NUMA node1 CPU(s):     64-127,192-255
Vulnerability Gather data sampling: Not affected
Vulnerability Itlb multihit:   Not affected
Vulnerability L1tf:          Not affected
Vulnerability Mds:          Not affected
Vulnerability Meltdown:       Not affected
```

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Platform Notes (Continued)

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, PBRSE-eIBRS Not affected

Vulnerability Srbds: Not affected
 Vulnerability Tsx async abort: Not affected

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 bml 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 avx512_vpocntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL
L1d	32K	4M	8	Data	1
L1i	32K	4M	8	Instruction	1
L2	1M	128M	8	Unified	2
L3	32M	512M	16	Unified	3

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

```
available: 2 nodes (0-1)
node 0 cpus: 0-63,128-191
node 0 size: 515705 MB
node 0 free: 512325 MB
node 1 cpus: 64-127,192-255
node 1 size: 515968 MB
node 1 free: 512094 MB
node distances:
node 0 1
0: 10 32
1: 32 10
```

9. /proc/meminfo

MemTotal: 1056433636 kB

10. who -r

run-level 5 Oct 10 18:49

11. Systemd service manager version: systemd 245 (245.4-4ubuntu3.20)

Default Target Status

(Continued on next page)



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Platform Notes (Continued)

graphical degraded

12. Failed units, from `systemctl list-units --state=failed`

```
UNIT                                LOAD  ACTIVE SUB  DESCRIPTION
* fwupd-refresh.service loaded failed failed Refresh fwupd metadata and update motd
```

13. Services, from `systemctl list-unit-files`

```
STATE      UNIT FILES
enabled    ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
accounts-daemon anacron apparmor autovt@ avahi-daemon bluetooth console-setup cron cups
cups-browsed dmesg e2scrub_reap getty@ gpu-manager grub-common grub-initrd-fallback
irqbalance kerneloops keyboard-setup network-manager networkd-dispatcher ondemand openvpn
pppd-dns rsync rsyslog secureboot-db setvtrgb snapd ssh sshd switcheroo-control syslog
systemd-pstore systemd-resolved systemd-timesyncd thermald ua-reboot-cmds udisks2 ufw
unattended-upgrades whoopsie wpa_supplicant
enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-fsck-root systemd-remount-fs
disabled    acpid brltty console-getty debug-shell openvpn-client@ openvpn-server@ openvpn@
rtkit-daemon serial-getty@ speech-dispatcher speech-dispatcherd
systemd-boot-check-no-failures systemd-network-generator systemd-networkd
systemd-networkd-wait-online systemd-time-wait-sync upower wpa_supplicant-nl80211@
wpa_supplicant-wired@ wpa_supplicant@
generated  apport
indirect    display-manager lightdm saned@ spice-vdagent spice-vdagentd uidd
masked      alsa-utils cryptdisks cryptdisks-early hwclock pulseaudio-enable-autospawn rc rcS saned
sudo x11-common
```

14. Linux kernel boot-time arguments, from `/proc/cmdline`

```
BOOT_IMAGE=/boot/vmlinuz-5.15.0-86-generic
root=UUID=1ae71a13-cac0-48f6-b6e6-e15e5e687f57
ro
quiet
splash
vt.handoff=7
```

15. `sysctl`

```
kernel.numa_balancing 1
kernel.randomize_va_space 0
vm.compaction_proactiveness 20
vm.dirty_background_bytes 0
vm.dirty_background_ratio 10
vm.dirty_bytes 0
vm.dirty_expire_centisecs 3000
vm.dirty_ratio 8
vm.dirty_writeback_centisecs 500
vm.dirtytime_expire_seconds 43200
vm.extfrag_threshold 500
vm.min_unmapped_ratio 1
vm.nr_hugepages 0
vm.nr_hugepages_mempolicy 0
vm.nr_overcommit_hugepages 0
vm.swappiness 1
vm.watermark_boost_factor 15000
vm.watermark_scale_factor 10
vm.zone_reclaim_mode 1
```

(Continued on next page)



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Platform Notes (Continued)

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

18. OS release
From /etc/*-release /etc/*-version
os-release Ubuntu 20.04.4 LTS

19. Disk information
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/nvme0n1p2 ext4 938G 20G 871G 3% /

20. /sys/devices/virtual/dmi/id
Vendor: Tyrone Systems
Product: Tyrone Camarero SDA200A2N-212
Product Family: SMC H13
Serial: A509935X3311011

21. dmidecode
Additional information from dmidecode 3.2 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:
8x NO DIMM NO DIMM
16x Samsung M321R8GA0BB0-CQKZJ 64 GB 2 rank 4800

22. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: American Megatrends International, LLC.
BIOS Version: 1.4
BIOS Date: 04/19/2023
BIOS Revision: 5.27

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)

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Compiler Version Notes (Continued)

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
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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

=====
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
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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

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Tyrone Systems
(Test Sponsor: Netweb Pte Ltd)
(Tyrone Camarero SDA200A2N-212)
(2.45 GHz, AMD EPYC 9534)

SPECrate®2017_fp_base = 861
SPECrate®2017_fp_peak = 934

CPU2017 License: 6042
Test Sponsor: Netweb Pte Ltd
Tested by: Tyrone Systems

Test Date: Oct-2023
Hardware Availability: Jun-2023
Software Availability: Sep-2023

Compiler Version Notes (Continued)

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
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



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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
-freemap-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
-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
```

(Continued on next page)



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Base Optimization Flags (Continued)

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
```

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++
```

(Continued on next page)



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Software Availability: Sep-2023

Peak 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

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
-freemap-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 -freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

C++ benchmarks:

(Continued on next page)



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Peak Optimization Flags (Continued)

```
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
-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
```

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SPECrate®2017_fp_base = 861

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CPU2017 License: 6042

Test Sponsor: Netweb Pte Ltd

Tested by: Tyrone Systems

Test Date: Oct-2023

Hardware Availability: Jun-2023

Software Availability: Sep-2023

Peak Optimization Flags (Continued)

521.wrf_r (continued):

-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

-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 -fvectors-transform

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Software Availability: Sep-2023

Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

-fscalar-transform -mrecursive -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang

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.html>

<http://www.spec.org/cpu2017/flags/Tyrone-Platform-Settings-V1.2-Genoa-revC.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/Tyrone-Platform-Settings-V1.2-Genoa-revC.xml>

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