



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Tyrone Systems

(Test Sponsor: Netweb Pte Ltd)

(Tyrone Camarero SDA200A2N-18)

(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 1290

SPECrate®2017_fp_peak = 1410

CPU2017 License: 6042

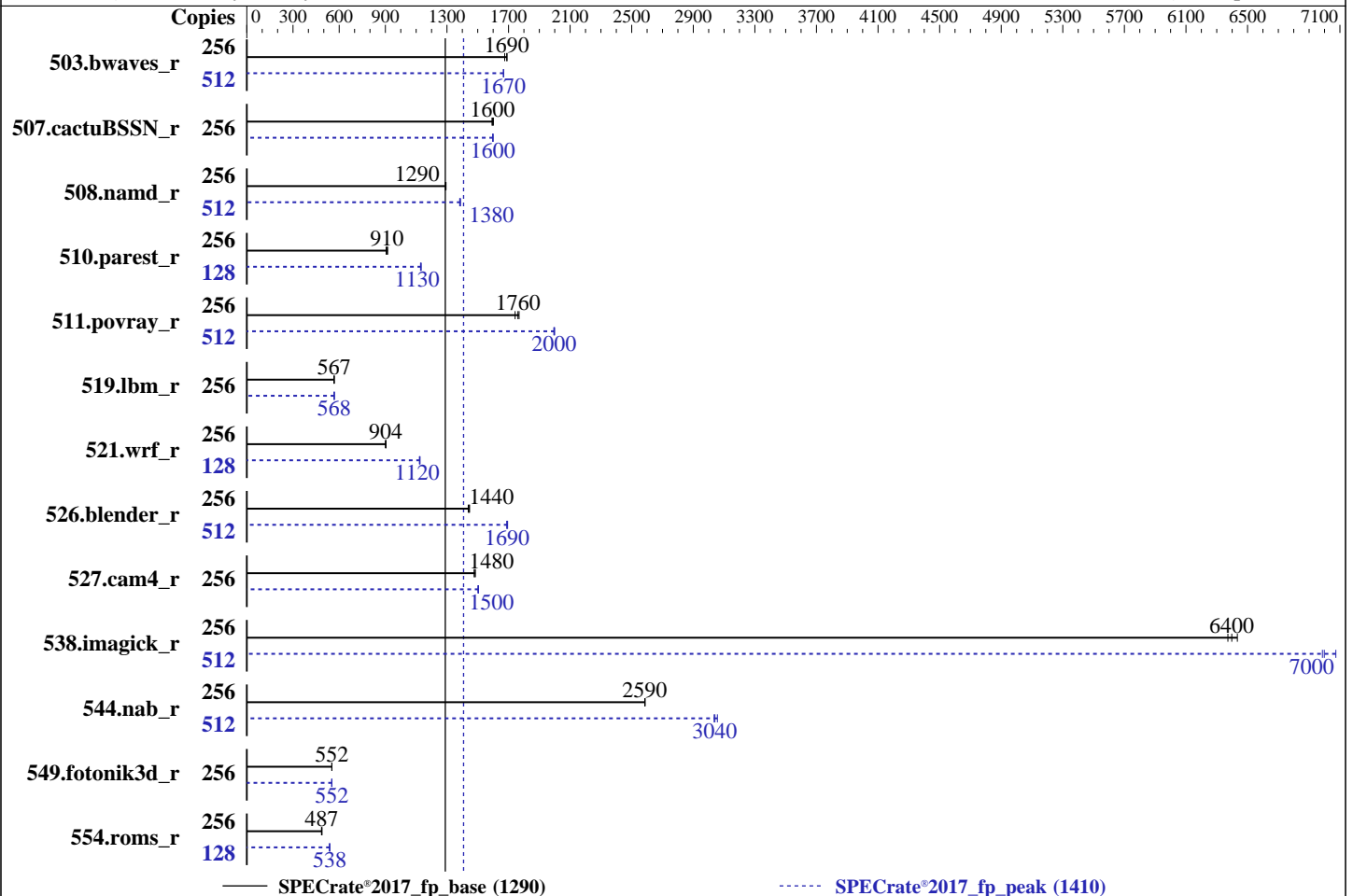
Test Sponsor: Netweb Pte Ltd

Tested by: Tyrone Systems

Test Date: Sep-2023

Hardware Availability: Jun-2023

Software Availability: Sep-2023



Hardware

CPU Name: AMD EPYC 9754
 Max MHz: 3100
 Nominal: 2250
 Enabled: 256 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, 16 MB shared / 8 cores
 Other: None
 Memory: 1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)
 Storage: 1 x 960 GB NVMe
 Other: None

Software

OS: Ubuntu 20.04.4 LTS
 kernel version 5.15.0-84-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: OS is 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	1533	1680	1519	1690	<u>1521</u>	<u>1690</u>	512	3080	1670	3078	1670	<u>3080</u>	<u>1670</u>
507.cactuBSSN_r	256	204	1590	202	1600	<u>203</u>	<u>1600</u>	256	203	1600	<u>203</u>	<u>1600</u>	203	1600
508.namd_r	256	189	1290	<u>188</u>	<u>1290</u>	188	1290	512	350	1390	<u>351</u>	<u>1380</u>	352	1380
510.parest_r	256	732	915	740	905	<u>736</u>	<u>910</u>	128	<u>296</u>	<u>1130</u>	296	1130	297	1130
511.povray_r	256	<u>339</u>	<u>1760</u>	343	1740	338	1770	512	598	2000	600	1990	<u>599</u>	<u>2000</u>
519.lbm_r	256	475	568	477	566	<u>476</u>	<u>567</u>	256	<u>475</u>	<u>568</u>	474	569	476	567
521.wrf_r	256	637	900	634	904	<u>635</u>	<u>904</u>	128	<u>255</u>	<u>1120</u>	256	1120	255	1130
526.blender_r	256	271	1440	<u>270</u>	<u>1440</u>	269	1450	512	<u>461</u>	<u>1690</u>	462	1690	460	1690
527.cam4_r	256	302	1480	303	1480	<u>303</u>	<u>1480</u>	256	297	1510	<u>298</u>	<u>1500</u>	298	1500
538.imagick_r	256	99.9	6370	<u>99.5</u>	<u>6400</u>	99.0	6430	512	<u>182</u>	<u>7000</u>	182	6990	180	7070
544.nab_r	256	<u>167</u>	<u>2590</u>	167	2590	167	2580	512	<u>283</u>	<u>3040</u>	282	3060	284	3040
549.fotonik3d_r	256	1804	553	<u>1806</u>	<u>552</u>	1806	552	256	1810	551	<u>1807</u>	<u>552</u>	1804	553
554.roms_r	256	839	485	833	488	<u>835</u>	<u>487</u>	128	379	537	<u>378</u>	<u>538</u>	377	539

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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 Thu Sep 28 01:29:07 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

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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 5.15.0-84-generic #93~20.04.1-Ubuntu SMP Wed Sep 6 16:15:40 UTC 2023 x86_64 x86_64
x86_64 GNU/Linux
-----

2. w
 01:29:07 up  8:20,  1 user,  load average: 174.15, 408.68, 470.99
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU   WHAT
amd2     tty2      -                17:09    8:17m  2.30s  0.03s  -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            6190793
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

```

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Platform Notes (Continued)

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

```
-----
6. /proc/cpuinfo
model name      : AMD EPYC 9754 128-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 25
model          : 160
stepping       : 2
microcode      : 0xaa00212
bugs           : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
TLB size      : 3584 4K pages
cpu cores     : 128
siblings      : 256
2 physical ids (chips)
512 processors (hardware threads)
physical id 0: core ids 0-127
physical id 1: core ids 0-127
physical id 0: apicids 0-255
physical id 1: apicids 256-511
```

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):                512
On-line CPU(s) list:  0-511
Thread(s) per core:   2
Core(s) per socket:   128
Socket(s):             2
NUMA node(s):         2
Vendor ID:             AuthenticAMD
CPU family:            25
Model:                 160
Model name:            AMD EPYC 9754 128-Core Processor
Stepping:              2
Frequency boost:      enabled
CPU MHz:               1800.000
CPU max MHz:           3100.3411
CPU min MHz:           1500.0000
BogoMIPS:              4500.15
Virtualization:        AMD-V
L1d cache:             8 MiB
L1i cache:             8 MiB
L2 cache:              256 MiB
L3 cache:              512 MiB
NUMA node0 CPU(s):    0-127,256-383
NUMA node1 CPU(s):    128-255,384-511
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 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, PBRB-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 sse3 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 avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL
L1d	32K	8M	8	Data	1
L1i	32K	8M	8	Instruction	1
L2	1M	256M	8	Unified	2
L3	16M	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: 0-127,256-383
node 0 size: 773814 MB
node 0 free: 770128 MB
node 1 cpus: 128-255,384-511
node 1 size: 773958 MB
node 1 free: 770191 MB
node distances:
node 0 1
0: 10 32
1: 32 10
```

9. /proc/meminfo

MemTotal: 1584920120 kB

10. who -r

run-level 5 Sep 27 17:08

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

Default Target	Status
graphical	degraded

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Platform Notes (Continued)

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-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-sync upower wpa_supplicant-nl80211@ wpa_supplicant-wired@ wpa_supplicant@	
generated	apport	
indirect	display-manager lightdm saned@ spice-vdagent spice-vdagentd uuidd	
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-5.15.0-84-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

16. `/sys/kernel/mm/transparent_hugepage`

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Platform Notes (Continued)

```
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/nvme1n1p2 ext4  938G  19G  872G   3% /
-----
```

```
-----
20. /sys/devices/virtual/dmi/id
Vendor:          Tyrone Systems
Product:         Tyrone Camarero SDA200A2N-18
Product Family: SMC H13
Serial:          A509928X3712360
-----
```

```
-----
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:
  24x 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)
Target: x86_64-unknown-linux-gnu
Thread model: posix
-----
```

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Compiler Version Notes (Continued)

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
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Target: x86_64-unknown-linux-gnu
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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

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Tyrone Systems
(Test Sponsor: Netweb Pte Ltd)
(Tyrone Camarero SDA200A2N-18)
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 1290

SPECrate®2017_fp_peak = 1410

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

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

Compiler Version Notes (Continued)

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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Test Date: Sep-2023
Hardware Availability: Jun-2023
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Base Optimization Flags

C benchmarks:

```
-m64 -flt0 -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 -flt0 -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 -flt0 -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 -flt0 -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 -flt0 -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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Test Date: Sep-2023

Hardware Availability: Jun-2023

Software Availability: Sep-2023

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```
-m64 -flt0 -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 -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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Test Date: Sep-2023
Hardware Availability: Jun-2023
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
-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:

(Continued on next page)



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Software Availability: Sep-2023

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 = 1290

SPECrate®2017_fp_peak = 1410

CPU2017 License: 6042

Test Sponsor: Netweb Pte Ltd

Tested by: Tyrone Systems

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

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