



SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkEdge SE455 V3
(2.05 GHz, AMD EPYC 8324PN)

SPECrate®2017_fp_base = 302

SPECrate®2017_fp_peak = 324

CPU2017 License: 9017

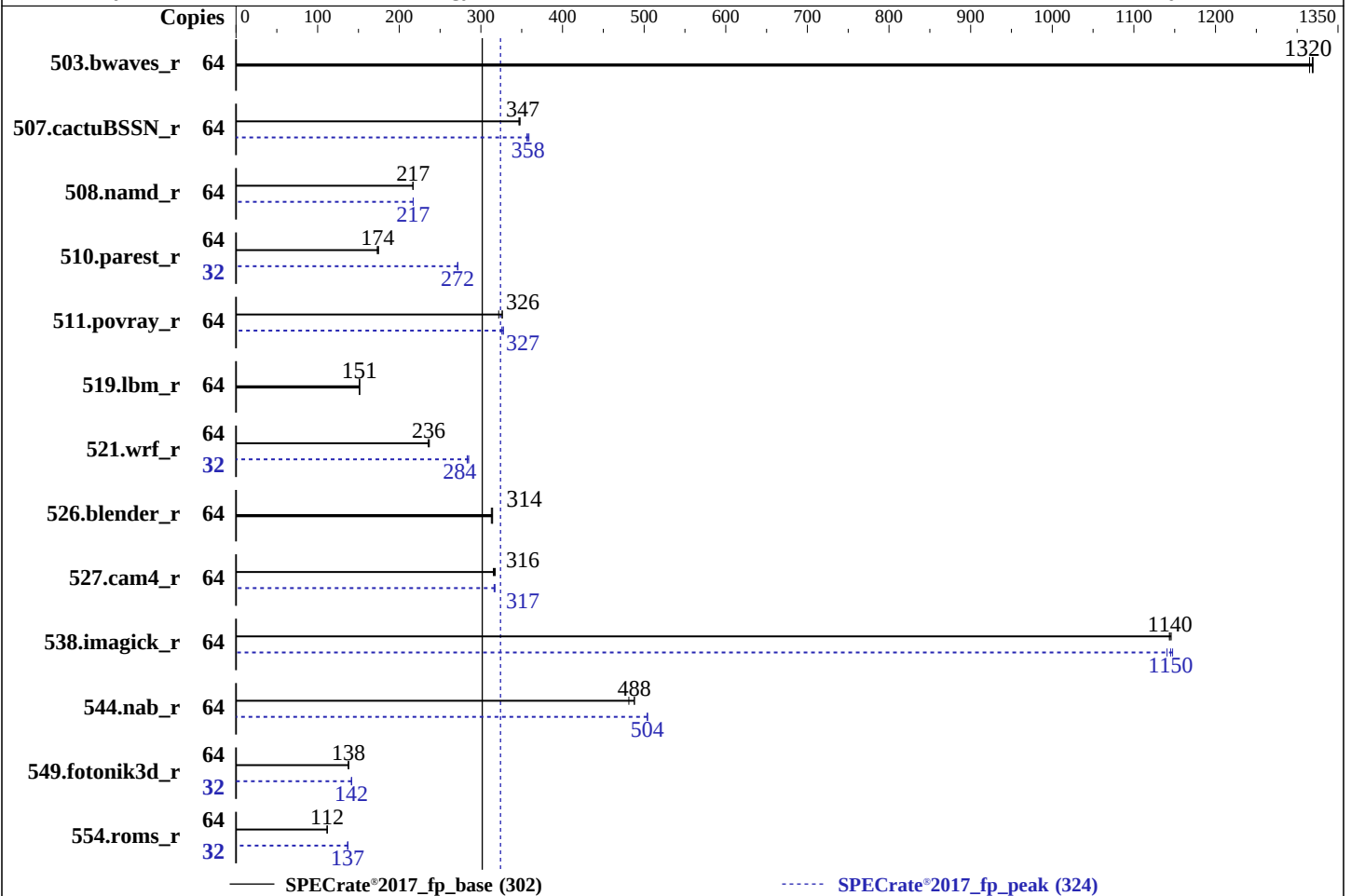
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Dec-2025

Hardware Availability: Nov-2023

Software Availability: Jun-2025



Hardware

CPU Name: AMD EPYC 8324PN
Max MHz: 3000
Nominal: 2050
Enabled: 32 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: 128 MB I+D on chip per chip,
16 MB shared / 4 cores
Other: None
Memory: 192 GB (6 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 480 GB M.2 NVME SSD
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP7
Kernel 6.4.0-150700.51-default
Compiler: C/C++/Fortran: Version 5.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version MBE119H 6.30 released Sep-2025
File System: xfs
System State: Run level 3 (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	64	487	1320	486	1320	488	1320	64	487	1320	486	1320	488	1320
507.cactuBSSN_r	64	233	348	234	347	234	347	64	227	356	226	359	226	358
508.namd_r	64	280	217	280	217	281	217	64	280	217	280	217	280	217
510.parest_r	64	963	174	968	173	959	175	32	308	272	308	272	308	272
511.povray_r	64	458	326	458	326	464	322	64	459	326	456	327	456	327
519.lbm_r	64	446	151	446	151	446	151	64	446	151	446	151	446	151
521.wrf_r	64	605	237	607	236	609	236	32	253	283	251	285	253	284
526.blender_r	64	310	314	312	313	311	314	64	310	314	312	313	311	314
527.cam4_r	64	352	318	355	315	354	316	64	353	317	354	316	353	317
538.imagick_r	64	139	1140	139	1150	139	1140	64	140	1140	139	1150	139	1150
544.nab_r	64	221	488	221	488	224	481	64	214	504	214	504	214	504
549.fotonik3d_r	64	1807	138	1814	138	1810	138	32	881	142	881	142	881	142
554.roms_r	64	912	112	911	112	909	112	32	372	137	372	137	371	137

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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) 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 =

"/home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2/amd_rate_aocc500_znver5_A_lib/lib:/home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2/amd_rate_aocc500_znver5_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 configuration:

Choose Operating Mode set to Maximum Performance

Sysinfo program /home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on localhost Sat Dec 6 14:47:29 2025

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

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-
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 254 (254.24+suse.148.g83b9060b6e)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 16. /sys/kernel/mm/transparent_hugepage
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 18. OS release

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Platform Notes (Continued)

19. Disk information

20. /sys/devices/virtual/dmi/id

21. dmidecode

22. BIOS

1. uname -a

```
Linux localhost 6.4.0-150700.51-default #1 SMP PREEMPT_DYNAMIC Wed Apr 30 21:35:43 UTC 2025 (6930611)
x86_64 x86_64 x86_64 GNU/Linux
```

2. w

```
14:47:29 up 3 min, 1 user, load average: 0.08, 0.07, 0.02
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU WHAT
```

3. Username

From environment variable \$USER: root

4. ulimit -a

```
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size                (blocks, -f) unlimited
pending signals         (-i) 771779
max locked memory       (kbytes, -l) 2097152
max memory size         (kbytes, -m) unlimited
open files              (-n) 1024
pipe size               (512 bytes, -p) 8
POSIX message queues    (bytes, -q) 819200
real-time priority      (-r) 0
stack size              (kbytes, -s) unlimited
cpu time                (seconds, -t) unlimited
max user processes      (-u) 771779
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited
```

5. sysinfo process ancestry

```
/usr/lib/systemd/systemd --switched-root --system --deserialize=42
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: root [priv]
sshd: root@notty
/bin/bash ./02.remote_local_SPECcpu_1.02.sh
/bin/bash ./Run026-compliant-amd-ratefp.sh
python3 ./run_amd_rate_aocc500_znver5_A1.py
/bin/bash ./amd_rate_aocc500_znver5_A1.sh
runcpu --config amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 fprate
runcpu --configfile amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 --nopower
--runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.083/temlogs/preenv.fprate.083.0.log --lognum 083.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2
```

6. /proc/cpuinfo

```
model name      : AMD EPYC 8324PN 32-Core Processor
vendor_id      : AuthenticAMD
```

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Platform Notes (Continued)

```
cpu family      : 25
model           : 160
stepping        : 2
microcode       : 0xaa00219
bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass srso
TLB size        : 3584 4K pages
cpu cores       : 32
siblings        : 64
1 physical ids (chips)
64 processors (hardware threads)
physical id 0: core ids 0-3,8-11,16-19,24-27,32-35,40-43,48-51,56-59
physical id 0: apicids 0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119
```

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 2.40.4:

```
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):            64
On-line CPU(s) list: 0-63
Vendor ID:         AuthenticAMD
Model name:        AMD EPYC 8324PN 32-Core Processor
CPU family:        25
Model:             160
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s):         1
Stepping:          2
Frequency boost:    enabled
CPU(s) scaling MHz: 74%
CPU max MHz:       2050.0000
CPU min MHz:       1500.0000
BogoMIPS:          4093.82
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 amd_lbr_v2 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 bpeext
                  perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate ssbd mba perfmon_v2
                  ibrs ibpb stibp ibrs_enhanced 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
                  user_shstk avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd
                  amd_ppin cppc amd_ibpb_ret arat npt lbrv svm_lock nrip_save tsc_scale
                  vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic
                  v_vmsave_vmload vgif x2avic v_spec_ctrl vnmi avx512vbmi umip pku
                  ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                  avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
                  debug_swap
Virtualization:     AMD-V
L1d cache:         1 MiB (32 instances)
L1i cache:         1 MiB (32 instances)
```

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Platform Notes (Continued)

L2 cache: 32 MiB (32 instances)
L3 cache: 128 MiB (8 instances)
NUMA node(s): 1
NUMA node0 CPU(s): 0-63
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 Reg file data sampling: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec rstack overflow: Mitigation; Safe RET
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced / Automatic IBRS; IBPB conditional; STIBP always-on; RSB filling; PBRSE-eIBRS Not affected; BHI 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	1M	8	Data	1	64	1	64
L1i	32K	1M	8	Instruction	1	64	1	64
L2	1M	32M	8	Unified	2	2048	1	64
L3	16M	128M	16	Unified	3	16384	1	64

8. numactl --hardware

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

available: 1 nodes (0)
node 0 cpus: 0-63
node 0 size: 192972 MB
node 0 free: 192091 MB
node distances:
node 0
0: 10

9. /proc/meminfo

MemTotal: 197603368 kB

10. who -r

run-level 3 Dec 6 14:45

11. Systemd service manager version: systemd 254 (254.24+suse.148.g83b9060b6e)

Default Target Status
multi-user running

12. Services, from systemctl list-unit-files

STATE	UNIT FILES
enabled	YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator kbdsettings klog lvm2-monitor nscd nvme-fc-boot-connections nvmmf-autoconnect postfix purge-kernels rollback rsyslog smartd sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime	systemd-remount-fs
disabled	autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait

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Platform Notes (Continued)

chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info
firewalld fsidd gpm grub2-once haveged hwloc-dump-hwdata ipmi ipmievd issue-add-ssh-keys
kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rpcbind rpmconfigcheck rsyncd
serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
systemd-confext systemd-network-generator systemd-sysext systemd-time-wait-sync
systemd-timesyncd
systemd-userdbd wickedd

indirect

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

BOOT_IMAGE=/boot/vmlinuz-6.4.0-150700.51-default
root=UUID=10ab2479-28f4-4c63-abf5-3887b0081c47
splash=silent
quiet
security=apparmor
mitigations=auto

14. cpupower frequency-info

analyzing CPU 19:
current policy: frequency should be within 1.50 GHz and 2.05 GHz.
The governor "ondemand" may decide which speed to use
within this range.
boost state support:
Supported: yes
Active: yes

15. sysctl

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

16. /sys/kernel/mm/transparent_hugepage

defrag	[always] defer defer+madvice madvice never
enabled	[always] madvice 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

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Platform Notes (Continued)

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 SUSE Linux Enterprise Server 15 SP7

19. Disk information

SPEC is set to: /home/cpu2017-1.1.9-amd-aocc500_znver5_A1.2
Filesystem Type Size Used Avail Use% Mounted on
/dev/nvme0n1p3 xfs 446G 37G 409G 9% /

20. /sys/devices/virtual/dmi/id

Vendor: Lenovo
Product: ThinkEdge SE455 V3 Planar
Product Family: ThinkSystem
Serial: 1234567890

21. dmidecode

Additional information from dmidecode 3.6 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:
6x SK Hynix HMC88AE8B173N 32 GB 2 rank 4800

22. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: Lenovo
BIOS Version: MBE119H-6.30
BIOS Date: 09/03/2025
BIOS Revision: 6.30
Firmware Revision: 8.10

Compiler Version Notes

C | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu

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Compiler Version Notes (Continued)

Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

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

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
=====

=====
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
=====

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
=====

=====
Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
=====

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
=====

=====
Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
=====

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
=====



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Lenovo Global Technology

ThinkEdge SE455 V3
(2.05 GHz, AMD EPYC 8324PN)

SPECrate®2017_fp_base = 302

SPECrate®2017_fp_peak = 324

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Dec-2025

Hardware Availability: Nov-2023

Software Availability: Jun-2025

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

Base Optimization Flags

C benchmarks:

-m64 -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=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flt0
-fstruct-layout=7 -mllvm -unroll-threshold=50

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Base Optimization Flags (Continued)

C benchmarks (continued):

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

C++ benchmarks:

```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-extra-inliner  
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -flto  
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000  
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc  
-lflang -ldl
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-enable-X86-prefetching  
-Wl,-mllvm -Wl,-enable-aggressive-gather=true  
-Wl,-mllvm -Wl,-enable-masked-gather-sequence=false -O3 -march=znver5  
-fveclib=AMDLIBM -ffast-math -flto -Mrecursive -funroll-loops  
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3  
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc  
-lflang -ldl
```

Benchmarks using both Fortran and C:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-enable-X86-prefetching  
-Wl,-mllvm -Wl,-enable-aggressive-gather=true  
-Wl,-mllvm -Wl,-enable-masked-gather-sequence=false -O3 -march=znver5  
-fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flto  
-fstruct-layout=7 -mllvm -unroll-threshold=50  
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining  
-mllvm -reduce-array-computations=3 -zopt -Mrecursive -funroll-loops  
-mllvm -lsr-in-nested-loop -fepilog-vectorization-of-inductions  
-lamdlibm -lamdalloc -lflang -ldl
```

Benchmarks using both C and C++:

```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-extra-inliner  
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie  
-flto -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
```

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Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):

-mllvm -loop-unswitch-threshold=2000000 -lamdlibm -lamdalloc -lflang
-ldl

Benchmarks using Fortran, C, and C++:

-m64 -std=c++14 -Wl, -mllvm -Wl, -align-all-nofallthru-blocks=6
-Wl, -mllvm -Wl, -reduce-array-computations=3
-Wl, -mllvm -Wl, -x86-use-vzeroupper=false -Wl, -mllvm -Wl, -extra-inliner
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie
-flto -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
-mllvm -loop-unswitch-threshold=2000000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang -ldl

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

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Peak Compiler Invocation (Continued)

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: basepeak = yes

538.imagick_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6

-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast

-march=znver5 -fveclib=AMDLIBM -ffast-math -flto

-fstruct-layout=7 -mllvm -unroll-threshold=50

-fremap-arrays -fstrip-mining

-mllvm -inline-threshold=1000

-mllvm -reduce-array-computations=3 -zopt -lamdlibm

-lamdalloc -ldl

544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-ldist-scalar-expand

-fenable-aggressive-gather -Ofast -march=znver5

-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 -ldl

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Peak Optimization Flags (Continued)

C++ benchmarks:

```
508.namd_r: -m64 -std=c++14
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver5 -fveclib=AMDLIB -ffast-math -flto
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc -ldl
```

```
510.parest_r: -m64 -std=c++14 -flto -Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver5 -fveclib=AMDLIB -ffast-math
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc -ldl
```

Fortran benchmarks:

```
503.bwaves_r: basepeak = yes
```

```
549.fotonik3d_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIB -ffast-math -flto
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -ldl -lflang
```

```
554.roms_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIB -ffast-math -flto
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm
-lamdalloc -ldl -lflang
```

Benchmarks using both Fortran and C:

```
521.wrf_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIB -ffast-math -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
```

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Peak Optimization Flags (Continued)

521.wrf_r (continued):

```
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc  
-ldl -lflang
```

```
527.cam4_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast  
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto  
-fstruct-layout=7 -mllvm -unroll-threshold=50  
-mllvm -inline-threshold=1000 -fremap-arrays  
-mllvm -reduce-array-computations=3 -zopt -Mrecursive  
-funroll-loops -mllvm -lsr-in-nested-loop  
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc  
-ldl -lflang
```

Benchmarks using both C and C++:

```
511.povray_r: -m64 -std=c++14  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false  
-Wl,-mllvm -Wl,-extra-inliner -Ofast -march=znver5  
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=7  
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000  
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt  
-mllvm -unroll-threshold=100  
-mllvm -loop-unswitch-threshold=200000 -lamdlibm  
-lamdalloc -ldl
```

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver5  
-fveclib=AMDLIBM -ffast-math -flto -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  
-faggressive-loop-transform -fvector-transform -fscalar-transform  
-Mrecursive -fepilog-vectorization-of-inductions -lamdlibm -lamdalloc  
-ldl -lflang
```



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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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Turin-K.html>

<http://www.spec.org/cpu2017/flags/aocc500-flags.2024-10-10.html>

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

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Turin-K.xml>

<http://www.spec.org/cpu2017/flags/aocc500-flags.2024-10-10.xml>

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