



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SD535 V3  
(2.70 GHz, AMD EPYC 9334)

SPECspeed®2017\_fp\_base = 237

SPECspeed®2017\_fp\_peak = 247

CPU2017 License: 9017

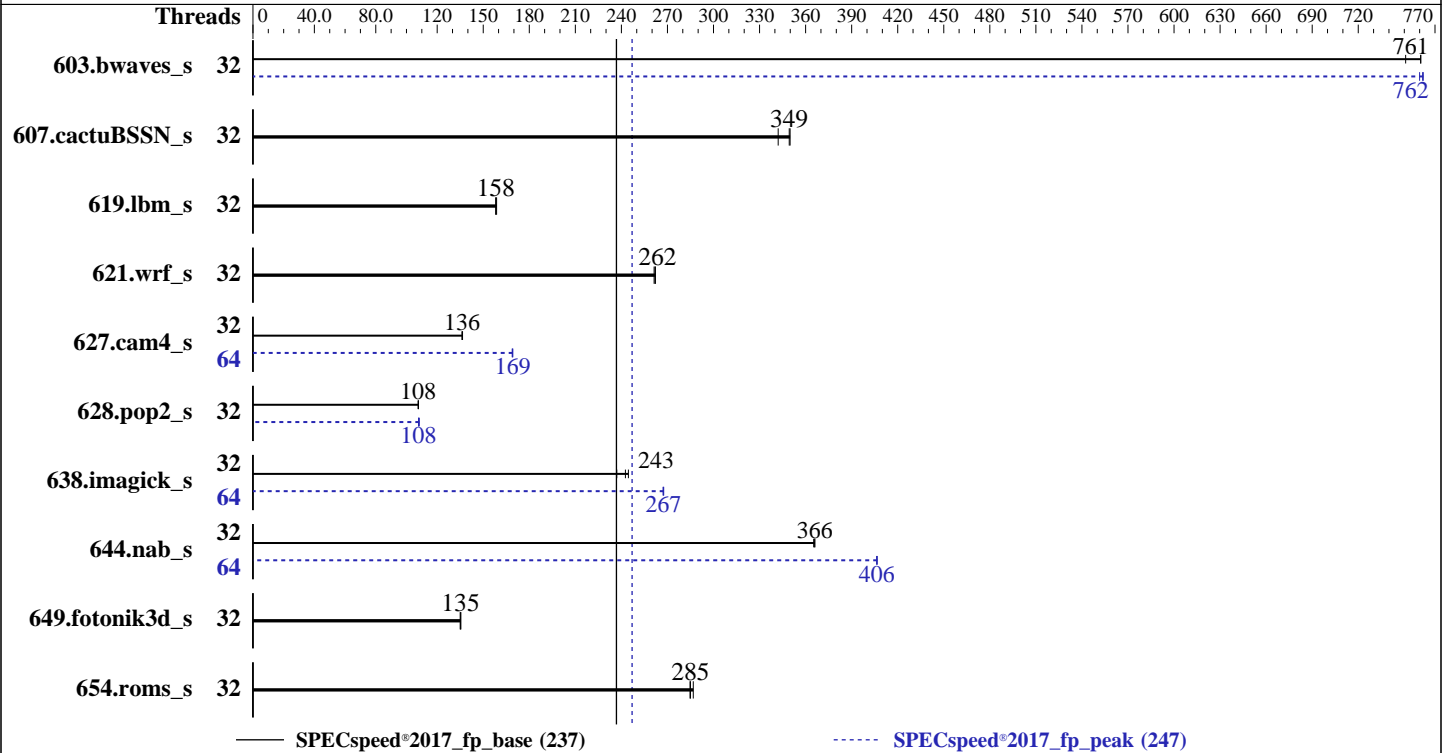
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: May-2024

Hardware Availability: May-2024

Software Availability: Jun-2023



### Hardware

CPU Name: AMD EPYC 9334  
 Max MHz: 3900  
 Nominal: 2700  
 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,  
 32 MB shared / 8 cores  
 Other: None  
 Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 1 x 960 GB M.2 SATA SSD  
 Other: CPU Cooling: Air

### Software

OS: SUSE Linux Enterprise Server 15 SP5  
 Kernel 5.14.21-150500.53-default  
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version GPE103H 1.10 released Mar-2024  
 File System: xfs  
 System State: Run level 3 (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							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	32	<b><u>77.6</u></b>	<b><u>761</u></b>	77.6	761	78.6	751	32	77.4	762	<b><u>77.4</u></b>	<b><u>762</u></b>	77.6	760
607.cactuBSSN_s	32	47.6	350	48.7	342	<b><u>47.7</u></b>	<b><u>349</u></b>	32	47.6	350	48.7	342	<b><u>47.7</u></b>	<b><u>349</u></b>
619.lbm_s	32	33.1	158	33.0	159	<b><u>33.1</u></b>	<b><u>158</u></b>	32	33.1	158	33.0	159	<b><u>33.1</u></b>	<b><u>158</u></b>
621.wrf_s	32	<b><u>50.5</u></b>	<b><u>262</u></b>	50.5	262	50.6	261	32	<b><u>50.5</u></b>	<b><u>262</u></b>	50.5	262	50.6	261
627.cam4_s	32	<b><u>65.0</u></b>	<b><u>136</u></b>	64.9	137	65.1	136	64	52.4	169	52.5	169	<b><u>52.4</u></b>	<b><u>169</u></b>
628.pop2_s	32	110	108	110	108	<b><u>110</u></b>	<b><u>108</u></b>	32	110	108	<b><u>110</u></b>	<b><u>108</u></b>	110	108
638.imagick_s	32	<b><u>59.5</u></b>	<b><u>243</u></b>	59.0	245	60.9	237	64	53.9	268	<b><u>54.0</u></b>	<b><u>267</u></b>	54.0	267
644.nab_s	32	47.7	366	47.8	365	<b><u>47.7</u></b>	<b><u>366</u></b>	64	43.0	406	<b><u>43.0</u></b>	<b><u>406</u></b>	43.0	407
649.fotonik3d_s	32	67.3	135	<b><u>67.4</u></b>	<b><u>135</u></b>	67.5	135	32	67.3	135	<b><u>67.4</u></b>	<b><u>135</u></b>	67.5	135
654.roms_s	32	54.9	287	<b><u>55.2</u></b>	<b><u>285</u></b>	55.3	285	32	54.9	287	<b><u>55.2</u></b>	<b><u>285</u></b>	55.3	285

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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.

cpupower set to performance mode  
cpupower frequency-set -r -g performance  
To enable Transparent Hugepages (THP) for all allocations,  
'echo always > /sys/kernel/mm/transparent\_hugepage/enabled' and  
'echo always > /sys/kernel/mm/transparent\_hugepage/defrag' run as root.  
To always enable THP for peak runs of:

(Continued on next page)



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### Operating System Notes (Continued)

```
603.bwaves_s, 607.cactuBSSN_s, 619.lbm_s, 627.cam4_s, 628.pop2_s, 638.imagick_s, 644.nab_s, 649.fotonik3d_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To disable THP for peak runs of 621.wrf_s:
'echo never > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To enable THP only on request for peak runs of 654.roms_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo madvise > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
```

### Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-63"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2/amd_speed_aocc400_znver4_A_lib/lib:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 627.cam4_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0-63"
```

### 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:  
Operating Mode set to Maximum Performance and then set it to Custom Mode

Sysinfo program /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2/bin/sysinfo

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### Platform Notes (Continued)

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost Tue May 14 09:40:20 2024

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

-----  
Table of contents  
-----

1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
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
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 localhost 5.14.21-150500.53-default #1 SMP PREEMPT\_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)  
x86\_64 x86\_64 x86\_64 GNU/Linux  
-----

2. w  
09:40:20 up 1 min, 1 user, load average: 0.08, 0.05, 0.01  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT  
root tty1 - 09:39 12.00s 1.00s 0.05s /bin/bash ./amd\_speed\_aocc400\_znver4\_A1.sh  
-----

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) 3093284  
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  
-----

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### Platform Notes (Continued)

stack size (kbytes, -s) unlimited  
cpu time (seconds, -t) unlimited  
max user processes (-u) 3093284  
virtual memory (kbytes, -v) unlimited  
file locks (-x) unlimited

```
-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
/bin/bash ./run_SD535V3_genoa-X_1.03.sh
/bin/bash ./Run036-compliant-amd-speedfp.sh
python3 ./run_amd_speed_aocc400_znver4_A1.py
/bin/bash ./amd_speed_aocc400_znver4_A1.sh
runcpu --config amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 fpspeed
runcpu --configfile amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 --nopower
--runmode speed --tune base:peak --size test:train:refspeed fpspeed --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.103/templogs/preenv.fpspeed.103.0.log --lognum 103.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2
-----
```

```
6. /proc/cpuinfo
model name      : AMD EPYC 9334 32-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 25
model         : 17
stepping      : 1
microcode     : 0xa101144
bugs          : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
TLB size     : 3584 4K pages
cpu cores     : 32
siblings      : 64
1 physical ids (chips)
64 processors (hardware threads)
physical id 0: core ids 0-31
physical id 0: apicids 0-63
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 2.37.4:
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 9334 32-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 1
Stepping: 1
Frequency boost: enabled
-----
```

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### Platform Notes (Continued)

```

CPU max MHz:          3910.2529
CPU min MHz:          1500.0000
BogoMIPS:             5391.63
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 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 perfmon_v2 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_ysave_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
AMD-V
Virtualization:      AMD-V
L1d cache:           1 MiB (32 instances)
L1i cache:           1 MiB (32 instances)
L2 cache:            32 MiB (32 instances)
L3 cache:            128 MiB (4 instances)
NUMA node(s):        1
NUMA node0 CPU(s):  0-63
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/swaps 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

```

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	32M	128M	16	Unified	3	32768	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: 773351 MB
node 0 free: 771870 MB
node distances:
node 0
0: 10

```

9. /proc/meminfo

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### Platform Notes (Continued)

MemTotal: 791911492 kB

-----  
10. who -r  
run-level 3 May 14 09:39

-----  
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)  
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 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  
chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info  
firewalld gpm grub2-once haveged haveged-switch-root 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-network-generator systemd-sysext  
systemd-time-wait-sync systemd-timesyncd  
generated ntp\_sync  
indirect wickedd

-----  
13. Linux kernel boot-time arguments, from /proc/cmdline  
BOOT\_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default  
root=UUID=3505b9fe-eece-4ce1-bf46-116abd9cf337  
splash=silent  
mitigations=auto  
quiet  
security=apparmor

-----  
14. cpupower frequency-info  
analyzing CPU 0:  
current policy: frequency should be within 1.50 GHz and 2.70 GHz.  
The governor "performance" 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

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### Platform Notes (Continued)

```

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+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 SUSE Linux Enterprise Server 15 SP5

```

```

-----
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   893G  25G  868G   3% /

```

```

-----
20. /sys/devices/virtual/dmi/id
Vendor:          Lenovo
Product:         ThinkSystem SD535V3 MB
Product Family: ThinkSystem
Serial:          1234567890

```

```

-----
21. dmidecode
Additional information from dmidecode 3.4 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:
  1x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800
  2x Samsung M321R8GA0BB0-CQKMG 64 GB 2 rank 4800
  9x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

```

```

-----
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor:      Lenovo

```

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**Software Availability:** Jun-2023

### Platform Notes (Continued)

BIOS Version: GPE103H-1.10  
BIOS Date: 03/12/2024  
BIOS Revision: 1.10  
Firmware Revision: 0.50

### Compiler Version Notes

=====  
C | 619.lbm\_s(base, peak) 638.imagick\_s(base, peak) 644.nab\_s(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, Fortran | 607.cactuBSSN\_s(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 | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak) 654.roms\_s(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 | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak) 628.pop2\_s(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  
=====



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

**Lenovo Global Technology**

SPECspeed®2017\_fp\_base = 237

ThinkSystem SD535 V3  
(2.70 GHz, AMD EPYC 9334)

SPECspeed®2017\_fp\_peak = 247

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: May-2024

Hardware Availability: May-2024

Software Availability: Jun-2023

## Base Compiler Invocation

C benchmarks:

clang

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## Base Portability Flags

603.bwaves\_s: -DSPEC\_LP64  
607.cactuBSSN\_s: -DSPEC\_LP64  
619.ibm\_s: -DSPEC\_LP64  
621.wrf\_s: -DSPEC\_CASE\_FLAG -Mbyteswapio -DSPEC\_LP64  
627.cam4\_s: -DSPEC\_CASE\_FLAG -DSPEC\_LP64  
628.pop2\_s: -DSPEC\_CASE\_FLAG -Mbyteswapio -DSPEC\_LP64  
638.imagick\_s: -DSPEC\_LP64  
644.nab\_s: -DSPEC\_LP64  
649.fotonik3d\_s: -DSPEC\_LP64  
654.roms\_s: -DSPEC\_LP64

## Base Optimization Flags

C benchmarks:

-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver4  
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7  
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000  
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3  
-DSPEC\_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lamdalloc  
-lflang

Fortran benchmarks:

-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC\_OPENMP -O3 -march=znver4  
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive  
-funroll-loops -mllvm -lsr-in-nested-loop

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**Software Availability:** Jun-2023

## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp
-lamdlibm -lamdalloc -lflang
```

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 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

Benchmarks using Fortran, C, and C++:

```
-m64 -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 -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

## Base Other Flags

C benchmarks:

```
-Wno-return-type -Wno-unused-command-line-argument
```

Fortran benchmarks:

```
-Wno-unused-command-line-argument
```

Benchmarks using both Fortran and C:

```
-Wno-return-type -Wno-unused-command-line-argument
```

Benchmarks using Fortran, C, and C++:

```
-Wno-return-type -Wno-unused-command-line-argument
```



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**Test Date:** May-2024

**Hardware Availability:** May-2024

**Software Availability:** Jun-2023

## Peak Compiler Invocation

C benchmarks:

clang

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

619.lbm\_s: basepeak = yes

638.imagick\_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast  
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp  
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50  
-fremap-arrays -fstrip-mining  
-mllvm -inline-threshold=1000  
-mllvm -reduce-array-computations=3 -DSPEC\_OPENMP -zopt  
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

644.nab\_s: -m64 -Wl,-mllvm -Wl,-region-vectorize -Ofast  
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp  
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50  
-fremap-arrays -fstrip-mining  
-mllvm -inline-threshold=1000  
-mllvm -reduce-array-computations=3 -DSPEC\_OPENMP -zopt  
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

Fortran benchmarks:

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## Peak Optimization Flags (Continued)

```
603.bwaves_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -Mrecursive -mllvm -reduce-array-computations=3
-fvector-transform -fscalar-transform -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang
```

649.fotonik3d\_s: basepeak = yes

654.roms\_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf\_s: basepeak = yes

```
627.cam4_s: -m64 -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 -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

```
628.pop2_s: -m64 -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 -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fvector-transform -fscalar-transform
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:

607.cactuBSSN\_s: basepeak = yes



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## Peak Other Flags

C benchmarks:

-Wno-return-type -Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-return-type -Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-Wno-return-type -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-Genoa-U.html>

<http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.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-Genoa-U.xml>

<http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.xml>

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