# Lenovo Global Technology

**ThinkSystem SR645 V3**  
(2.70 GHz, AMD EPYC 9334)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>323</td>
<td>328</td>
</tr>
</tbody>
</table>

## Software

- **OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)  
  Kernel 5.14.21-150400.22-default
- **Compiler:** C/C++/Fortran: Version 4.0.0 of AOCC  
  Parallel: Yes
- **Firmware:** Lenovo BIOS Version KAE105F 1.20 released Dec-2022  
  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

## Hardware

- **CPU Name:** AMD EPYC 9334  
  **Max MHz:** 3900  
  **Nominal:** 2700  
  **Enabled:** 64 cores, 2 chips  
  **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:** 128 MB I+D on chip per chip, 32 MB shared / 8 cores  
  **Other:** None  
  **Memory:** 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)  
  **Storage:** 1 x 480 GB SATA SSD  
  **Other:** None

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base (323)</th>
<th>SPECspeed®2017_fp_peak (328)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threads</td>
<td></td>
</tr>
<tr>
<td>603.bwaves_s 64</td>
<td>492</td>
</tr>
<tr>
<td>607.cactuBSSN_s 64</td>
<td>492</td>
</tr>
<tr>
<td>619.lbm_s 64</td>
<td>193</td>
</tr>
<tr>
<td>621.wrf_s 64</td>
<td>202</td>
</tr>
<tr>
<td>627.cam4_s 64</td>
<td>211</td>
</tr>
<tr>
<td>628.pop2_s 64</td>
<td>215</td>
</tr>
<tr>
<td>638.imagick_s 64</td>
<td>430</td>
</tr>
<tr>
<td>644.nab_s 64</td>
<td>609</td>
</tr>
<tr>
<td>649.fotonik3d_s 64</td>
<td>214</td>
</tr>
<tr>
<td>654.roms_s 64</td>
<td>491</td>
</tr>
<tr>
<td></td>
<td>498</td>
</tr>
</tbody>
</table>
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ThinkSystem SR645 V3 (2.70 GHz, AMD EPYC 9334)

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### SPECspeed®2017_fp_base = 323

### SPECspeed®2017_fp_peak = 328

---

## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds Peak</th>
<th>Ratio Peak</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>39.8 1480</td>
<td>39.9 1480</td>
<td>39.5 1490</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>33.7 495</td>
<td>33.9 492</td>
<td>33.9 492</td>
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<tr>
<td>619.lbm_s</td>
<td>64</td>
<td>27.2 193</td>
<td>27.2 193</td>
<td>27.2 193</td>
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</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>64.5 205</td>
<td>65.4 202</td>
<td>65.5 202</td>
<td></td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>41.4 214</td>
<td>41.3 215</td>
<td>41.2 215</td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>64</td>
<td>163 72.7</td>
<td>163 72.7</td>
<td>164 72.5</td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>33.5 430</td>
<td>33.2 435</td>
<td>34.1 423</td>
<td></td>
</tr>
<tr>
<td>644.nab_s</td>
<td>64</td>
<td>28.7 610</td>
<td>28.8 608</td>
<td>28.7 609</td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>42.2 216</td>
<td>42.6 214</td>
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<td></td>
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<tr>
<td>654.roms_s</td>
<td>64</td>
<td>32.1 491</td>
<td>32.0 491</td>
<td>32.0 491</td>
<td></td>
</tr>
</tbody>
</table>

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### Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

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### 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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SPECspeed®2017_fp_base = 323
SPECspeed®2017_fp_peak = 328

Operating System Notes (Continued)

'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To always enable THP for peak runs of:
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/cpu2017-1.1.8-amd-aocc400-genoa-B1b/amd_speed_aocc400_genoa_B_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 = "0-63"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-63"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0 32 1 33 2 34 3 35 4 36 5 37 6 38 7 39 8 40 9 41 10 42
11 43 12 44 11 12 45 14 46 15 47 16 48 17 49 18 50 19 51 20 52 21 53 22 54

(Continued on next page)
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SPECspeed®2017_fp_base = 323
SPECspeed®2017_fp_peak = 328

Environment Variables Notes (Continued)
23 55 24 56 25 57 26 58 27 59 28 60 29 61 30 62 31 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
SMT Mode set to Disabled

Sysinfo program /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6af4d
running on localhost Fri Apr 29 21:07:42 2022

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
model name : AMD EPYC 9334 32-Core Processor
  2 "physical id"s (chips)
  64 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 32
siblings : 32
  physical 0: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 32 33 34 35 36 37 38 39
  48 49 50 51 52 53 54 55
  physical 1: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 32 33 34 35 36 37 38 39
  48 49 50 51 52 53 54 55

From lscpu from util-linux 2.37.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 52 bits physical, 57 bits virtual

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**

**Lenovo Global Technology**

**ThinkSystem SR645 V3**

(2.70 GHz, AMD EPYC 9334)

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**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Dec-2022  
**Hardware Availability:** Feb-2023  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Nov-2022

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**SPECspeed®2017_fp_base = 323**  
**SPECspeed®2017_fp_peak = 328**

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### Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Byte Order:</th>
<th>Little Endian</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU(s):</td>
<td>64</td>
</tr>
<tr>
<td>On-line CPU(s) list:</td>
<td>0-63</td>
</tr>
<tr>
<td>Vendor ID:</td>
<td>AuthenticAMD</td>
</tr>
<tr>
<td>Model name:</td>
<td>AMD EPYC 9334 32-Core Processor</td>
</tr>
<tr>
<td>CPU family:</td>
<td>25</td>
</tr>
<tr>
<td>Model:</td>
<td>17</td>
</tr>
<tr>
<td>Thread(s) per core:</td>
<td>1</td>
</tr>
<tr>
<td>Core(s) per socket:</td>
<td>32</td>
</tr>
<tr>
<td>Socket(s):</td>
<td>2</td>
</tr>
<tr>
<td>Stepping:</td>
<td>1</td>
</tr>
<tr>
<td>Frequency boost:</td>
<td>enabled</td>
</tr>
<tr>
<td>CPU max MHz:</td>
<td>3910.2529</td>
</tr>
<tr>
<td>CPU min MHz:</td>
<td>1500.0000</td>
</tr>
<tr>
<td>BogoMIPS:</td>
<td>5391.71</td>
</tr>
</tbody>
</table>

**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 aperf perf rapl pni pclmulqdq monitor ssse3 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 b pext perfctr_l1l mwaitx cbp 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 xsaveopt xsaaves cqm_llc cqm_occum llc cqm_mbb total cqm_mbb_local avx512_bf16 clzero irperf xsaveerptr rdpri wbnoinvd amd_pmn arat npt lbrv svm_lock ripr_save tsc_scale vmcb_clean flushbyasi decodeassists pausefilter ptthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbe umip pku ospe avx512_vbmi2 gfnl vaes vpclmulqdq avx512vn1 avx512_bitalg avx512 vpoptndtq la57 rdpid overflow_reco succor smca fslm flush_ll1d

**Virtualization:**  
`AMD-V`

| L1d cache: | 2 MiB (64 instances) |
| L1i cache: | 2 MiB (64 instances) |
| L2 cache:  | 64 MiB (64 instances) |
| L3 cache:  | 256 MiB (8 instances) |
| NUMA node(s): | 2 |
| NUMA node0 CPU(s): | 0-31 |
| NUMA node1 CPU(s): | 32-63 |

**Vulnerability Itlb multihit:** Not affected

**Vulnerability L1tf:** Not affected

**Vulnerability Mds:** Not affected

**Vulnerability Meltdown:** Not affected

**Vulnerability Spec store bypass:** Mitigation; Speculative Store Bypass disabled via prctl and seccomp

**Vulnerability Spec trom Spectre v1:** Mitigation; usercopy/swapgs barriers and __user pointer sanitization

**Vulnerability Spectre v2:** Mitigation; Retpolines, IBPB conditional, IBRS_FW,

(Continued on next page)
Platform Notes (Continued)

STIBP disabled, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>1M</td>
<td>64M</td>
<td>8</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>32M</td>
<td>256M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

/proc/cpuinfo cache data
cache size : 1024 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
28 29 30 31
node 0 size: 386601 MB
node 0 free: 384972 MB
node 1 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
57 58 59 60 61 62 63
node 1 size: 386814 MB
node 1 free: 385943 MB
node distances:
node 0 1
  0: 10 32
  1: 32 10

From /proc/meminfo
MemTotal: 791977548 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

From /etc/*release*/etc/*version*
oS--release:
  NAME="SLES"
  VERSION="15-SP4"
  VERSION_ID="15.4"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"

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ThinkSystem SR645 V3
(2.70 GHz, AMD EPYC 9334)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECspeed®2017_fp_base = 323
SPECspeed®2017_fp_peak = 328

Test Date: Dec-2022
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Platform Notes (Continued)

CPE_NAME="cpe:/o:suse:sles:15:sp4"

uname -a:
    Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222) x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Apr 29 20:00

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b

From /sys/devices/virtual/dmi/id
    Vendor: Lenovo
    Product: ThinkSystem SR645 V3 MB, Genoa, DDR5, Oahu, 1U
    Product Family: ThinkSystem
    Serial: 1234567890

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:
    7x SK Hynix HMCG88AEBRA115N 32 GB 2 rank 4800
    17x SK Hynix HMCG88AEBRA168N 32 GB 2 rank 4800

BIOS:
    BIOS Vendor: Lenovo
    BIOS Version: KAE105F-1.20

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SPECspeed®2017_fp_base = 323
SPECspeed®2017_fp_peak = 328

Platform Notes (Continued)

BIOS Date: 12/01/2022
BIOS Revision: 1.20
Firmware Revision: 1.20

(End of data from sysinfo program)

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#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

C++, C, Fortran
607.cactuBSSN_s(base, peak)

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (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#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/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#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Dec-2022
Hardware Availability: Feb-2023
Software Availability: Nov-2022

### Compiler Version Notes (Continued)

Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

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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#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
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AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

---

### 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.lbm_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

(Continued on next page)
Base Portability Flags (Continued)

644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3 -O3 -march=znver4
-fvecclib=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 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3
-W1, -mllvm -W1, -enable-X86-prefetching -DSPEC_OPENMP -O3 -march=znver4
-fvecclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp
-lamdlibm -lamdalloc -lflang

Benchmarks using both Fortran and C:
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3
-W1, -mllvm -W1, -enable-X86-prefetching -O3 -march=znver4
-fvecclib=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 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang

Benchmarks using Fortran, C, and C++:
-m64 -W1, -mllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mllvm -W1, -reduce-array-computations=3
-W1, -mllvm -W1, -x86-use-vzeroupper=false -O3 -march=znver4
-fvecclib=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 -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops

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Lenovo Global Technology
ThinkSystem SR645 V3
(2.70 GHz, AMD EPYC 9334)

SPECspeed®2017_fp_base = 323
SPECspeed®2017_fp_peak = 328

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Dec-2022
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Base Optimization Flags (Continued)

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

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
Lenovo Global Technology
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Peak Optimization Flags

C benchmarks:

619.lbm_s: -m64 -W1, -mlllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mlllvm -W1, -reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mlllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mlllvm -inline-threshold=1000
-mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -m64 -W1, -mlllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mlllvm -W1, -reduce-array-computations=3
-W1, -mlllvm -W1, -enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -Mrecursive -mlllvm -reduce-array-computations=3
-fvector-transform -fscalar-transform -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

649.fotonik3d_s: -m64 -W1, -mlllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mlllvm -W1, -reduce-array-computations=3
-W1, -mlllvm -W1, -enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -flto -Mrecursive
-mlllvm -reduce-array-computations=3 -zopt -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

654.roms_s: Same as 603.bwaves_s

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -W1, -mlllvm -W1, -align-all-nofallthru-blocks=6
-W1, -mlllvm -W1, -reduce-array-computations=3
-W1, -mlllvm -W1, -enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mlllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mlllvm -inline-threshold=1000
-mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-O3 -Mrecursive -funroll-loops -mlllvm -lsl-in-nested-loop

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SPECspeed®2017_fp_base = 323
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Peak Optimization Flags (Continued)

621.wrf_s (continued):
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

627.cam4_s: basepeak = yes

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=xnver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-ftlo -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-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

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-O.html
http://www.spec.org/cpu2017/flags/aocc400-flags.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-O.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml
## Lenovo Global Technology

**ThinkSystem SR645 V3**  
(2.70 GHz, AMD EPYC 9334)

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