**Lenovo Global Technology**

**ThinkSystem SR645 V3**

(3.85 GHz, AMD EPYC 9374F)

---

**SPECspeed®2017_fp_peak** = 362

**SPECspeed®2017_fp_base** = 356

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<table>
<thead>
<tr>
<th>Task</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
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<tr>
<td>603.bwaves_s</td>
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<td>457</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>619.lbm_s</td>
<td>206</td>
<td>232</td>
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<tr>
<td>621.wrf_s</td>
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<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<td>638.imagick_s</td>
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<tr>
<td>654.roms_s</td>
<td>571</td>
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**Hardware**

**CPU Name:** AMD EPYC 9374F  
**Max MHz:** 4300  
**Nominal:** 3850  
**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:** 256 MB I+D on chip per chip, 32 MB shared / 4 cores  
**Other:** None  
**Memory:** 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)  
**Storage:** 1 x 480 GB SATA SSD  
**Other:** None

---

**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 KAE105L 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

---

**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Jan-2023  
**Hardware Availability:** Feb-2023  
**Software Availability:** Nov-2022
Lenovo Global Technology
ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

**SPEC CPU®2017 Floating Point Speed Result**

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

**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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</table>

**SPECspeed®2017_fp_base = 356**  
**SPECspeed®2017_fp_peak = 362**

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/

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</table>

**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,
Lenovo Global Technology
ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

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

Operating System Notes (Continued)

'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:
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 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 = "0-63"

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

Environment variables set by runcpu during the 649.fotonik3d_s peak run:

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3 
(3.85 GHz, AMD EPYC 9374F)

SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

Environment Variables Notes (Continued)

GOMP_CPU_AFFINITY = "0-63"
PGHPF_ZMEM = "yes"

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 982a61ec0915b55891ef0e16acaf64d
running on localhost Fri Apr 29 20:02:44 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 9374F 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 16 17 18 19 32 33 34 35 48 49 50 51 64 65 66 67 80 81 82 83 96 97 98 99 112 113 114 115
physical 1: cores 0 1 2 3 16 17 18 19 32 33 34 35 48 49 50 51 64 65 66 67 80 81 82 83 96 97 98 99 112 113 114 115

From lscpu from util-linux 2.37.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
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ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

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

SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

Platform Notes (Continued)

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 9374F 32-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 32
Socket(s): 2
Stepping: 1
Frequency boost: enabled
CPU max MHz: 4304.9312
CPU min MHz: 1500.0000
BogoMIPS: 7688.52
Flags: fpu vme de pse tsc msr pae 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 extapicid aperfmrperf 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 cm8_legacy abm sse4a misalignsse 3nowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr llc mwitx cpb cat l3 cdp l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqsbasin bml1 axvz smep bml2 ermvcn invpcid cq dm rdt_a axv512f axv512dq rsead adx smap axv512ifma clflushopt clwb axv512cd sha_ni axv512bw axv512vl xsaveopt xsave xgetbv1 xsavevs_poly dq xcm_lcc xcm_occup lcc xcm_mbm_total xcm_mbm_local axv512 bfly16 cizer irperf xsaveeprtr rdp pr umovinv amd_pfin arat npt lbrv svm_lock nrip_sav e tsc_scale vmcb_clean flushbyasid decodeassistsootps filter pfthreshold avic v_vsav em_vload vg v spec cr1 axv512vmbi umip pku ospe axv512 vmbi2 gfn vaes vpcmulq dq avx512 vnni avx512 bitalg axv512 vpopcntdq 1a57 rdpid overflow_recover succor smca fsm 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: 512 MiB (16 instances)
NUMA node(s): 2
NUMA node0 CPU(s): 0-31
NUMA node1 CPU(s): 32-63
Vulnerability Itlb multihit: Not affected
Vulnerability L1 I: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: 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

(Continued on next page)
Lenovo Global Technology
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SPEC CPU®2017 Floating Point Speed Result
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Lenovo Global Technology

SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

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

Platform Notes (Continued)

Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:

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<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
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<td>8</td>
<td>Data</td>
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<td>64</td>
<td>1</td>
<td>64</td>
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<td>L1i</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Instruction</td>
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<td>64</td>
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<tr>
<td>L2</td>
<td>1M</td>
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<td>8</td>
<td>Unified</td>
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<td>2048</td>
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<td>64</td>
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<td>16</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
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</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: 386727 MB
node 0 free: 384868 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: 386810 MB
node 1 free: 385941 MB
node distances:
node 0: 10 32
node 1: 32 10

From /proc/meminfo

MemTotal: 792102480 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"

(Continued on next page)
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CPU2017 License: 9017
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SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

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

Platform Notes (Continued)

ANSI_COLOR="0;32"
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
Microarchitectual Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected

run-level 3 Apr 29 20:00

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb3 xfs 442G 46G 397G 11% /

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

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3
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SPECSpeed®2017_fp_base = 356
SPECSpeed®2017_fp_peak = 362

Platform Notes (Continued)

BIOS Version: KAE105L-1.20
BIOS Date: 12/29/2022
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
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)
Lenovo Global Technology  
ThinkSystem SR645 V3  
(3.85 GHz, AMD EPYC 9374F)  

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

### Compiler Version Notes (Continued)

**Target:** x86_64-unknown-linux-gnu  
**Thread model:** posix  
**InstalledDir:** /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/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#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  
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

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

Lenovo Global Technology  
ThinkSystem SR645 V3  
(3.85 GHz, AMD EPYC 9374F)

<table>
<thead>
<tr>
<th>CPU2017 License: 9017</th>
<th>Test Date: Jan-2023</th>
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<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Feb-2023</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Nov-2022</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 356**  
**SPECspeed®2017_fp_peak = 362**

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**Base Portability Flags (Continued)**

- 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 -lamdaloc`
- `-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 -lslr-in-nested-loop`
- `-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp`
- `-lamdlibm -lamdaloc -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 -DSPEC_OPENMP -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 -Mrecursive -funroll-loops`
- `-mllvm -lslr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdaloc -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`
- `-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3`
- `-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive`

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

Base Optimization Flags (Continued)

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

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
ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

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

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

Peak Optimization Flags

C benchmarks:

619.lbm_s: -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-Ofast -fstrict-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: Same as 619.lbm_s

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-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 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-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: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-Ofast -fstrict-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 -lsr-in-nested-loop

(Continued on next page)
**Lenovo Global Technology**

ThinkSystem SR645 V3 (3.85 GHz, AMD EPYC 9374F)

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</table>

**PACKAGE NAME**

**SPECs**

**SPECspeed®2017_fp_base = 356**

**SPECspeed®2017_fp_peak = 362**

**Peak Optimization Flags (Continued)**

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

627.cam4_s: -m64 -W1, -ml1vm -W1, -align-all-nofallthru-blocks=6
- W1, -ml1vm -W1, -reduce-array-computations=3
- W1, -ml1vm -W1, -enable-X86-prefetching -Ofast
- march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
- flio -fstruct-layout=9 -ml1vm -unroll-threshold=50
- fremap-arrays -fstrip-mining
- ml1vm -inline-threshold=1000
- ml1vm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
- Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc
- lflang

628.pop2_s: -m64 -W1, -ml1vm -W1, -align-all-nofallthru-blocks=6
- W1, -ml1vm -W1, -reduce-array-computations=3
- W1, -ml1vm -W1, -enable-X86-prefetching -Ofast
- march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
- flio -fstruct-layout=9 -ml1vm -unroll-threshold=50
- fremap-arrays -fstrip-mining
- ml1vm -inline-threshold=1000
- ml1vm -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
Lenovo Global Technology
ThinkSystem SR645 V3
(3.85 GHz, AMD EPYC 9374F)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Test Date: Jan-2023
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SPECspeed®2017_fp_base = 356
SPECspeed®2017_fp_peak = 362

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-P.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-P.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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