# SPEC CPU®2017 Floating Point Speed Result

**Lenovo Global Technology**  
ThinkSystem SR665 V3  
(4.10 GHz, AMD EPYC 9174F)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>263</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>291</td>
</tr>
</tbody>
</table>

## 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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>363</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>32, 64</td>
<td>382</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>32</td>
<td>210</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>166</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>32, 64</td>
<td>136, 180</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>71.4</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32, 64</td>
<td>289, 399</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32, 64</td>
<td>217, 447</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>218</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32, 64</td>
<td>398, 500</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** AMD EPYC 9174F  
- **Max MHz:** 4400  
- **Nominal:** 4100  
- **Enabled:** 32 cores, 2 chips, 2 threads/core  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 1 MB I+D on chip per core  
- **L3:** 256 MB I+D on chip per chip, 32 MB shared / 2 cores  
- **Other:** None  
- **Memory:** 1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)  
- **Storage:** 1 x 480 GB SATA SSD  
- **Other:** None

## Software

- **OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)  
- **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
Lenovo Global Technology
ThinkSystem SR665 V3
(4.10 GHz, AMD EPYC 9174F)

**SPECspeed®2017_fp_base = 263**
**SPECspeed®2017_fp_peak = 291**

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>40.2</td>
<td>1470</td>
<td>40.2</td>
<td>1470</td>
<td>40.2</td>
<td>1470</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
<td>45.8</td>
<td>364</td>
<td>47.2</td>
<td>354</td>
<td>45.9</td>
<td>363</td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>32</td>
<td>24.9</td>
<td>211</td>
<td>25.2</td>
<td>208</td>
<td>25.0</td>
<td>210</td>
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<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>80.5</td>
<td>164</td>
<td>79.8</td>
<td>166</td>
<td>79.2</td>
<td>167</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>65.2</td>
<td>136</td>
<td>64.9</td>
<td>137</td>
<td>65.2</td>
<td>136</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>168</td>
<td>70.8</td>
<td>166</td>
<td>71.4</td>
<td>166</td>
<td>71.5</td>
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<td>638.imagick_s</td>
<td>32</td>
<td>55.3</td>
<td>261</td>
<td>55.4</td>
<td>261</td>
<td>55.4</td>
<td>261</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
<td>43.7</td>
<td>399</td>
<td>43.8</td>
<td>399</td>
<td>43.8</td>
<td>399</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>42.2</td>
<td>216</td>
<td>42.0</td>
<td>217</td>
<td>41.9</td>
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<tr>
<td>654.roms_s</td>
<td>32</td>
<td>39.4</td>
<td>399</td>
<td>40.0</td>
<td>394</td>
<td>39.6</td>
<td>398</td>
</tr>
</tbody>
</table>

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 minimize 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
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SPECspeed®2017_fp_base = 263
SPECspeed®2017_fp_peak = 291

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"
MALLOCC_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 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 621.wrf_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:

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**Environment Variables Notes (Continued)**

GOMP_CPU_AFFINITY = "0-63"

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

| PGHPF_ZMEM = "yes" |
| GOMP_CPU_AFFINITY = "0-31" |

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 13 45 14 46 15 47 16 48 17 49 18 50 19 51 20 52 21 53 22 54 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.

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**Platform Notes**

BIOS configuration:

Operating Mode set to Maximum Performance

Sysinfo program /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost Tue Dec  6 23:33:43 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 9174F 16-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 : 16
    siblings : 32
    physical 0: cores 0 1 16 17 24 25 32 33 40 41 48 49 56 57
```

(Continued on next page)
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**Tested by:** Lenovo Global Technology

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**Platform Notes (Continued)**

```plaintext
physical 1: cores 0 1 16 17 24 25 32 33 40 41 48 49 56 57
```

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
Byte Order:           Little Endian
CPU(s):               64
On-line CPU(s) list:  0-63
Vendor ID:            AuthenticAMD
Model name:           AMD EPYC 9174F 16-Core Processor
CPU family:           25
Model:                17
Thread(s) per core:   2
Core(s) per socket:   16
Socket(s):            2
Stepping:             1
Frequency boost:      enabled
CPU max MHz:          4408.2998
CPU min MHz:          1500.0000
BogoMIPS:             8187.28
Flags:                fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pe mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
pdpeslgb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfmerpr rapi 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
bpext perfctr_lld mwaitx cpb cat_l3 cdpl_l3 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmmcall fsqsgbase bml1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
avx512fd qdsseed adx smap avx512ifma clflushopt clwb avx512cd sha ni avx512bw
avx512vl xsaveopt xsave vgetbv xsavees cqm_l1c cqm_occbr_l1c cqm_mbms_total
cqm_mbms_local avx512_bf16 clzero irperf xsaveeprt rdpru wbnoinvd amd_ppin arat npt
lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pffthread avic v_vmsave_vmload vgfl v_spec_ctrl avx512vbmi umip pku ospe
k avx512_vbmi2 gfn vaes vpclmulqdq avx512_vnni avx512_vitalg avx512_vpopcntdq la57
rdpid overflow_recov succor smca fsrm flush_lld
Virtualization:       AMD-V
```

**NUMA**

- **NUMA node(s):** 2
- **NUMA node0 CPU(s):** 0-15, 32-47
- **NUMA node1 CPU(s):** 16-31, 48-63

**Vulnerability Itlb multihit:** Not affected

**Vulnerability Itlf:** Not affected

**Vulnerability Mds:** Not affected

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Platform Notes (Continued)

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 sanitation
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBF always-on, RSB filling
Vulnerability Srbd: 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 512M 16 Unified 3 32768 1 64

/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 32 33 34 35 36 37 38 39 40 41 42 43
  44 45 46 47
  node 0 size: 773673 MB
  node 0 free: 771995 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 48 49 50 51 52 53 54 55 56
  57 58 59 60 61 62 63
  node 1 size: 773882 MB
  node 1 free: 773250 MB
  node distances:
  node 0 1
  0: 10 32
  1: 32 10

From /proc/meminfo
  MemTotal: 1584697000 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"

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Platform Notes (Continued)

VERSION="15-SP4"
VERSION_ID="15.4"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
ID="sles"
ID_LIKE="suse"
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
Microarchitectural 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 sanitation
CVE-2017-5753 (Spectre variant 1): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Dec 6 19:22

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 446G 31G 416G 7% /

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR665 V3 MB, Genoa, Kauai, DDR5, Kauai, 2U
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 SMI BIOS" standard.

Memory:
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SPECspeed®2017_fp_base = 263
SPECspeed®2017_fp_peak = 291

Platform Notes (Continued)

24x SK Hynix HMCG94AEBRA102N 64 GB 2 rank 4800

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

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**Compiler Version Notes (Continued)**

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</tr>
</tbody>
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**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.cactusSSN_s: -DSPEC_LP64

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

- 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
- 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`
- `-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`
- `-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 -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`

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Lenovo Global Technology
ThinkSystem SR665 V3
(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_fp_base = 263
SPECspeed®2017_fp_peak = 291

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

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- 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
- mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
- mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdaloc
- 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
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SPEC CPU®2017 Floating Point Speed Result

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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-nofallback-thru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fsstrict-layou=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 -lamlalloc -lflang

644.nab_s: -m64 -Wl,-mllvm -Wl,-region-vectorize -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fsstrict-layou=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 -lamlalloc -lflang

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallback-thru-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 -lamlalloc -lflang

649.fotonik3d_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallback-thru-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 -flto -Mrecursive
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp
-lomp -lamdlibm -lamlalloc -lflang

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**Lenovo Global Technology**  
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### Peak Optimization Flags (Continued)

654.roms_s: Same as 603.bwaves_s

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -W1,-mllvm -W1,-reduce-array-computations=3  
-W1,-mllvm -W1,-enable-X86-prefetching -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  
-03 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop  
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

627.cam4_s: -m64 -W1,-mllvm -W1,-reduce-array-computations=3  
-W1,-mllvm -W1,-enable-X86-prefetching -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  
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc  
-lflang

628.pop2_s: -m64 -W1,-mllvm -W1,-reduce-array-computations=3  
-W1,-mllvm -W1,-enable-X86-prefetching -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  
-Mrecursive -fvector-transform -fscalar-transform  
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

Benchmarks using Fortran, C, and C++:

-m64 -W1,-mllvm -W1,-reduce-array-computations=3  
-W1,-mllvm -W1,-reduce-array-computations=3  
-W1,-mllvm -W1,-x86-use-vzeroupper=false -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 -finline-aggressive -mllvm -unroll-threshold=100  
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
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**SPECspeed®2017_fp_base = 263**  
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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


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


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