SPEC CPU®2017 Floating Point Speed Result

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Lenovo Global Technology

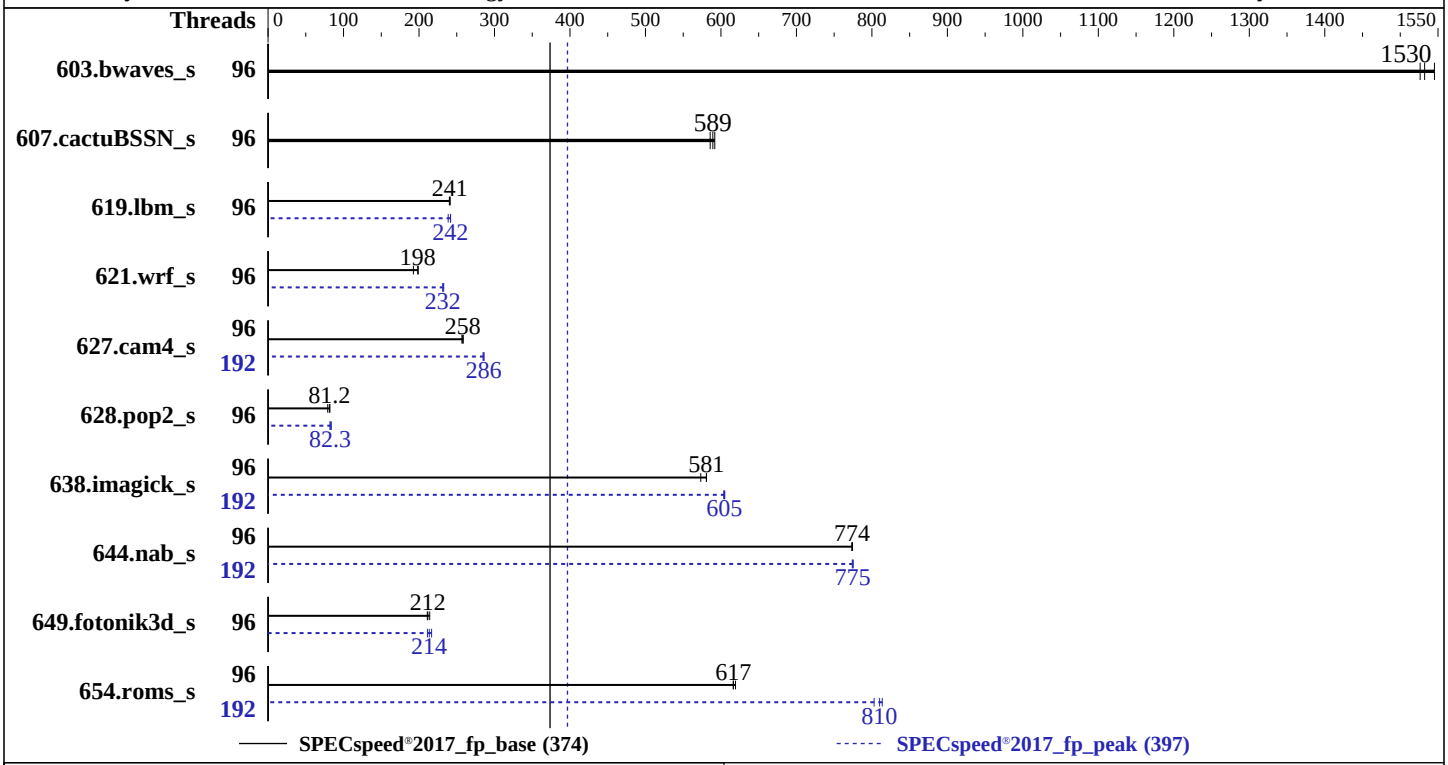
ThinkSystem SR665 V3
(2.75 GHz,AMD EPYC 9454)

SPECspeed®2017_fp_base = 374

SPECspeed®2017_fp_peak = 397

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



Hardware

CPU Name:	AMD EPYC 9454
Max MHz:	3800
Nominal:	2750
Enabled:	96 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 / 6 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 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

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	96	**38.5**	**1530**	38.2	1550	38.7	1530	96	**38.5**	**1530**	38.2	1550	38.7	1530
607.cactuBSSN_s	96	28.2	592	**28.3**	**589**	28.5	586	96	28.2	592	**28.3**	**589**	28.5	586
619.lbm_s	96	**21.7**	**241**	21.7	241	21.8	240	96	21.7	242	21.9	239	**21.7**	**242**
621.wrf_s	96	68.7	193	**66.7**	**198**	66.5	199	96	57.1	232	**57.1**	**232**	56.8	233
627.cam4_s	96	34.3	259	**34.4**	**258**	34.5	257	192	**31.0**	**286**	31.1	285	31.0	286
628.pop2_s	96	**146**	**81.2**	145	82.0	150	79.0	96	**144**	**82.3**	144	82.2	142	83.8
638.imagick_s	96	24.8	581	**24.8**	**581**	25.2	573	192	23.8	605	**23.9**	**605**	23.9	604
644.nab_s	96	22.6	774	22.6	774	**22.6**	**774**	192	22.5	775	22.6	774	**22.6**	**775**
649.fotonik3d_s	96	43.2	211	**43.1**	**212**	42.6	214	96	43.2	211	42.1	217	**42.7**	**214**
654.roms_s	96	25.4	619	**25.5**	**617**	25.5	616	192	19.3	814	19.6	803	**19.4**	**810**

SPECspeed®2017_fp_base = 374

SPECspeed®2017_fp_peak = 397

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

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

Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.
```

Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
```

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Operating System Notes (Continued)

'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
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 = "0-191"
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 = "192"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-95"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-95"

Environment variables set by runcpu during the 627.cam4_s peak run:
GOMP_CPU_AFFINITY = "0-191"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-95"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-191"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0-191"

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

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Environment Variables Notes (Continued)

```
GOMP_CPU_AFFINITY = "0-95"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0 96 1 97 2 98 3 99 4 100 5 101 6 102 7 103 8 104 9 105
     10 106 11 107 12 108 13 109 14 110 15 111 16 112 17 113 18 114 19 115 20
     116 21 117 22 118 23 119 24 120 25 121 26 122 27 123 28 124 29 125 30
     126 31 127 32 128 33 129 34 130 35 131 36 132 37 133 38 134 39 135 40
     136 41 137 42 138 43 139 44 140 45 141 46 142 47 143 48 144 49 145 50
     146 51 147 52 148 53 149 54 150 55 151 56 152 57 153 58 154 59 155 60
     156 61 157 62 158 63 159 64 160 65 161 66 162 67 163 68 164 69 165 70
     166 71 167 72 168 73 169 74 170 75 171 76 172 77 173 78 174 79 175 80
     176 81 177 82 178 83 179 84 180 85 181 86 182 87 183 88 184 89 185 90
     186 91 187 92 188 93 189 94 190 95 191"
```

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

 Sysinfo program /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost Sun Dec 18 02:36:11 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 9454 48-Core Processor
       2  "physical id"s (chips)
       192 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
```

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Platform Notes (Continued)

```
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
       cpu cores : 48
       siblings  : 96
       physical 0: cores 0 1 2 3 4 5 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29 32 33
       34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61
       physical 1: cores 0 1 2 3 4 5 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29 32 33
       34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61

  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):                          192
       On-line CPU(s) list:             0-191
       Vendor ID:                       AuthenticAMD
       Model name:                      AMD EPYC 9454 48-Core Processor
       CPU family:                      25
       Model:                           17
       Thread(s) per core:              2
       Core(s) per socket:              48
       Socket(s):                       2
       Stepping:                        1
       Frequency boost:                 enabled
       CPU max MHz:                     3810.7910
       CPU min MHz:                     1500.0000
       BogoMIPS:                        5491.85
       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
       aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
       popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
       misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
       bpext perfctr_llc mwaitx cpb 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 xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
       cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt
       lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
       pfthreshold avic v_vmsave_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
       Virtualization:                  AMD-V
       L1d cache:                       3 MiB (96 instances)
       L1i cache:                       3 MiB (96 instances)
       L2 cache:                        96 MiB (96 instances)
       L3 cache:                        512 MiB (16 instances)
```

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Platform Notes (Continued)

```
      NUMA node(s):                    2
      NUMA node0 CPU(s):               0-47,96-143
      NUMA node1 CPU(s):               48-95,144-191
      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 Spectre v1:        Mitigation; usercopy/swapgs barriers and __user
      pointer sanitization
      Vulnerability Spectre v2:        Mitigation; Retpolines, IBPB conditional, IBRS_FW,
      STIBP always-on, RSB filling
      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       3M    8 Data            1    64        1             64
      L1i       32K       3M    8 Instruction     1    64        1             64
      L2         1M      96M    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 16 17 18 19 20 21 22 23 24 25 26 27
    28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 96 97 98 99 100 101 102 103
    104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125
    126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
    node 0 size: 386600 MB
    node 0 free: 384422 MB
    node 1 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72
    73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 144 145 146 147
    148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169
    170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191
    node 1 size: 386810 MB
    node 1 free: 386237 MB
    node distances:
    node   0   1
      0:  10  32
      1:  32  10

  From /proc/meminfo
```

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Platform Notes (Continued)

```
    MemTotal:       791972832 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"
       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:
                                                           always-on, RSB filling
  CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
  CVE-2019-11135 (TSX Asynchronous Abort):                 Not affected

  run-level 3 Dec 18 00:56

  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
```


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Platform Notes (Continued)

```
     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 SMBIOS" standard.
    Memory:
      5x SK Hynix HMCG88AEBRA115N 32 GB 2 rank 4800
      19x SK Hynix HMCG88AEBRA168N 32 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
```

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Compiler Version Notes (Continued)

```
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)
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`

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Base Compiler Invocation (Continued)

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
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

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Base Optimization Flags (Continued)

Benchmarks using both Fortran 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 -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
-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 -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

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Peak Compiler Invocation (Continued)

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: -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

638.imagick_s: Same as 619.lbm_s

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:

603.bwaves_s: basepeak = yes

649.fotonik3d_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 -flto -Mrecursive

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Peak Optimization Flags (Continued)

649.fotonik3d_s (continued):
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

654.roms_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

Benchmarks using both Fortran and C:

621.wrf_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
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-O3 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

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
-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 -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
-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

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Peak Optimization Flags (Continued)

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`

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