



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11

(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base =

SPECrate®2017_fp_peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Oct-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022

SPEC has determined that this result does not comply with the SPEC CPU 2017 rules and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

Copies

503.bwaves_r

507.cactuBSSN_r

508.namd_r

510.parest_r

511.povray_r

519.lbm_r

521.wrf_r

526.blender_r

527.cam4_r

538.imagick_r

541.mab_r

549.fotonik3d_r

554.roms_r

Non-Compliant

Hardware

CPU Name: AMD EPYC 9654P
Max MHz: 3700
Nominal: 2400
Enabled: 96 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 384 MB I+D on chip per chip,
32 MB shared / 8 cores

(Continued on next page)

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
Kernel 5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version v1.10 10/06/2022 released Oct-2022
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit

(Continued on next page)



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Hardware (Continued)

Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software (Continued)

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								
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	
503.bwaves_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
507.cactuBSSN_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
508.namd_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
510.parest_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
511.povray_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
519.lbm_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
521.wrf_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
526.blender_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
527.cam4_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
538.imagick_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
544.nab_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
549.fotonik3d_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
554.romps_r	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

SPECrate®2017_fp_base =

SPECrate®2017_fp_peak =

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

Compiler Notes

The AMD64 AOC 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.



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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 excessive 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,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

Environment Variables Notes

Environment variables set by runner before the start of the run:

LD_LIBRARY_PATH =
"/home/cpu2017_rate/aml_rate_aocc400_genoa_B_lib/lib:/home/cpu2017_rate/aml_rate_aocc400_genoa_B_lib/1ib32:"
MALLOC_CONF = "retain:true"

General Notes

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
Workload Profile set to General Throughput Compute
AMD SMT Option set to Disabled
Determinism Control set to Manual
Performance Determinism set to Power Deterministic

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Platform Notes (Continued)

Last-Level Cache (LLC) as NUMA Node set to Enabled
NUMA memory domains per socket set to Four memory domains per socket
ACPI CST C2 Latency set to 18 microseconds
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Power Regulator set to OS Control Mode

The system ROM used for this result contains microcode version 0xa10110d for the AMD EPYC 9nn4X family of processors. The reference code AGESA version used in this ROM is version GenoaPI 1.0.0.1-L2

Sysinfo program /home/cpu2017_rate/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61c0915b55891ef0e6acafc64d
running on localhost.localdomain Thu Apr 7 05:57:39 2022

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

From /proc/cpuinfo
model name : AMD EPYC 9654P 96-Core Processor
1 "physical id" (chassis)
96 "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 : 96
siblings : 96
physical 0: core 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 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

From lscpu for util-linux 2.37.4:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 52 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Vendor ID: AuthenticAMD
BIOS Vendor ID: Advanced Micro Devices, Inc.
Model name: AMD EPYC 9654P 96-Core Processor
BIOS Model name: AMD EPYC 9654P 96-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 96
Socket(s): 1
Stepping: 1
Frequency boost: enabled
CPU max MHz: 3707.8120

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Platform Notes (Continued)

```

CPU min MHz:          1500.0000
BogoMIPS:             4792.79
Flags:                fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush mmx fxsr sse sse2 syscall nx mmxext fxsr_opt
pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfperf rapl pni pclmulqdq monitor sse4_1 sse4_2 cx16 x2apic x2apic movbe
popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
misalignsse 3dnowprefetch osvw fsgsbase tce skinit wdt tce topoext perfctr_core perfctr_nb
bpext perfctr_llc mwaitx cpb cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
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 xsaveopt xsavec cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local avx512_bf16 rdp zero 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 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:           384 MiB (12 instances)
NUMA node(s):       12
NUMA node0 CPU(s): 0-7
NUMA node1 CPU(s): 8-15
NUMA node2 CPU(s): 16-23
NUMA node3 CPU(s): 24-31
NUMA node4 CPU(s): 32-39
NUMA node5 CPU(s): 40-47
NUMA node6 CPU(s): 48-55
NUMA node7 CPU(s): 56-63
NUMA node8 CPU(s): 64-71
NUMA node9 CPU(s): 72-79
NUMA node10 CPU(s): 80-87
NUMA node11 CPU(s): 88-95
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
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, 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

(Continued on next page)



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L1i	32K	3M	8 Instruction	1	1	1	64
L2	1M	96M	8 Unified	2	248	1	64
L3	32M	384M	16 Unified	3	68	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: 12 nodes (0-11)
node 0 cpus: 0 1 2 3 4 5 6 7
node 0 size: 32007 MB
node 0 free: 31832 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 32254 MB
node 1 free: 32101 MB
node 2 cpus: 16 17 18 19 20 21 22
node 2 size: 32254 MB
node 2 free: 32080 MB
node 3 cpus: 24 25 26 27 28 29 30 31
node 3 size: 32254 MB
node 3 free: 32071 MB
node 4 cpus: 32 33 34 35 36 37 38 39
node 4 size: 32254 MB
node 4 free: 32106 MB
node 5 cpus: 40 41 42 43 44 45 46 47
node 5 size: 32254 MB
node 5 free: 32117 MB
node 6 cpus: 48 49 50 51 52 53 54 55
node 6 size: 32217 MB
node 6 free: 32011 MB
node 7 cpus: 56 57 58 59 60 61 62 63
node 7 size: 32254 MB
node 7 free: 32055 MB
node 8 cpus: 64 65 66 67 68 69 70 71
node 8 size: 32254 MB
node 8 free: 32093 MB
node 9 cpus: 72 73 74 75 76 77 78 79
node 9 size: 32203 MB
node 9 free: 32074 MB
node 10 cpus: 80 81 82 83 84 85 86 87
node 10 size: 32254 MB
node 10 free: 32104 MB
node 11 cpus: 88 89 90 91 92 93 94 95
node 11 size: 32254 MB
node 11 free: 31750 MB
node distances:
node 0 1 2 3 4 5 6 7 8 9 10 11
0: 10 12 12 12 12 11 12 12 12 11 12 12 12
1: 12 10 12 12 12 11 12 12 12 11 12 12
2: 12 12 10 12 12 12 11 12 12 12 11 12

```

(Continued on next page)



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Platform Notes (Continued)

```

3: 12 12 12 12 10 12 12 12 11 12 12 12 11
4: 11 12 12 12 10 12 12 12 11 12 12 11
5: 12 11 12 12 12 10 12 12 12 11 12 11
6: 12 12 11 12 12 12 10 12 12 12 11 11
7: 12 12 12 11 12 12 12 10 12 12 12 11
8: 11 12 12 12 11 12 12 12 10 12 12 11
9: 12 11 12 12 12 11 12 12 12 10 12 11
10: 12 12 11 12 12 12 11 12 12 10 12 11
11: 12 12 12 11 12 12 12 12 12 12 10 11

```

From /proc/meminfo

MemTotal: 395998020 kB

HugePages_Total: 0

Hugepagesize: 2048 kB

/sbin/tuned-adm active

Current active profile: throughput-performance

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

From /etc/*release* /etc/*version*

os-release:

NAME="Red Hat Enterprise Linux"

VERSION="9.0 (Plow)"

ID="rhel"

ID_LIKE="fedora"

VERSION_ID="9.0"

PLATFORM_ID="platform:el9"

PRETTY_NAME="Red Hat Enterprise Linux 9.0 (Plow)"

ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 9.0 (Plow)

system-release: Red Hat Enterprise Linux release 9.0 (Plow)

rhel-release: cpe:/o:redhat:enterprise_linux:9::baseos

uname -a:

Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14

12:48:38 EDT 2022 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

CVE-2017-5753 (Spectre variant 1):

Mitigation: usercopy/swappgs

barriers and __user pointer

sanitization

CVE-2017-5715 (Spectre variant 2):

Mitigation: Retpolines, IBPB:

(Continued on next page)



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Platform Notes (Continued)

Conditional, IBRS_Fn, STIBP: disabled, RSB filling Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling) Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Apr 7 05:30

SPEC is set to: /home/cpu2017_rate
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 81G 51G 76% /home

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL325 Gen11
Product Family: ProLiant
Serial: DL325G11-010

Additional information from dmidecode 3.3 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:
6x Hynix HMC88M1A113N 32GB 2 rank 4800
6x Hynix HMC88M1A115N 32GB 2 rank 4800

BIOS:
BIOS Vendor: HPE
BIOS Version: 1.10
BIOS Date: 11/06/2022
BIOS Revision: 1.10
Firmware Revision: 1.10

(End of data from sysinfo program)

Compiler Version Notes

=====
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(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++ | 508.namd_r(base, peak) 510.parest_r(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)
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Compiler Version Notes (Continued)

Thread model: posix

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

=====
C++, C | 511.povray_r(base, peak) 526.fotonik3d_r(base, peak)

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Target: x86_64-unknown-linux-gnu

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Target: x86_64-unknown-linux-gnu

Thread model: posix

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

=====
C++, C, Fortran | 507.cactuBSSN_r(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

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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)

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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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(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 | 521.wrf_r(base, peak) 527.cam4_r(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)

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Compiler Version Notes (Continued)

Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-32/389/bin

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

Base Portability Flags

503.bwav_r: -DSPEC_LP64
507.cactu_ssn_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11

(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base =

SPECrate®2017_fp_peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Oct-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022

SPEC has determined that this result does not comply with the SPEC CPU 2017 rules and reporting rules. Specifically, the test sponsor notified SPEC that the results were measured on an unsupported configuration.

Base Portability Flags (Continued)

538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=100 -mllvm -inline-threshold=1000
-fremap-arrays -fstrength-reduce -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang
```

C++ benchmarks:

```
-m64 -flto -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 -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
```

Fortran benchmarks:

```
-m64 -flto -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 -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
```

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Benchmarks using both C and C++:

```
-m64 -flto -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 -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C and C++:

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

Base Other Flags

C benchmarks:

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

C++ benchmarks:

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

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Base Other Flags (Continued)

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-Wno-unused-command-line-argument

Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang



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Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes

538.imagick_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mixing
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: basepeak = yes

-flto -Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

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Peak Optimization Flags (Continued)

```
554.roms_r: -m64 -flto -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 -Mrecursive
-mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm
-lamdalloc -lflang
```

Benchmarks using both Fortran and C++:

521.wrf_r: basepeak = yes

```
527.cam4_r: -m64 -flto -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 -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -reduce-array-computations=3 -zopt
-Kieee -Mrecursive -unroll-loops
-mllvm -lsr-injected-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

Benchmarks using C and C++:

basepeak = yes

520.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -zopt
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-finline-aggressive -faggressive-loop-transform -fvector-transform
-fscalar-transform -Mrecursive -fepilog-vectorization-of-inductions
```

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Peak Optimization Flags (Continued)

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

-lamdlibm -lamdalloc -lflang

Peak Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-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/HPE-Platform-Flags-AMD-Genoa-rev2.0.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/HPE-Platform-Flags-AMD-Genoa-rev2.0.xml>

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



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