



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11

(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_base =

SPECspeed®2017_fp_peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

Hardware Availability: Dec-2022

Software Availability: Nov-2022

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

Threads

603.bwaves_s

607.cactuBSSN_s

619.lbm_s

621.wrf_s

627.cam4_s

628.pop2_s

638.imagick_s

644.nab_s

649.fotonik3d_s

654.roms_s

Hardware

CPU Name: AMD EPYC 9174F

Nominal: 4100

Enabled: 16 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: 256 MB I+D on chip per chip,

32 MB shared / 2 cores

Other: None

Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)

Storage: 1 x 480 GB SATA SSD

Other: None

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:

Yes

Firmware:

HPE BIOS Version v1.12 11/24/2022 released

Nov-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



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Results Table

Benchmark	Base								Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio		
603.bwaves_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
607.cactuBSSN_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
619.lbm_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
621.wrf_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
627.cam4_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
628.pop2_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
638.imagick_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
644.nab_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
649.fotonik3d_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		
654.roms_s	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC		

SPECspeed®2017_fp_base =

SPECspeed®2017_fp_peak =

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.
The option 'bind' 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.

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Operating System Notes (Continued)

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, and '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 634.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 = "0-15"

LD_LIBRARY_PATH = "/home/spec/cpu2017/old_speed_aocc400_genoa_B_lib/lib:"

LIBOMP_NUM_HIDDEN_HELPERS_THREADS = "0"

MALLOC_CONF = "oversize_threshold:0,retain:true"

OMP_DYNAMIC = "false"

OMP_SCHEDULE = "static"

OMP_STACKSIZE = "128M"

OMP_THREAD_LIMIT = "16"

Environment variables set by runcpu during the 603.bwaves_s peak run:

GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 619.lbm_s peak run:

GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 621.wrf_s peak run:

GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 627.cam4_s peak run:

GOMP_CPU_AFFINITY = "0-15"

Environment variables set by runcpu during the 628.pop2_s peak run:

GOMP_CPU_AFFINITY = "0-15"



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General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F (16C) + 1.5TB 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 Work Frequency Compute

Determinism Control set to Manual

Performance Determinism set to Power Deterministic

AMD SMT Option set to Disabled

Last-Level Cache (LLC) as NUMA Node set to Enabled

ACPI CST C2 Latency set to 18 microseconds

Memory PStates set to Disabled

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 0xa10110e for the AMD EPYC 9nn4X family processors. The reference code/AGESA version used in this ROM is version GenoaPI_1.0.0.1-L6

Sysinfo program: /home/cpu2017/bin/sysinfo

Rev: r6622 of 2022-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost.localdomain Thu Apr 7 05:33:20 2022

SUI (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

1 "physical id"s (chips)

16 "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 : 16

physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu from util-linux 2.37.4:

Architecture: x86_64

CPU op-mode(s): 32-bit, 64-bit

Address sizes: 52 bits physical, 57 bits virtual

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Platform Notes (Continued)

```

Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Vendor ID: AuthenticAMD
BIOS Vendor ID: Advanced Micro Devices, Inc.
Model name: AMD EPYC 9174F 16-Core Processor
BIOS Model name: AMD EPYC 9174F 16-Core Processor
CPU family: 25
Model: 7
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s): 1
Stepping: 1
Frequency boost: enabled
CPU max MHz: 4408.2993
CPU min MHz: 1500.0000
BogoMIPS: 52
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
pdpelgb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfperf rapl pstate tsc_e1000 mulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
popcnt aes xsave avx100 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 waitx_tpr 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 smad 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 clflushopt irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pri_shreshoavic vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku ospke
avx512_vbmi2 clwb vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57
rdpid overflow_recov succor smca fsrm flush_l1d
Virtualization: AMD-V
L1i cache: 512 KiB (16 instances)
L2 cache: 512 KiB (16 instances)
L3 cache: 16 MiB (16 instances)
L4 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0,1
NUMA node1 CPU(s): 8,9
NUMA node2 CPU(s): 4,5
NUMA node3 CPU(s): 12,13
NUMA node4 CPU(s): 6,7
NUMA node5 CPU(s): 14,15
NUMA node6 CPU(s): 2,3
NUMA node7 CPU(s): 10,11
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

```

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Platform Notes (Continued)

```

prctl
Vulnerability Spectre v1:      Mitigation: usercopy/swapgs barriers and __user
pointer sanitization
Vulnerability Spectre v2:      Mitigation: Retpolines, BSB 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	512K	8	Data	1	64	1	64
L1i	32K	512K	1	Instruction	1	64	1	64
L2	1M	16M	1	Unified	2	2048	1	64
L3	32M	256M	1	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: 8 nodes (0-7)
node 0 cpus: 0 1
node 0 size: 96521 MB
node 0 free: 96346 MB
node 1 cpus: 8 9
node 1 size: 96521 MB
node 1 free: 96397 MB
node 2 cpus: 4 5
node 2 size: 96767 MB
node 2 free: 96632 MB
node 3 cpus: 10 11
node 3 size: 96730 MB
node 3 free: 96592 MB
node 4 cpus: 12 13
node 4 size: 96767 MB
node 4 free: 96647 MB
node 5 cpus: 14 15
node 5 size: 96719 MB
node 5 free: 96610 MB
node 6 cpus: 2 3
node 6 size: 96767 MB
node 6 free: 96637 MB
node 7 cpus: 10 11
node 7 size: 96767 MB
node 7 free: 96552 MB
node distances:
node  0  1  2  3  4  5  6  7
0:  10  11  11  11  11  11  11  11
1:  11  10  11  11  11  11  11  11
2:  11  11  10  11  11  11  11  11
3:  11  11  11  10  11  11  11  11

```

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Platform Notes (Continued)

```

4: 11 11 11 11 10 11 11 11
5: 11 11 11 11 11 10 11 11
6: 11 11 11 11 11 11 10 11
7: 11 11 11 11 11 11 11 10

```

From /proc/meminfo

```

MemTotal:      792379232 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)
system-release-cpe: 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 12:42:28 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/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):  Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

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Platform Notes (Continued)

run-level 3 Apr 7 05:30

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/rhel-home	xfs	372G	17G	355G	5%	/home

From /sys/devices/virtual/dmi/id

Vendor: HPE
 Product: ProLiant DL325 Gen11
 Product Family: ProLiant
 Serial: DL325GEN11-002

Additional information from dmi code 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:

12x Hynix HMC94MEBRA121N 64 GB 2 rank 4800

BIOS:

BIOS Vendor: HPE
 BIOS Version: 1.12
 BIOS Date: 11/24/2022
 BIOS Revision: 1.12
 Firmware Revision: 1.12

(End of data from sysinfo program)

Compiler Version Notes

=====
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)
=====

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Thread model: posix
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Fortran | 603.bwaves_s(base, peak) 64.fotoniks_s(base, peak) 654.roms_s(base, peak)

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Fortran, C | 621.wrf_s(base, peak) cam4_s(base, peak) 628.pop2_s(base, peak)

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

Base Compiler Invocation

Clang compiler:

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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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 -fskip-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

```

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SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11

(4.10 GHz, AMD EPYC 9174F)

SPECspeed®2017_base =

SPECspeed®2017_fp_peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

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 Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-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-nofallthrough -blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vector-upper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp=flto -fstruct-layout=7
-mllvm -unroll-threshold=500000 -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
```

```
-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
```



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SPECspeed®2017_fo_base =

SPECspeed®2017_fo_peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

Hardware Availability: Dec-2022

Software Availability: Nov-2022

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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

Peak Optimization Flags

C benchmarks:

```
619.lbm_s: -march=znver4 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flt-soft -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: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

(Continued on next page)



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SPECspeed® 2017 / fp base =

SPECspeed® 2017 / fp peak =

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

Hardware Availability: Dec-2022

Software Availability: Nov-2022

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

Peak Optimization Flags (Continued)

```
603.bwaves_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
-fopenmp -Mrecursive -mllvm -reduce-array-computations=3
-fvector-transform -fscalar-transform -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang
```

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

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
```

```
-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
```

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Peak Optimization Flags (Continued)

628.pop2_s (continued):

```
-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 -lamdlibm -lflang
```

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

Peak Other Flags

C benchmarks:

```
-Wno-return-type -Wno-unused-command-line-argument
```

Fortran benchmarks:

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

Benchmarks using both Fortran and C:

```
-Wno-return-type -Wno-unused-command-line-argument
```

Benchmarks using Fortran, C, and C++:

```
-Wno-return-type -Wno-unused-command-line-argument
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.1.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-rev2.1.xml>

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



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