SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

$SPECrate^{®}2017\_fp\_base = 792$

ProLiant DL385 Gen11
(2.70 GHz, AMD EPYC 9334)

$SPECrate^{®}2017\_fp\_peak = 795$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Dec-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022

Benchmark	Copies	Base	Peak
503.bwaves_r	128	1530	
507.cactuBSSN_r	128	1070	1070
508.namd_r	128	526	526
510.parest_r	128	529	
511.povray_r	128	756	
519.lbm_r	128	543	544
521.wrf_r	128	801	833
526.blender_r	128	700	
527.cam4_r	128	696	
538.imagick_r	128	2750	
544.nab_r	128	1130	1140
549.fotonik3d_r	128	537	538
554.roms_r	128	393	

SPECrate®2017_fp_base (792) ———
SPECrate®2017_fp_peak (795) - - - - -

Hardware

CPU Name: AMD EPYC 9334

Max MHz: 3900

Nominal: 2700

Enabled: 64 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: 128 MB I+D on chip per chip,
32 MB shared / 8 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: Ubuntu 22.04.1 LTS
Kernel 5.15.0-56-generic

Compiler: C/C++/Fortran: Version 4.0.0 of AOCC

Parallel: No

Firmware: HPE BIOS Version v1.12 11/24/2022 released Nov-2022

File System: ext4

System State: Run level 5 (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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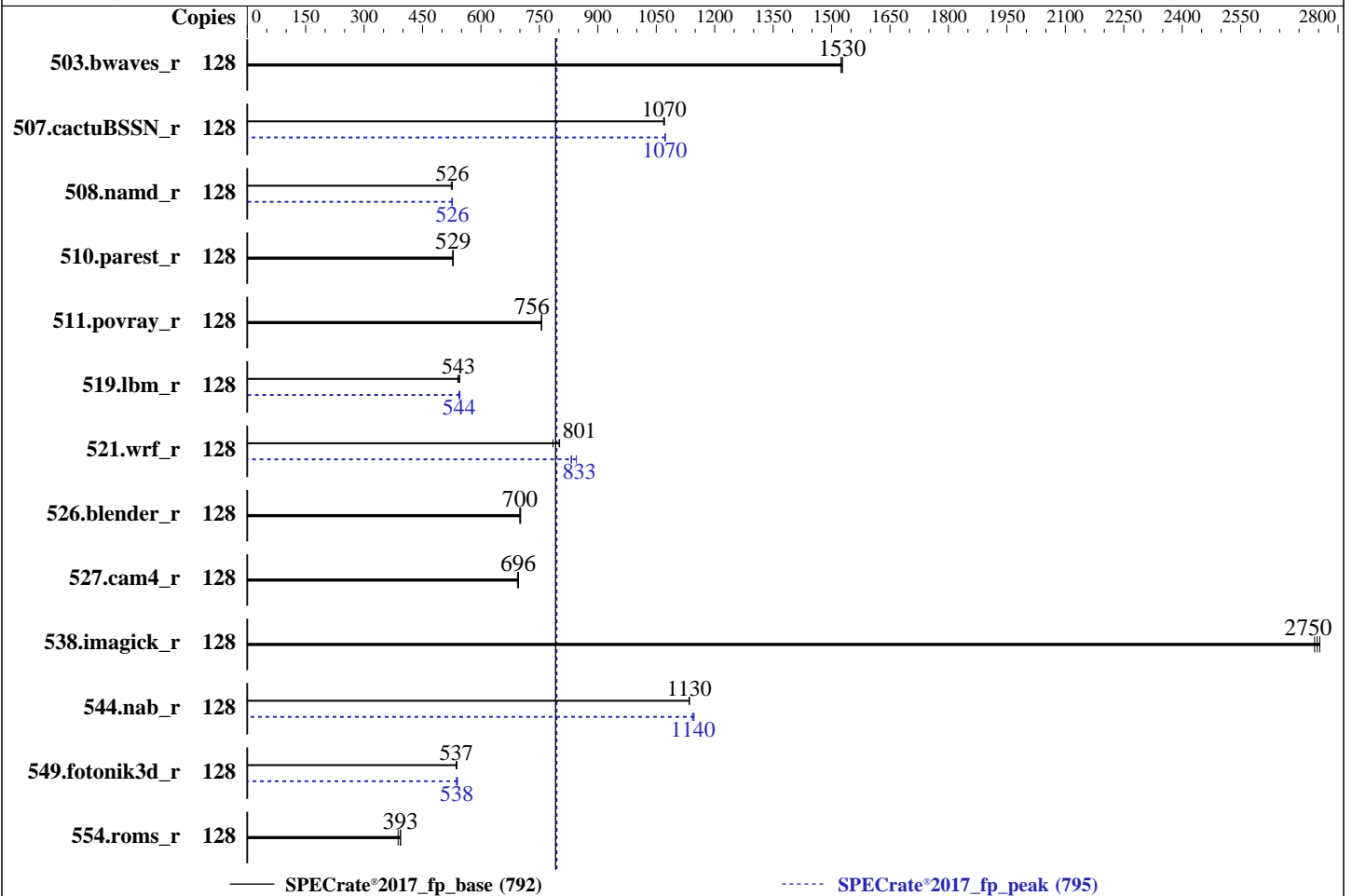SPECrate®2017_fp_base = 792

SPECrate®2017_fp_peak = 795

CPU2017 License: 3	**Test Date:** Dec-2022
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Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	128	**840**	**1530**	842	1520	840	1530	128	**840**	**1530**	842	1520	840	1530
507.cactuBSSN_r	128	**151**	**1070**	151	1070	152	1070	128	151	1070	**151**	**1070**	151	1070
508.namd_r	128	231	527	232	524	**231**	**526**	128	232	525	231	527	**231**	**526**
510.parest_r	128	**633**	**529**	633	529	635	527	128	**633**	**529**	633	529	635	527
511.povray_r	128	**396**	**756**	396	756	396	755	128	**396**	**756**	396	756	396	755
519.lbm_r	128	**249**	**543**	247	546	250	541	128	248	543	**248**	**544**	247	546
521.wrf_r	128	358	802	**358**	**801**	365	785	128	345	831	**344**	**833**	339	845
526.blender_r	128	279	700	278	702	**278**	**700**	128	279	700	278	702	**278**	**700**
527.cam4_r	128	321	696	323	694	**322**	**696**	128	321	696	323	694	**322**	**696**
538.imagick_r	128	**116**	**2750**	116	2740	116	2750	128	**116**	**2750**	116	2740	116	2750
544.nab_r	128	**190**	**1130**	190	1130	190	1130	128	**188**	**1140**	188	1150	188	1140
549.fotonik3d_r	128	**929**	**537**	927	538	930	537	128	928	538	**928**	**538**	924	540
554.roms_r	128	**517**	**393**	517	394	525	387	128	**517**	**393**	517	394	525	387
SPECrate®2017_fp_base =		**792**												
SPECrate®2017_fp_peak =		**795**												

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.
```

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Operating System Notes (Continued)

```
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 runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017/amd_rate_aocc400_genoa_B_lib/lib:/home/cpu2017/amd_rate_a
     occ400_genoa_B_lib/lib32:"
MALLOC_CONF = "retain:true"
```

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
 Workload Profile set to General Throughput Compute
 Determinism Control set to Manual
   Performance Determinism set to Power Deterministic
 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 0xa10110e for the
AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this
```

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Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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Platform Notes (Continued)

```
ROM is version GenoaPI 1.0.0.1-L6

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on admin1 Tue Jun 28 07:32:36 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 9334 32-Core Processor
       2  "physical id"s (chips)
       128 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
       cpu cores : 32
       siblings  : 64
       physical 0: cores 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
       physical 1: cores 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

 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):                   128
       On-line CPU(s) list:      0-127
       Vendor ID:                AuthenticAMD
       Model name:               AMD EPYC 9334 32-Core Processor
       CPU family:               25
       Model:                    17
       Thread(s) per core:       2
       Core(s) per socket:       32
       Socket(s):                2
       Stepping:                 1
       Frequency boost:          enabled
       CPU max MHz:              3911.0000
       CPU min MHz:              400.0000
       BogoMIPS:                 5392.31
       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
```

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Platform Notes (Continued)

```
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 cppc 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:                     2 MiB (64 instances)
L1i cache:                     2 MiB (64 instances)
L2 cache:                      64 MiB (64 instances)
L3 cache:                      256 MiB (8 instances)
NUMA node(s):                  8
NUMA node0 CPU(s):             0-7,64-71
NUMA node1 CPU(s):             16-23,80-87
NUMA node2 CPU(s):             24-31,88-95
NUMA node3 CPU(s):             8-15,72-79
NUMA node4 CPU(s):             32-39,96-103
NUMA node5 CPU(s):             48-55,112-119
NUMA node6 CPU(s):             56-63,120-127
NUMA node7 CPU(s):             40-47,104-111
Vulnerability Itlb multihit:   Not affected
Vulnerability L1tf:            Not affected
Vulnerability Mds:             Not affected
Vulnerability Meltdown:        Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed:        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, PBRSB-eIBRS Not affected
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       2M    8 Data            1     64        1             64
    L1i       32K       2M    8 Instruction     1     64        1             64
    L2         1M      64M    8 Unified         2   2048        1             64
    L3        32M     256M   16 Unified         3  32768        1             64

 /proc/cpuinfo cache data
```

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Platform Notes (Continued)

```
     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 2 3 4 5 6 7 64 65 66 67 68 69 70 71
   node 0 size: 193221 MB
   node 0 free: 192377 MB
   node 1 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
   node 1 size: 193531 MB
   node 1 free: 192748 MB
   node 2 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
   node 2 size: 193531 MB
   node 2 free: 192757 MB
   node 3 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
   node 3 size: 193531 MB
   node 3 free: 192730 MB
   node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
   node 4 size: 193531 MB
   node 4 free: 192767 MB
   node 5 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
   node 5 size: 193531 MB
   node 5 free: 192753 MB
   node 6 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
   node 6 size: 193496 MB
   node 6 free: 192690 MB
   node 7 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
   node 7 size: 193486 MB
   node 7 free: 192677 MB
   node distances:
   node   0    1    2    3    4    5    6    7
     0:  10   12   12   12   32   32   32   32
     1:  12   10   12   12   32   32   32   32
     2:  12   12   10   12   32   32   32   32
     3:  12   12   12   10   32   32   32   32
     4:  32   32   32   32   10   12   12   12
     5:  32   32   32   32   12   10   12   12
     6:  32   32   32   32   12   12   10   12
     7:  32   32   32   32   12   12   12   10

 From /proc/meminfo
    MemTotal:       1585013300 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 /sbin/tuned-adm active
     It seems that tuned daemon is not running, preset profile is not activated.
```

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Platform Notes (Continued)

```
Preset profile: balanced

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

/usr/bin/lsb_release -d
   Ubuntu 22.04.1 LTS

From /etc/*release* /etc/*version*
   debian_version: bookworm/sid
   os-release:
      PRETTY_NAME="Ubuntu 22.04.1 LTS"
      NAME="Ubuntu"
      VERSION_ID="22.04"
      VERSION="22.04.1 LTS (Jammy Jellyfish)"
      VERSION_CODENAME=jammy
      ID=ubuntu
      ID_LIKE=debian
      HOME_URL="https://www.ubuntu.com/"

uname -a:
   Linux admin1 5.15.0-56-generic #62-Ubuntu SMP Tue Nov 22 19:54:14 UTC 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
mmio_stale_data:                                  Not affected
retbleed:                                         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,
                                                  PBRSB-eIBRS: Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):          Not affected

run-level 5 Jun 27 18:30
```

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Platform Notes (Continued)

```
SPEC is set to: /home/cpu2017
   Filesystem                        Type  Size  Used Avail Use% Mounted on
   /dev/mapper/ubuntu--vg-ubuntu--lv ext4   98G   19G   75G  20% /

From /sys/devices/virtual/dmi/id
    Vendor:           HPE
    Product:          ProLiant DL385 Gen11
    Product Family: ProLiant
    Serial:           DL385GEN11-003

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:
     13x Hynix HMCG94MEBRA121N 64 GB 2 rank 4800
     11x Hynix HMCG94MEBRA123N 64 GB 2 rank 4800

BIOS:
   BIOS Vendor:        HPE
   BIOS Version:       1.12
   BIOS Date:          11/24/2022
   BIOS Revision:      1.12
   Firmware Revision: 1.10

(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)
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
--------------------------------------------------------------------------


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


==========================================================================
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
```

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Compiler Version Notes (Continued)

```
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)
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`

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.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen11
(2.70 GHz, AMD EPYC 9334)

SPECrate®2017_fp_base = 792

SPECrate®2017_fp_peak = 795

CPU2017 License:	3	**Test Date:**	Dec-2022
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

Base Portability Flags (Continued)

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`
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=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -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
-lflang
```

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
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen11
(2.70 GHz, AMD EPYC 9334)

SPECrate®2017_fp_base = 792

SPECrate®2017_fp_peak = 795

CPU2017 License:	3	**Test Date:**	Dec-2022
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
```
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-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
-fremap-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
-fremap-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
```

Fortran benchmarks:
```
-Wno-unused-command-line-argument
```

Benchmarks using both Fortran and C:
```
-Wno-unused-command-line-argument
```

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 792

ProLiant DL385 Gen11
(2.70 GHz, AMD EPYC 9334)

SPECrate®2017_fp_peak = 795

CPU2017 License: 3

Test Date: Dec-2022

Test Sponsor: HPE

Hardware Availability: Dec-2022

Tested by: HPE

Software Availability: Nov-2022

Base Other Flags (Continued)

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:
```
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
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
519.lbm_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-mining
-mllvm -inline-threshold=1000
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 792

ProLiant DL385 Gen11
(2.70 GHz, AMD EPYC 9334)

SPECrate®2017_fp_peak = 795

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Dec-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022

Peak Optimization Flags (Continued)

519.lbm_r (continued):
```
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

538.imagick_r: basepeak = yes

544.nab_r: `-m64 -flto -Wl,-mllvm -Wl,-ldist-scalar-expand`
```
-fenable-aggressive-gather -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

C++ benchmarks:

508.namd_r: `-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
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_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 -Kieee
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -lflang
```

554.roms_r: basepeak = yes

Benchmarks using both Fortran and C:

521.wrf_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
```

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Tested by: HPE

Test Date: Dec-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022

Peak Optimization Flags (Continued)

521.wrf_r (continued):
```
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: basepeak = yes

526.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 -fremap-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
-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
```

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CPU2017 License: 3		**Test Date:**	Dec-2022
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

Peak Other Flags (Continued)

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-rev2.1.html
http://www.spec.org/cpu2017/flags/aocc400-flags.2023-02-15.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.2023-02-15.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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