



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen11

(4.10 GHz, AMD EPYC 9174F)

SPECrate®2017_fp_base = 591

SPECrate®2017_fp_peak = 601

CPU2017 License: 3

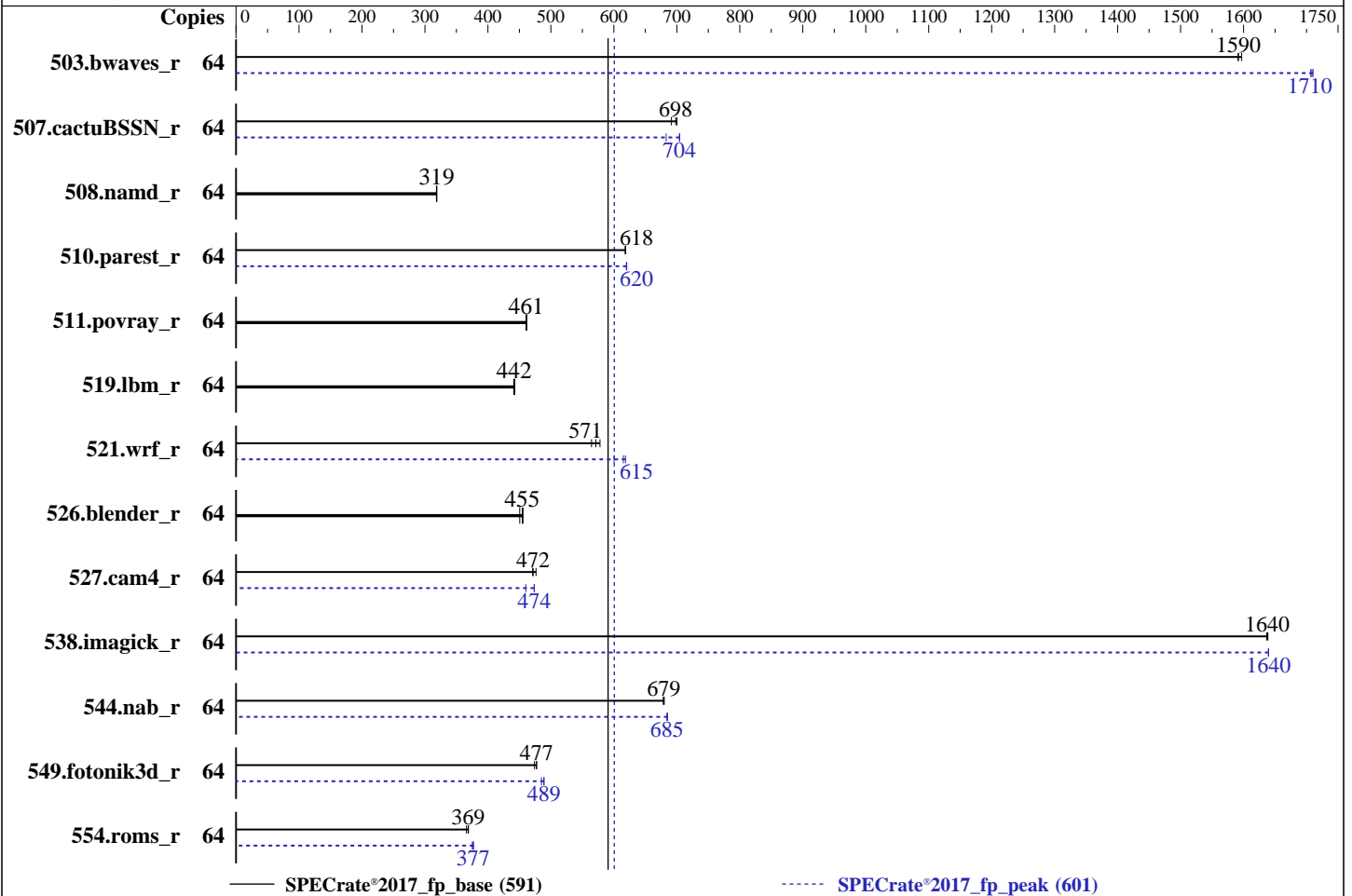
Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

Hardware Availability: Dec-2022

Software Availability: Nov-2022



Hardware

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

Software

OS: 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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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	64	402	1600	403	1590	403	1590	64	376	1710	376	1710	375	1710
507.cactuBSSN_r	64	116	700	117	691	116	698	64	119	683	115	705	115	704
508.namd_r	64	191	319	191	318	191	319	64	191	319	191	318	191	319
510.parest_r	64	271	618	271	619	271	618	64	270	620	270	620	270	620
511.povray_r	64	324	461	324	462	324	461	64	324	461	324	462	324	461
519.lbm_r	64	153	442	153	441	152	443	64	153	442	153	441	152	443
521.wrf_r	64	248	578	254	565	251	571	64	232	618	233	615	239	600
526.blender_r	64	216	451	214	456	214	455	64	216	451	214	456	214	455
527.cam4_r	64	235	476	237	472	238	471	64	236	474	236	474	243	460
538.imagick_r	64	97.3	1640	97.2	1640	97.1	1640	64	97.1	1640	97.1	1640	97.1	1640
544.nab_r	64	158	680	159	678	159	679	64	157	685	157	685	157	685
549.fotonik3d_r	64	526	474	523	477	522	477	64	510	489	510	489	514	485
554.roms_r	64	276	369	276	369	278	366	64	271	375	270	377	270	377

SPECrate®2017_fp_base = **591**

SPECrate®2017_fp_peak = **601**

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:"  
MALLOCONF = "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 0x10110e for the AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this

(Continued on next page)



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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 02:24:58 2022

```

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

From /proc/cpuinfo

```

model name      : AMD EPYC 9174F 16-Core Processor
 2 "physical id"s (chips)
 64 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
  cpu cores      : 16
  siblings       : 32
 physical 0:    cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 physical 1:    cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

```

From lscpu from util-linux 2.37.2:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         52 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                64
On-line CPU(s) list:   0-63
Vendor ID:             AuthenticAMD
Model name:            AMD EPYC 9174F 16-Core Processor
CPU family:            25
Model:                 17
Thread(s) per core:    2
Core(s) per socket:    16
Socket(s):             2
Stepping:              1
Frequency boost:       enabled
CPU max MHz:           4409.0000
CPU min MHz:           400.0000
BogoMIPS:              8188.20
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
aperfmpperf 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

```

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Platform Notes (Continued)

ibpb stibp vmcall 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_lld

Virtualization:

AMD-V

L1d cache:

1 MiB (32 instances)

L1i cache:

1 MiB (32 instances)

L2 cache:

32 MiB (32 instances)

L3 cache:

512 MiB (16 instances)

NUMA node(s):

16

NUMA node0 CPU(s):

0,1,32,33

NUMA node1 CPU(s):

8,9,40,41

NUMA node2 CPU(s):

4,5,36,37

NUMA node3 CPU(s):

12,13,44,45

NUMA node4 CPU(s):

6,7,38,39

NUMA node5 CPU(s):

14,15,46,47

NUMA node6 CPU(s):

2,3,34,35

NUMA node7 CPU(s):

10,11,42,43

NUMA node8 CPU(s):

16,17,48,49

NUMA node9 CPU(s):

24,25,56,57

NUMA node10 CPU(s):

20,21,52,53

NUMA node11 CPU(s):

28,29,60,61

NUMA node12 CPU(s):

22,23,54,55

NUMA node13 CPU(s):

30,31,62,63

NUMA node14 CPU(s):

18,19,50,51

NUMA node15 CPU(s):

26,27,58,59

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, PBRSE-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

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Platform Notes (Continued)

L1d	32K	1M	8 Data	1	64	1	64
L1i	32K	1M	8 Instruction	1	64	1	64
L2	1M	32M	8 Unified	2	2048	1	64
L3	32M	512M	16 Unified	3	32768	1	64

```
/proc/cpuinfo cache data
cache size : 1024 KB
```

```
From numactl --hardware
```

```
WARNING: a numactl 'node' might or might not correspond to a physical chip.
```

```
available: 16 nodes (0-15)
node 0 cpus: 0 1 32 33
node 0 size: 96456 MB
node 0 free: 96290 MB
node 1 cpus: 8 9 40 41
node 1 size: 96766 MB
node 1 free: 96580 MB
node 2 cpus: 4 5 36 37
node 2 size: 96766 MB
node 2 free: 96551 MB
node 3 cpus: 12 13 44 45
node 3 size: 96766 MB
node 3 free: 96678 MB
node 4 cpus: 6 7 38 39
node 4 size: 96766 MB
node 4 free: 96594 MB
node 5 cpus: 14 15 46 47
node 5 size: 96731 MB
node 5 free: 96631 MB
node 6 cpus: 2 3 34 35
node 6 size: 96766 MB
node 6 free: 96636 MB
node 7 cpus: 10 11 42 43
node 7 size: 96766 MB
node 7 free: 96622 MB
node 8 cpus: 16 17 48 49
node 8 size: 96766 MB
node 8 free: 96666 MB
node 9 cpus: 24 25 56 57
node 9 size: 96766 MB
node 9 free: 96674 MB
node 10 cpus: 20 21 52 53
node 10 size: 96766 MB
node 10 free: 96672 MB
node 11 cpus: 28 29 60 61
node 11 size: 96766 MB
node 11 free: 96657 MB
```

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Platform Notes (Continued)

```

node 12 cpus: 22 23 54 55
node 12 size: 96766 MB
node 12 free: 96667 MB
node 13 cpus: 30 31 62 63
node 13 size: 96766 MB
node 13 free: 96658 MB
node 14 cpus: 18 19 50 51
node 14 size: 96766 MB
node 14 free: 96620 MB
node 15 cpus: 26 27 58 59
node 15 size: 96719 MB
node 15 free: 96623 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
  0:  10 11 12 12 12 12 12 12 32 32 32 32 32 32 32 32
  1:  11 10 12 12 12 12 12 12 32 32 32 32 32 32 32 32
  2:  12 12 10 11 12 12 12 12 32 32 32 32 32 32 32 32
  3:  12 12 11 10 12 12 12 12 32 32 32 32 32 32 32 32
  4:  12 12 12 12 10 11 12 12 32 32 32 32 32 32 32 32
  5:  12 12 12 12 11 10 12 12 32 32 32 32 32 32 32 32
  6:  12 12 12 12 12 10 11 32 32 32 32 32 32 32 32 32
  7:  12 12 12 12 12 12 11 10 32 32 32 32 32 32 32 32
  8:  32 32 32 32 32 32 32 32 32 10 11 12 12 12 12 12
  9:  32 32 32 32 32 32 32 32 32 11 10 12 12 12 12 12
10:  32 32 32 32 32 32 32 32 32 12 12 10 11 12 12 12
11:  32 32 32 32 32 32 32 32 32 12 12 11 10 12 12 12
12:  32 32 32 32 32 32 32 32 32 12 12 12 12 10 11 12
13:  32 32 32 32 32 32 32 32 32 12 12 12 12 11 10 12
14:  32 32 32 32 32 32 32 32 32 12 12 12 12 12 10 11
15:  32 32 32 32 32 32 32 32 32 12 12 12 12 12 11 10

```

From /proc/meminfo

MemTotal: 1585025480 kB

HugePages_Total: 0

Hugepagesize: 2048 kB

/sbin/tuned-adm active

Current active profile: throughput-performance

/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

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Platform Notes (Continued)

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, PBRSE-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 28 00:00

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv	ext4	98G	18G	75G	20%	/

From /sys/devices/virtual/dmi/id

```
Vendor: HPE
Product: ProLiant DL365 Gen11
Product Family: ProLiant
Serial: DL365G11-003
```

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Platform Notes (Continued)

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:

24x Hynix HMC94AEBRA103N 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  
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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Compiler Version Notes (Continued)

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

=====
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
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
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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
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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen11

(4.10 GHz, AMD EPYC 9174F)

SPECrate®2017_fp_base = 591

SPECrate®2017_fp_peak = 601

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2023

Hardware Availability: Dec-2022

Software Availability: Nov-2022

Compiler Version Notes (Continued)

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

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



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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
-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
```

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Base Optimization Flags (Continued)

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

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++

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Peak Compiler Invocation (Continued)

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: 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
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

```
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 -freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

C++ benchmarks:

(Continued on next page)



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Peak Optimization Flags (Continued)

508.namd_r: basepeak = yes

```
510.parest_r: -m64 -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: -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
```

```
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: Same as 503.bwaves_r

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
-fstruct-layout=7 -mllvm -unroll-threshold=50
-freap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

```
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
```

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Peak Optimization Flags (Continued)

527.cam4_r (continued):

```
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -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++:

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 -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
-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

(Continued on next page)



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

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