SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
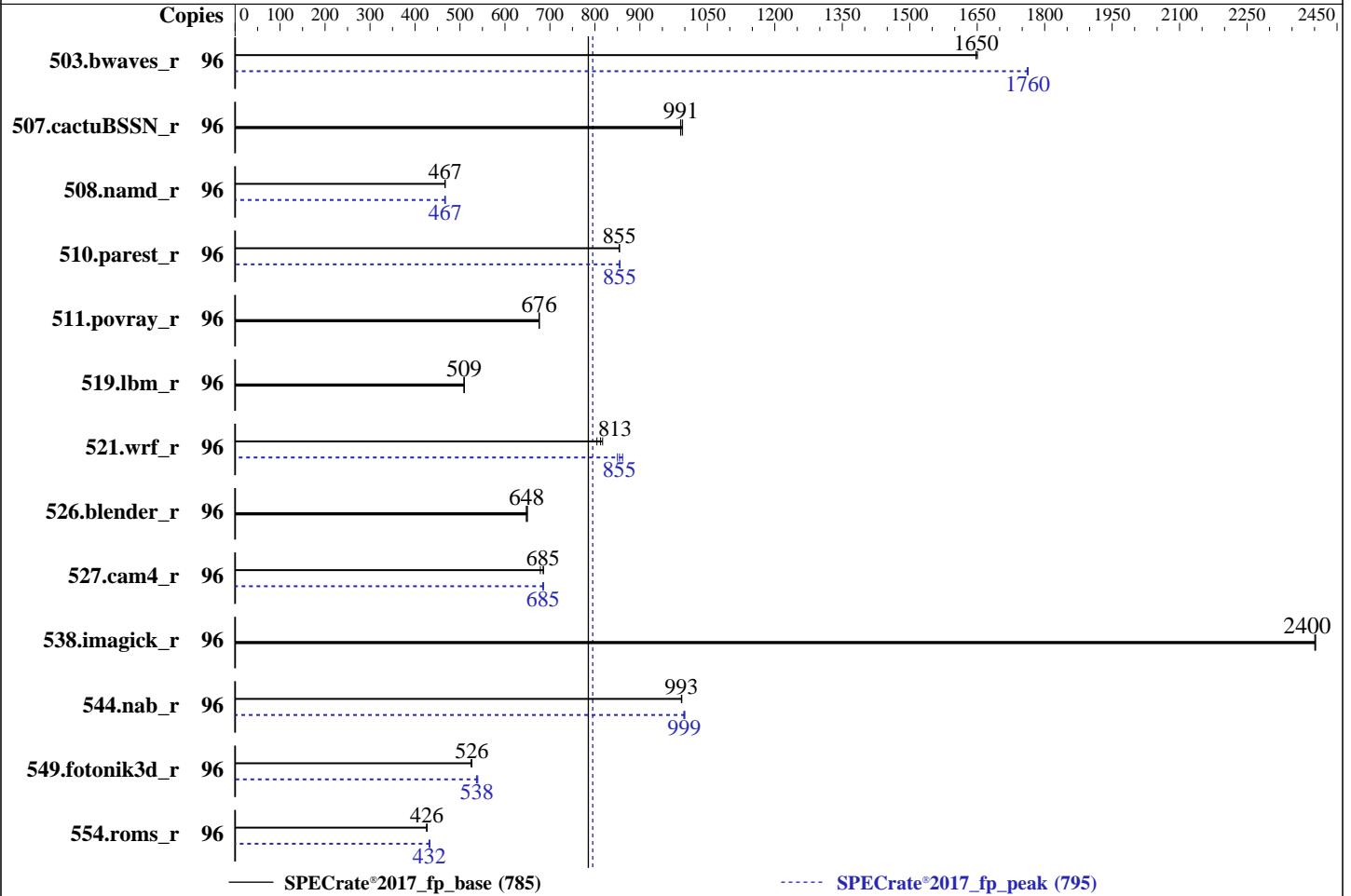
ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

$SPECrate®2017\_fp\_base = 785$

$SPECrate®2017\_fp\_peak = 795$

CPU2017 License: 3	**Test Date:** Jan-2023
Test Sponsor: HPE	**Hardware Availability:** Dec-2022
Tested by: HPE	**Software Availability:** Nov-2022

Graph data (Copies = 96 for all):

- 503.bwaves_r: base 1650, peak 1760
- 507.cactuBSSN_r: base 991
- 508.namd_r: base 467, peak 467
- 510.parest_r: base 855, peak 855
- 511.povray_r: base 676
- 519.lbm_r: base 509
- 521.wrf_r: base 813, peak 855
- 526.blender_r: base 648
- 527.cam4_r: base 685, peak 685
- 538.imagick_r: base 2400
- 544.nab_r: base 993, peak 999
- 549.fotonik3d_r: base 526, peak 538
- 554.roms_r: base 426, peak 432

SPECrate®2017_fp_base (785) — SPECrate®2017_fp_peak (795)

Hardware

- CPU Name: AMD EPYC 9274F
- Max MHz: 4300
- Nominal: 4050
- Enabled: 48 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 / 3 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 5.15.0-50-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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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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	96	584	1650	583	1650	**584**	**1650**	96	546	1760	**546**	**1760**	547	1760
507.cactuBSSN_r	96	122	995	123	990	**123**	**991**	96	122	995	123	990	**123**	**991**
508.namd_r	96	**195**	**467**	195	467	195	467	96	**195**	**467**	195	467	196	466
510.parest_r	96	294	855	**294**	**855**	294	854	96	294	855	294	855	**294**	**855**
511.povray_r	96	332	676	**332**	**676**	331	677	96	332	676	**332**	**676**	331	677
519.lbm_r	96	**199**	**509**	199	509	199	510	96	**199**	**509**	199	509	199	510
521.wrf_r	96	263	817	**265**	**813**	267	805	96	253	850	**252**	**855**	250	862
526.blender_r	96	225	650	226	648	**226**	**648**	96	225	650	226	648	**226**	**648**
527.cam4_r	96	247	679	**245**	**685**	245	686	96	245	686	**245**	**685**	245	684
538.imagick_r	96	99.5	2400	**99.4**	**2400**	99.4	2400	96	99.5	2400	**99.4**	**2400**	99.4	2400
544.nab_r	96	163	993	163	992	**163**	**993**	96	162	998	**162**	**999**	162	1000
549.fotonik3d_r	96	**711**	**526**	711	526	713	525	96	697	537	693	540	**696**	**538**
554.roms_r	96	**358**	**426**	358	426	357	427	96	352	433	353	432	**353**	**432**

SPECrate®2017_fp_base =	**785**
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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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 04:25:00 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 9274F 24-Core Processor
       2  "physical id"s (chips)
       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 : 24
       siblings  : 48
       physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30
       physical 1: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

 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):                   96
    On-line CPU(s) list:      0-95
    Vendor ID:                AuthenticAMD
    Model name:               AMD EPYC 9274F 24-Core Processor
    CPU family:               25
    Model:                    17
    Thread(s) per core:       2
    Core(s) per socket:       24
    Socket(s):                2
    Stepping:                 1
    Frequency boost:          enabled
    CPU max MHz:              4304.0000
    CPU min MHz:              400.0000
    BogoMIPS:                 8088.07
    Flags:                    fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
    pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
    pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
    aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
    popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
    misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
    bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
```

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Platform Notes (Continued)

```
     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:                     1.5 MiB (48 instances)
     L1i cache:                     1.5 MiB (48 instances)
     L2 cache:                      48 MiB (48 instances)
     L3 cache:                      512 MiB (16 instances)
     NUMA node(s):                  16
     NUMA node0 CPU(s):             0-2,48-50
     NUMA node1 CPU(s):             12-14,60-62
     NUMA node2 CPU(s):             6-8,54-56
     NUMA node3 CPU(s):             18-20,66-68
     NUMA node4 CPU(s):             9-11,57-59
     NUMA node5 CPU(s):             21-23,69-71
     NUMA node6 CPU(s):             3-5,51-53
     NUMA node7 CPU(s):             15-17,63-65
     NUMA node8 CPU(s):             24-26,72-74
     NUMA node9 CPU(s):             36-38,84-86
     NUMA node10 CPU(s):            30-32,78-80
     NUMA node11 CPU(s):            42-44,90-92
     NUMA node12 CPU(s):            33-35,81-83
     NUMA node13 CPU(s):            45-47,93-95
     NUMA node14 CPU(s):            27-29,75-77
     NUMA node15 CPU(s):            39-41,87-89
     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
```

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Platform Notes (Continued)

```
        L1d         32K      1.5M      8 Data             1    64       1          64
        L1i         32K      1.5M      8 Instruction      1    64       1          64
        L2           1M       48M      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 2 48 49 50
    node 0 size: 96456 MB
    node 0 free: 95998 MB
    node 1 cpus: 12 13 14 60 61 62
    node 1 size: 96766 MB
    node 1 free: 96376 MB
    node 2 cpus: 6 7 8 54 55 56
    node 2 size: 96766 MB
    node 2 free: 96339 MB
    node 3 cpus: 18 19 20 66 67 68
    node 3 size: 96766 MB
    node 3 free: 96334 MB
    node 4 cpus: 9 10 11 57 58 59
    node 4 size: 96766 MB
    node 4 free: 96352 MB
    node 5 cpus: 21 22 23 69 70 71
    node 5 size: 96766 MB
    node 5 free: 96360 MB
    node 6 cpus: 3 4 5 51 52 53
    node 6 size: 96766 MB
    node 6 free: 96326 MB
    node 7 cpus: 15 16 17 63 64 65
    node 7 size: 96766 MB
    node 7 free: 96368 MB
    node 8 cpus: 24 25 26 72 73 74
    node 8 size: 96730 MB
    node 8 free: 96321 MB
    node 9 cpus: 36 37 38 84 85 86
    node 9 size: 96766 MB
    node 9 free: 96343 MB
    node 10 cpus: 30 31 32 78 79 80
    node 10 size: 96766 MB
    node 10 free: 96369 MB
    node 11 cpus: 42 43 44 90 91 92
    node 11 size: 96766 MB
    node 11 free: 96359 MB
```

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Platform Notes (Continued)

```
   node 12 cpus: 33 34 35 81 82 83
   node 12 size: 96766 MB
   node 12 free: 96310 MB
   node 13 cpus: 45 46 47 93 94 95
   node 13 size: 96766 MB
   node 13 free: 96351 MB
   node 14 cpus: 27 28 29 75 76 77
   node 14 size: 96766 MB
   node 14 free: 96365 MB
   node 15 cpus: 39 40 41 87 88 89
   node 15 size: 96716 MB
   node 15 free: 96323 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  12  10  11  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  10  11  12  12  12  12  12  12
     9:  32  32  32  32  32  32  32  32  11  10  12  12  12  12  12  12
    10:  32  32  32  32  32  32  32  32  12  12  10  11  12  12  12  12
    11:  32  32  32  32  32  32  32  32  12  12  11  10  12  12  12  12
    12:  32  32  32  32  32  32  32  32  12  12  12  12  10  11  12  12
    13:  32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
    14:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  10  11
    15:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  10

  From /proc/meminfo
    MemTotal:       1585015528 kB
    HugePages_Total:         0
    Hugepagesize:         2048 kB

  /sbin/tuned-adm active
      Current active 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
```

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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 5.15.0-50-generic #56-Ubuntu SMP Tue Sep 20 13:23:26 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 28 00:00

SPEC is set to: /home/cpu2017
    Filesystem                      Type  Size  Used  Avail Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv ext4  437G   20G  399G   5% /

From /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL365 Gen11
    Product Family: ProLiant
    Serial:         DL365G11-001
```

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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 HMCG94AEBRA103N 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
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
------------------------------------------------------------------------------


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

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

$SPECrate^{®}2017\_fp\_base = 785$

$SPECrate^{®}2017\_fp\_peak = 795$

CPU2017 License: 3	**Test Date:**	Jan-2023
Test Sponsor: HPE	**Hardware Availability:**	Dec-2022
Tested by: HPE	**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`

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

SPECrate®2017_fp_base = 785

SPECrate®2017_fp_peak = 795

CPU2017 License: 3		**Test Date:**	Jan-2023
Test Sponsor: HPE		**Hardware Availability:**	Dec-2022
Tested by: HPE		**Software Availability:**	Nov-2022

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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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

SPECrate®2017_fp_base = 785

SPECrate®2017_fp_peak = 795

CPU2017 License: 3		**Test Date:**	Jan-2023
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

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++
```

(Continued on next page)

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

SPECrate®2017_fp_base = 785

SPECrate®2017_fp_peak = 795

CPU2017 License: 3		**Test Date:**	Jan-2023
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

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: 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```

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Hewlett Packard Enterprise
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ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

SPECrate®2017_fp_base = 785

SPECrate®2017_fp_peak = 795

CPU2017 License: 3		**Test Date:**	Jan-2023
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2022
Tested by:	HPE	**Software Availability:**	Nov-2022

Peak Optimization Flags (Continued)

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 -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: `-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 -mllvm -reduce-array-computations=3 -zopt`

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

SPECrate®2017_fp_base = 785

SPECrate®2017_fp_peak = 795

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Jan-2023
Hardware Availability: Dec-2022
Software Availability: Nov-2022

Peak Optimization Flags (Continued)

527.cam4_r (continued):
```
-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++:

507.cactuBSSN_r: basepeak = yes

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-rev2.1.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

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen11
(4.05 GHz, AMD EPYC 9274F)

$SPECrate^{®}2017\_fp\_base = 785$

$SPECrate^{®}2017\_fp\_peak = 795$

CPU2017 License: 3	**Test Date:** Jan-2023
Test Sponsor: HPE	**Hardware Availability:** Dec-2022
Tested by: HPE	**Software Availability:** Nov-2022

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