SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
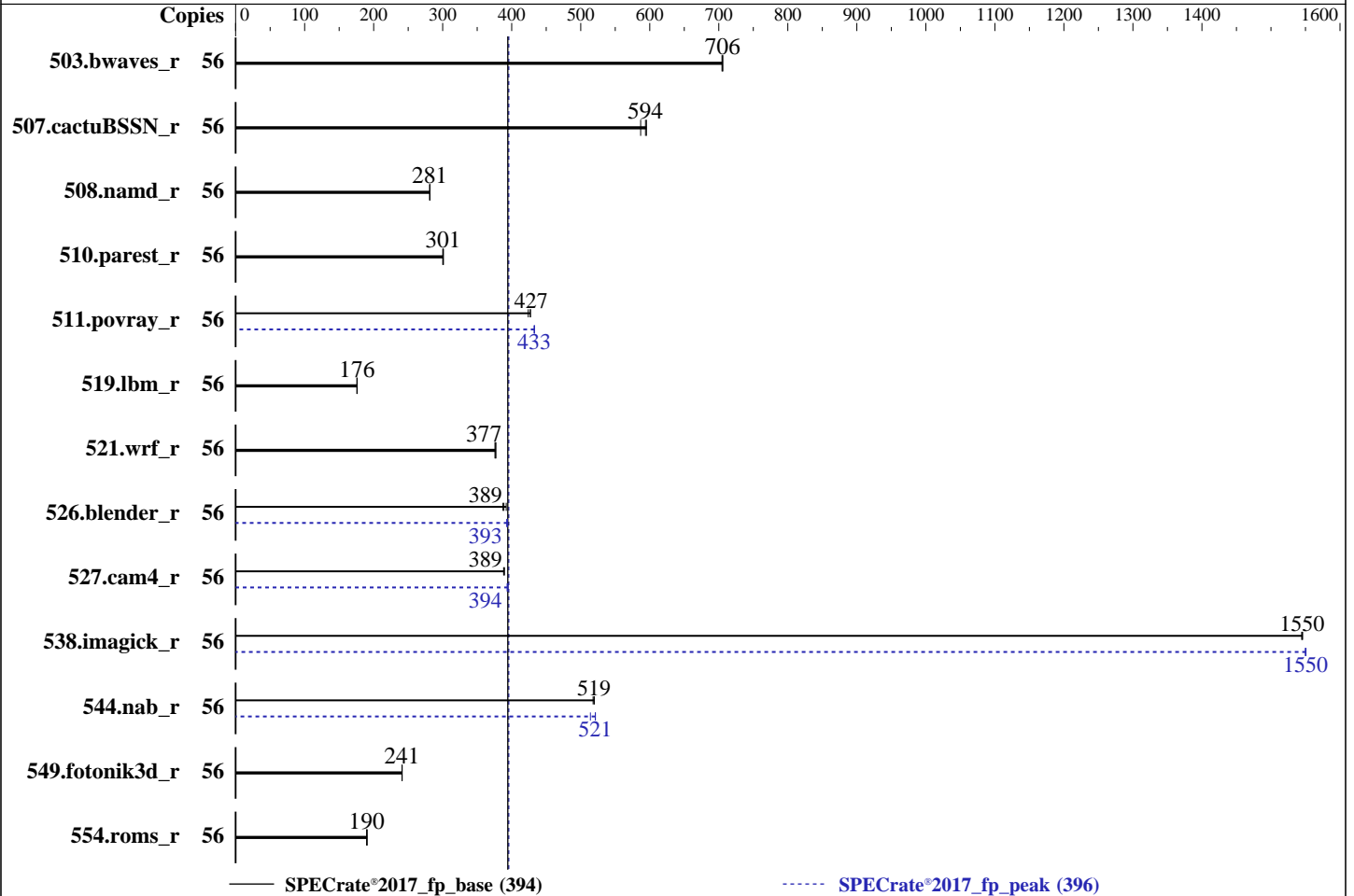
ProLiant DL365 Gen10 Plus
(2.75 GHz, AMD EPYC 7453)

$SPECrate^{®}2017\_fp\_base = 394$

$SPECrate^{®}2017\_fp\_peak = 396$

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

Test Date: Jun-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Copies	
503.bwaves_r	56 — 706
507.cactuBSSN_r	56 — 594
508.namd_r	56 — 281
510.parest_r	56 — 301
511.povray_r	56 — 427 / 433
519.lbm_r	56 — 176
521.wrf_r	56 — 377
526.blender_r	56 — 389 / 393
527.cam4_r	56 — 389 / 394
538.imagick_r	56 — 1550 / 1550
544.nab_r	56 — 519 / 521
549.fotonik3d_r	56 — 241
554.roms_r	56 — 190

—— SPECrate®2017_fp_base (394)   ------ SPECrate®2017_fp_peak (396)

Hardware

CPU Name: AMD EPYC 7453
 Max MHz: 3450
 Nominal: 2750
Enabled: 56 cores, 2 chips
Orderable: 1,2 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 64 MB I+D on chip per chip, 16 MB shared / 7 cores
 Other: None
Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
Storage: 1 x 196 GB SATA SSD, RAID 0
Other: None

Software

OS: Ubuntu 20.04.1 LTS (x86_64)
 Kernel 5.4.0-56-generic
Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A42 v2.42 04/29/2021 released Apr-2021
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc: jemalloc memory allocator library v5.1.0
Power Management: BIOS 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	56	**796**	**706**	797	705	796	706	56	**796**	**706**	797	705	796	706
507.cactuBSSN_r	56	121	587	119	595	**119**	**594**	56	121	587	119	595	**119**	**594**
508.namd_r	56	189	281	189	282	**189**	**281**	56	189	281	189	282	**189**	**281**
510.parest_r	56	488	300	**487**	**301**	487	301	56	488	300	**487**	**301**	487	301
511.povray_r	56	306	427	**306**	**427**	308	424	56	**302**	**433**	302	433	302	433
519.lbm_r	56	336	176	335	176	**335**	**176**	56	336	176	335	176	**335**	**176**
521.wrf_r	56	**333**	**377**	334	376	333	377	56	**333**	**377**	334	376	333	377
526.blender_r	56	218	392	**219**	**389**	220	387	56	217	393	**217**	**393**	217	394
527.cam4_r	56	252	388	**252**	**389**	252	389	56	248	395	249	393	**248**	**394**
538.imagick_r	56	**90.1**	**1550**	90.2	1540	90.1	1550	56	**89.8**	**1550**	89.9	1550	89.8	1550
544.nab_r	56	181	520	**181**	**519**	182	518	56	183	514	181	521	**181**	**521**
549.fotonik3d_r	56	905	241	**905**	**241**	905	241	56	905	241	**905**	**241**	905	241
554.roms_r	56	**468**	**190**	468	190	467	190	56	**468**	**190**	468	190	467	190

SPECrate®2017_fp_base = **394**

SPECrate®2017_fp_peak = **396**

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>
'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of
memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum
necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory
and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
```

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Operating System Notes (Continued)

```
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout
randomization (ASLR) to reduce run-to-run variability.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root for peak
integer runs and all FP runs to enable Transparent Hugepages (THP).
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for base
integer runs to enable THP only on request.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/SPEC_CPU2017/amd_rate_aocc300_milan_A_lib/64;/home/SPEC_CPU2017/a
      md_rate_aocc300_milan_A_lib/32:"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB Memory using OpenSUSE 15.2

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.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
jemalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2


Submitted_by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon Jun 21 10:16:41 EDT 2021
Submission: cpu2017-20210621-27521.sub
```

Platform Notes

```
BIOS Configuration
Workload Profile set to General Throughput Compute
AMD SMT Option set to Disabled
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Last-Level Cache (LLC) as NUMA Node set to Enabled
```

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

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Platform Notes (Continued)

```
NUMA memory domains per socket set to Four memory domains per socket
Data Fabric C-State Enable set to Force Enabled
Thermal Configuration set to Maximum Cooling
Infinity Fabric Power Management set to Disabled
Infinity Fabric Performance State set to P0
Workload Profile set to Custom
L1 HW Prefetcher set to Disabled

 Sysinfo program /home/SPEC_CPU2017/bin/sysinfo
 Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
 running on admin Wed Apr  1 17:32:15 2020

 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 7453 28-Core Processor
       2  "physical id"s (chips)
       56 "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 : 28
       siblings  : 28
       physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30

 From lscpu:
    Architecture:          x86_64
    CPU op-mode(s):        32-bit, 64-bit
    Byte Order:            Little Endian
    Address sizes:         48 bits physical, 48 bits virtual
    CPU(s):                56
    On-line CPU(s) list:   0-55
    Thread(s) per core:    1
    Core(s) per socket:    28
    Socket(s):             2
    NUMA node(s):          8
    Vendor ID:             AuthenticAMD
    CPU family:            25
    Model:                 1
    Model name:            AMD EPYC 7453 28-Core Processor
    Stepping:              1
    Frequency boost:       enabled
    CPU MHz:               1795.859
```

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Platform Notes (Continued)

```
         CPU max MHz:                    2750.0000
         CPU min MHz:                    1500.0000
         BogoMIPS:                       5490.03
         Virtualization:                 AMD-V
         L1d cache:                      1.8 MiB
         L1i cache:                      1.8 MiB
         L2 cache:                       28 MiB
         L3 cache:                       128 MiB
         NUMA node0 CPU(s):              0-6
         NUMA node1 CPU(s):              7-13
         NUMA node2 CPU(s):              14-20
         NUMA node3 CPU(s):              21-27
         NUMA node4 CPU(s):              28-34
         NUMA node5 CPU(s):              35-41
         NUMA node6 CPU(s):              42-48
         NUMA node7 CPU(s):              49-55
         Vulnerability Itlb multihit:    Not affected
         Vulnerability L1tf:             Not affected
         Vulnerability Mds:              Not affected
         Vulnerability Meltdown:         Not affected
         Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
         prctl and seccomp
         Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user
         pointer sanitization
         Vulnerability Spectre v2:        Mitigation; Full AMD retpoline, IBPB conditional,
         IBRS_FW, STIBP disabled, RSB filling
         Vulnerability Srbds:            Not affected
         Vulnerability Tsx async abort:  Not affected
         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 pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 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
         ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cqm rdt_a rdseed adx smap
         clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc
         cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr wbnoinvd arat npt lbrv svm_lock
         nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold
         v_vmsave_vmload vgif umip pku ospke vaes vpclmulqdq rdpid overflow_recov succor smca

  /proc/cpuinfo cache data
     cache size : 512 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
     available: 8 nodes (0-7)
```

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Platform Notes (Continued)

```
   node 0 cpus: 0 1 2 3 4 5 6
   node 0 size: 257797 MB
   node 0 free: 257496 MB
   node 1 cpus: 7 8 9 10 11 12 13
   node 1 size: 258021 MB
   node 1 free: 257707 MB
   node 2 cpus: 14 15 16 17 18 19 20
   node 2 size: 258045 MB
   node 2 free: 257828 MB
   node 3 cpus: 21 22 23 24 25 26 27
   node 3 size: 258033 MB
   node 3 free: 257790 MB
   node 4 cpus: 28 29 30 31 32 33 34
   node 4 size: 258045 MB
   node 4 free: 257844 MB
   node 5 cpus: 35 36 37 38 39 40 41
   node 5 size: 258045 MB
   node 5 free: 257853 MB
   node 6 cpus: 42 43 44 45 46 47 48
   node 6 size: 258045 MB
   node 6 free: 257852 MB
   node 7 cpus: 49 50 51 52 53 54 55
   node 7 size: 258045 MB
   node 7 free: 257846 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:       2113618964 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
```

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Platform Notes (Continued)

```
    Ubuntu 20.04.1 LTS

 From /etc/*release* /etc/*version*
    debian_version: bullseye/sid
    os-release:
        NAME="Ubuntu"
        VERSION="20.04.1 LTS (Focal Fossa)"
        ID=ubuntu
        ID_LIKE=debian
        PRETTY_NAME="Ubuntu 20.04.1 LTS"
        VERSION_ID="20.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

 uname -a:
    Linux admin 5.4.0-56-generic #62-Ubuntu SMP Mon Nov 23 19:20:19 UTC 2020 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 and
                                                   seccomp
 CVE-2017-5753 (Spectre variant 1):                Mitigation: usercopy/swapgs
                                                   barriers and __user pointer
                                                   sanitization
 CVE-2017-5715 (Spectre variant 2):                Mitigation: Full AMD retpoline,
                                                  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

 run-level 5 Apr 1 17:24

 SPEC is set to: /home/SPEC_CPU2017
    Filesystem                      Type  Size  Used Avail Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv ext4  196G   42G  145G  23% /

 From /sys/devices/virtual/dmi/id
     Vendor:          HPE
     Product:         ProLiant DL365 Gen10 Plus
     Product Family:  ProLiant
     Serial:          CN70430NKR
```

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Platform Notes (Continued)

```
 Additional information from dmidecode 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:
      16x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
      16x UNKNOWN NOT AVAILABLE

  BIOS:
     BIOS Vendor:        HPE
     BIOS Version:       A42
     BIOS Date:          04/29/2021
     BIOS Revision:      2.42
     Firmware Revision: 2.42

  (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 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
C++                | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
C++, C             | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
```

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Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
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Target: x86_64-unknown-linux-gnu
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/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 -D__BOOL_DEFINED -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

(Continued on next page)

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus
(2.75 GHz, AMD EPYC 7453)

SPECrate®2017_fp_base = 394

SPECrate®2017_fp_peak = 396

CPU2017 License: 3		**Test Date:**	Jun-2021
Test Sponsor:	HPE	**Hardware Availability:**	Jun-2021
Tested by:	HPE	**Software Availability:**	Mar-2021

Base Portability Flags (Continued)

554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs
-lamdlibm -ljemalloc -lflang -lflangrti
```

C++ benchmarks:
```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-z muldefs -lamdlibm -ljemalloc -lflang -lflangrti
```

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Hz,1,0x1 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -z muldefs -lamdlibm -ljemalloc
-lflang -lflangrti
```

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus
(2.75 GHz, AMD EPYC 7453)

SPECrate®2017_fp_base = 394

SPECrate®2017_fp_peak = 396

CPU2017 License: 3		**Test Date:**	Jun-2021
Test Sponsor:	HPE	**Hardware Availability:**	Jun-2021
Tested by:	HPE	**Software Availability:**	Mar-2021

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
-Kieee -Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs
-lamdlibm -ljemalloc -lflang -lflangrti
```

Benchmarks using both C and C++:
```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false
-z muldefs -lamdlibm -ljemalloc -lflang -lflangrti
```

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
```

SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus
(2.75 GHz, AMD EPYC 7453)

SPECrate®2017_fp_base = 394

SPECrate®2017_fp_peak = 396

CPU2017 License:	3	**Test Date:**	Jun-2021
Test Sponsor:	HPE	**Hardware Availability:**	Jun-2021
Tested by:	HPE	**Software Availability:**	Mar-2021

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
```
-mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false
-Hz,1,0x1 -Kieee -Mrecursive -mllvm -fuse-tile-inner-loop
-funroll-loops -mllvm -lsr-in-nested-loop -z muldefs -lamdlibm
-ljemalloc -lflang -lflangrti
```

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++
```

Fortran benchmarks:
```
flang
```

Benchmarks using both Fortran and C:
```
flang clang
```

Benchmarks using both C and C++:
```
clang++ clang
```

(Continued on next page)

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Hewlett Packard Enterprise
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ProLiant DL365 Gen10 Plus
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SPECrate®2017_fp_base = 394

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

Test Date: Jun-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Peak Compiler Invocation (Continued)

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,-function-specialize`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`
`-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays`
`-flv-function-specialization -mllvm -inline-threshold=1000`
`-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true`
`-mllvm -function-specialize -mllvm -enable-licm-vrp`
`-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc`

544.nab_r: `-m64 -flto -Wl,-mllvm -Wl,-region-vectorize`
`-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3`
`-fveclib=AMDLIBM -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays`
`-flv-function-specialization -mllvm -inline-threshold=1000`
`-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true`
`-mllvm -function-specialize -mllvm -enable-licm-vrp`
`-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `basepeak = yes`

Fortran benchmarks:

(Continued on next page)

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SPECrate®2017_fp_base = 394

ProLiant DL365 Gen10 Plus
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SPECrate®2017_fp_peak = 396

CPU2017 License:	3	**Test Date:**	Jun-2021
Test Sponsor:	HPE	**Hardware Availability:**	Jun-2021
Tested by:	HPE	**Software Availability:**	Mar-2021

Peak Optimization Flags (Continued)

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `basepeak = yes`

Benchmarks using both Fortran and C:

521.wrf_r: `basepeak = yes`

527.cam4_r: `-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching`
`-Wl,-mllvm -Wl,-enable-licm-vrp -flto`
`-Wl,-mllvm -Wl,-function-specialize`
`-Wl,-mllvm -Wl,-force-vector-interleave=1 -Ofast`
`-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays`
`-flv-function-specialization -mllvm -inline-threshold=1000`
`-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true`
`-mllvm -function-specialize -mllvm -enable-licm-vrp`
`-mllvm -reduce-array-computations=3 -O3 -ffast-math`
`-funroll-loops -mllvm -extra-vectorizer-passes`
`-mllvm -lsr-in-nested-loop -Mrecursive -lamdlibm`
`-ljemalloc -lflang -lflangrti`

Benchmarks using both C and C++:
`-m64 -std=c++98 -mno-adx -mno-sse4a`
`-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-enable-licm-vrp`
`-flto -Wl,-mllvm -Wl,-function-specialize`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3`
`-fveclib=AMDLIBM -fstruct-layout=7 -mllvm -unroll-threshold=50`
`-fremap-arrays -flv-function-specialization`
`-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist`
`-mllvm -global-vectorize-slp=true -mllvm -function-specialize`
`-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3`
`-finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reroll-loops`
`-mllvm -aggressive-loop-unswitch -lamdlibm -ljemalloc`

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: `basepeak = yes`

SPEC CPU®2017 Floating Point Rate Result

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ProLiant DL365 Gen10 Plus
(2.75 GHz, AMD EPYC 7453)

$SPECrate®2017\_fp\_base = 394$

$SPECrate®2017\_fp\_peak = 396$

CPU2017 License: 3	**Test Date:** Jun-2021
Test Sponsor: HPE	**Hardware Availability:** Jun-2021
Tested by: HPE	**Software Availability:** Mar-2021

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-V1.2-EPYC-revP.html
http://www.spec.org/cpu2017/flags/aocc300-flags-A1.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml
http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml

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

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