SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
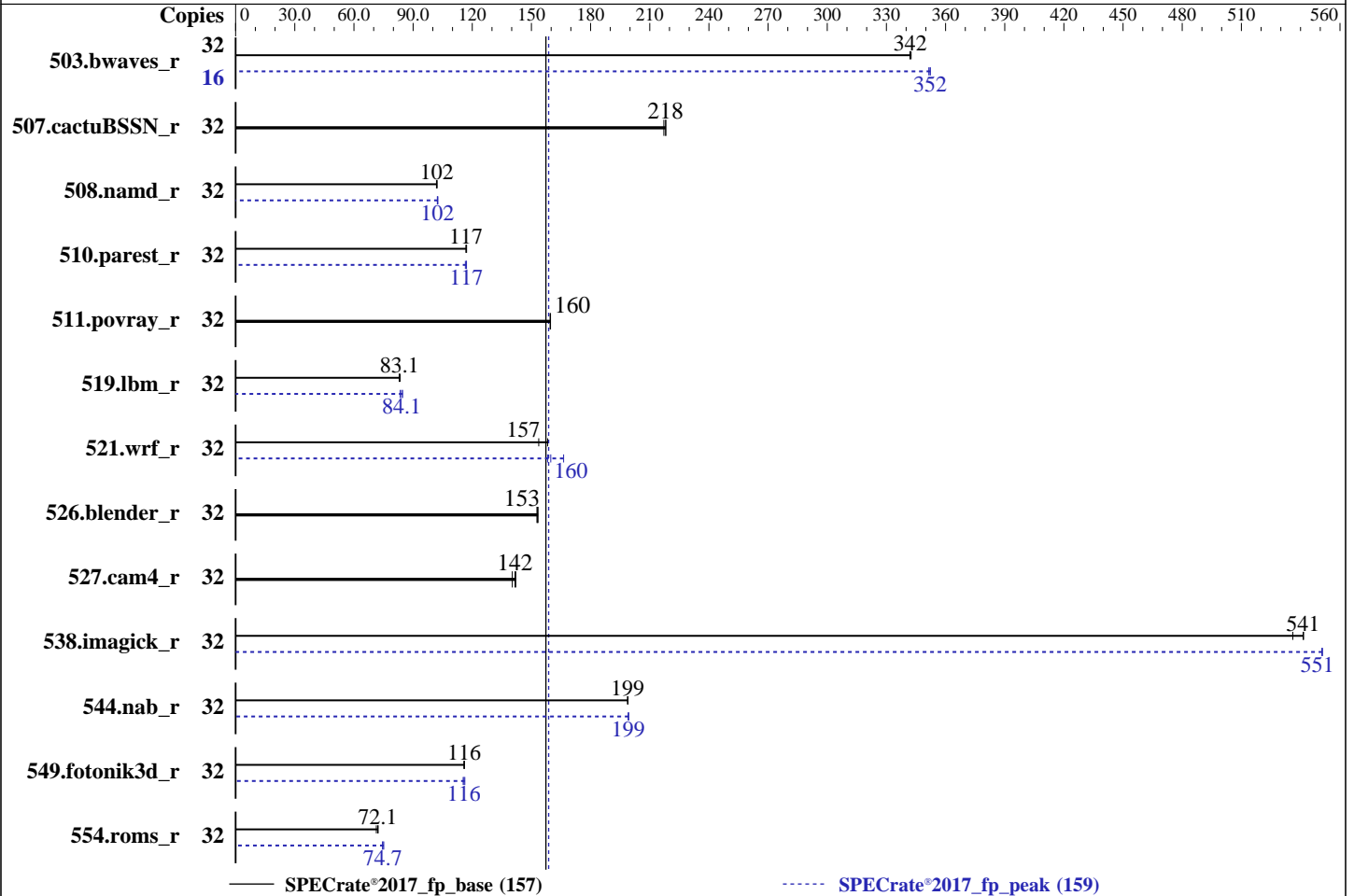
ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

$SPECrate®2017\_fp\_base = 157$

$SPECrate®2017\_fp\_peak = 159$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2023

Hardware Availability: Nov-2023

Software Availability: May-2022

	Copies	
503.bwaves_r	32	342
	16	352
507.cactuBSSN_r	32	218
508.namd_r	32	102
		102
510.parest_r	32	117
		117
511.povray_r	32	160
519.lbm_r	32	83.1
		84.1
521.wrf_r	32	157
		160
526.blender_r	32	153
527.cam4_r	32	142
538.imagick_r	32	541
		551
544.nab_r	32	199
		199
549.fotonik3d_r	32	116
		116
554.roms_r	32	72.1
		74.7

— SPECrate®2017_fp_base (157)   ----- SPECrate®2017_fp_peak (159)

Hardware

CPU Name: AMD EPYC 7303P
 Max MHz: 3400
 Nominal: 2400
Enabled: 16 cores, 1 chip, 2 threads/core
Orderable: 1 chip
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 / 4 cores
 Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 480 GB SAS SSD
Other: None

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
 kernel 5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A43 v2.84 08/17/2023 released Aug-2023
File System: xfs
System State: Run level 3 (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	32	**938**	**342**	937	343	938	342	16	456	351	455	352	**456**	**352**
507.cactuBSSN_r	32	**186**	**218**	186	218	187	217	32	**186**	**218**	186	218	187	217
508.namd_r	32	298	102	**298**	**102**	298	102	32	297	102	**297**	**102**	296	103
510.parest_r	32	717	117	715	117	**716**	**117**	32	719	116	715	117	**715**	**117**
511.povray_r	32	468	159	**468**	**160**	468	160	32	468	159	**468**	**160**	468	160
519.lbm_r	32	407	82.9	**406**	**83.1**	404	83.4	32	398	84.7	404	83.4	**401**	**84.1**
521.wrf_r	32	**456**	**157**	453	158	466	154	32	453	158	**449**	**160**	431	166
526.blender_r	32	**318**	**153**	319	153	318	153	32	**318**	**153**	319	153	318	153
527.cam4_r	32	394	142	399	140	**395**	**142**	32	394	142	399	140	**395**	**142**
538.imagick_r	32	147	542	**147**	**541**	148	536	32	144	551	**144**	**551**	144	551
544.nab_r	32	**271**	**199**	271	199	271	199	32	**270**	**199**	270	199	270	199
549.fotonik3d_r	32	1075	116	**1076**	**116**	1077	116	32	1081	115	**1077**	**116**	1073	116
554.roms_r	32	713	71.4	**705**	**72.1**	704	72.3	32	677	75.1	**681**	**74.7**	683	74.5
SPECrate®2017_fp_base =	**157**											
SPECrate®2017_fp_peak =	**159**											

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.
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
```

(Continued on next page)

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Operating System Notes (Continued)

```
'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_aocc320_milanx_A_lib/lib;/home/cpu2017/amd_rate_aocc320_milanx_A_lib/lib32:"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB 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
```

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
Memory Patrol Scrubbing set to Disabled
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Power Regulator set to OS Control Mode

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Thu Nov  2 23:12:14 2023

 SUT (System Under Test) info as seen by some common utilities.

 ----------------------------------------------------------
 Table of contents
 ----------------------------------------------------------
  1. uname -a
  2. w
  3. Username
  4. ulimit -a
  5. sysinfo process ancestry
  6. /proc/cpuinfo
  7. lscpu
```

(Continued on next page)

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Platform Notes (Continued)

```
    8. numactl --hardware
    9. /proc/meminfo
   10. who -r
   11. Systemd service manager version: systemd 250 (250-6.el9_0)
   12. Services, from systemctl list-unit-files
   13. Linux kernel boot-time arguments, from /proc/cmdline
   14. cpupower frequency-info
   15. tuned-adm active
   16. sysctl
   17. /sys/kernel/mm/transparent_hugepage
   18. /sys/kernel/mm/transparent_hugepage/khugepaged
   19. OS release
   20. Disk information
   21. /sys/devices/virtual/dmi/id
   22. dmidecode
   23. BIOS
  ------------------------------------------------------------


  ------------------------------------------------------------
  1. uname -a
    Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
    x86_64 x86_64 GNU/Linux


  ------------------------------------------------------------
  2. w
     23:12:14 up 15 min,  1 user,  load average: 0.07, 0.02, 0.00
    USER     TTY         LOGIN@   IDLE   JCPU   PCPU WHAT
    root     pts/0       23:09   14.00s  1.13s  0.02s /bin/bash ./amd_rate_aocc320_milanx_A1.sh


  ------------------------------------------------------------
  3. Username
    From environment variable $USER:  root


  ------------------------------------------------------------
  4. ulimit -a
    real-time non-blocking time  (microseconds, -R) unlimited
    core file size              (blocks, -c) 0
    data seg size               (kbytes, -d) unlimited
    scheduling priority               (-e) 0
    file size                   (blocks, -f) unlimited
    pending signals                   (-i) 2062712
    max locked memory           (kbytes, -l) 2097152
    max memory size             (kbytes, -m) unlimited
    open files                        (-n) 1024
    pipe size              (512 bytes, -p) 8
    POSIX message queues        (bytes, -q) 819200
    real-time priority                (-r) 0
    stack size                  (kbytes, -s) unlimited
    cpu time                   (seconds, -t) unlimited
    max user processes                (-u) 2062712
    virtual memory              (kbytes, -v) unlimited
    file locks                        (-x) unlimited


  ------------------------------------------------------------
  5. sysinfo process ancestry
  /usr/lib/systemd/systemd --switched-root --system --deserialize 18
  sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
  sshd: root [priv]
  sshd: root@pts/0
  -bash
```

(Continued on next page)

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Platform Notes (Continued)

```
  python3 ./run_amd_rate_aocc320_milanx_A1.py
  /bin/bash ./amd_rate_aocc320_milanx_A1.sh
  runcpu --config amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 fprate
  runcpu --configfile amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 --nopower
    --runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.017/templogs/preenv.fprate.017.0.log --lognum 017.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017


  -------------------------------------------------------------
6. /proc/cpuinfo
     model name      : AMD EPYC 7303P 16-Core Processor
     vendor_id       : AuthenticAMD
     cpu family      : 25
     model           : 1
     stepping        : 1
     microcode       : 0xa0011d1
     bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
     TLB size        : 2560 4K pages
     cpu cores       : 16
     siblings        : 32
     1 physical ids (chips)
     32 processors (hardware threads)
     physical id 0: core ids 0-15
     physical id 0: apicids 0-31
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


  -------------------------------------------------------------
7. lscpu

  From lscpu from util-linux 2.37.4:
    Architecture:             x86_64
    CPU op-mode(s):           32-bit, 64-bit
    Address sizes:            48 bits physical, 48 bits virtual
    Byte Order:               Little Endian
    CPU(s):                   32
    On-line CPU(s) list:      0-31
    Vendor ID:                AuthenticAMD
    BIOS Vendor ID:           Advanced Micro Devices, Inc.
    Model name:               AMD EPYC 7303P 16-Core Processor
    BIOS Model name:          AMD EPYC 7303P 16-Core Processor
    CPU family:               25
    Model:                    1
    Thread(s) per core:       2
    Core(s) per socket:       16
    Socket(s):                1
    Stepping:                 1
    Frequency boost:          enabled
    CPU max MHz:              2400.0000
    CPU min MHz:              1500.0000
    BogoMIPS:                 4790.95
    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 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
```

(Continued on next page)

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Platform Notes (Continued)

```
                          erms 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 rdpru wbnoinvd amd_ppin arat npt lbrv svm_lock
                          nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
                          pfthreshold v_vmsave_vmload vgif v_spec_ctrl umip pku ospke vaes
                          vpclmulqdq rdpid overflow_recov succor smca fsrm
  Virtualization:         AMD-V
  L1d cache:              512 KiB (16 instances)
  L1i cache:              512 KiB (16 instances)
  L2 cache:               8 MiB (16 instances)
  L3 cache:               64 MiB (4 instances)
  NUMA node(s):           4
  NUMA node0 CPU(s):      0-3,16-19
  NUMA node1 CPU(s):      4-7,20-23
  NUMA node2 CPU(s):      8-11,24-27
  NUMA node3 CPU(s):      12-15,28-31
  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
  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
  Vulnerability Srbds:            Not affected
  Vulnerability Tsx async abort:  Not affected

From lscpu --cache:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE          LEVEL   SETS PHY-LINE COHERENCY-SIZE
    L1d       32K      512K   8 Data              1     64        1             64
    L1i       32K      512K   8 Instruction       1     64        1             64
    L2       512K        8M   8 Unified           2   1024        1             64
    L3        16M       64M  16 Unified           3  16384        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0-3,16-19
  node 0 size: 128774 MB
  node 0 free: 128227 MB
  node 1 cpus: 4-7,20-23
  node 1 size: 129021 MB
  node 1 free: 128770 MB
  node 2 cpus: 8-11,24-27
  node 2 size: 129021 MB
  node 2 free: 128731 MB
  node 3 cpus: 12-15,28-31
  node 3 size: 128965 MB
  node 3 free: 128683 MB
  node distances:
  node   0   1   2   3
    0:  10  12  12  12
    1:  12  10  12  12
    2:  12  12  10  12
    3:  12  12  12  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:      528161496 kB
```

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Platform Notes (Continued)

```
   ------------------------------------------------------------
   10. who -r
     run-level 3 Nov 2 22:56


   ------------------------------------------------------------
   11. Systemd service manager version: systemd 250 (250-6.el9_0)
     Default Target  Status
     multi-user      running


   ------------------------------------------------------------
   12. Services, from systemctl list-unit-files
     STATE              UNIT FILES
     enabled            NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                        dbus-broker firewalld getty@ irqbalance kdump lvm2-monitor mdmonitor microcode
                        nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd
                        systemd-network-generator tuned udisks2
     enabled-runtime    systemd-remount-fs
     disabled           blk-availability chrony-wait chronyd console-getty cpupower debug-shell kvm_stat
                        man-db-restart-cache-update nftables powertop rdisc rhsm rhsm-facts rpmdb-rebuild
                        serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysext
     indirect           sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo


   ------------------------------------------------------------
   13. Linux kernel boot-time arguments, from /proc/cmdline
     BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
     root=/dev/mapper/rhel-root
     ro
     resume=/dev/mapper/rhel-swap
     rd.lvm.lv=rhel/root
     rd.lvm.lv=rhel/swap


   ------------------------------------------------------------
   14. cpupower frequency-info
     analyzing CPU 0:
       current policy: frequency should be within 1.50 GHz and 2.40 GHz.
                       The governor "performance" may decide which speed to use
                       within this range.
     boost state support:
       Supported: yes
       Active: yes
       Boost States: 0
       Total States: 3
       Pstate-P0:  2400MHz


   ------------------------------------------------------------
   15. tuned-adm active
     Current active profile: throughput-performance


   ------------------------------------------------------------
   16. sysctl
     kernel.numa_balancing           1
     kernel.randomize_va_space       0
     vm.compaction_proactiveness     20
     vm.dirty_background_bytes       0
     vm.dirty_background_ratio       10
     vm.dirty_bytes                  0
     vm.dirty_expire_centisecs       3000
     vm.dirty_ratio                  8
     vm.dirty_writeback_centisecs    500
```

(Continued on next page)

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Platform Notes (Continued)

```
   vm.dirtytime_expire_seconds       43200
   vm.extfrag_threshold                500
   vm.min_unmapped_ratio                 1
   vm.nr_hugepages                       0
   vm.nr_hugepages_mempolicy             0
   vm.nr_overcommit_hugepages            0
   vm.swappiness                         1
   vm.watermark_boost_factor         15000
   vm.watermark_scale_factor            10
   vm.zone_reclaim_mode                  1


   ----------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
   defrag          [always] defer defer+madvise madvise never
   enabled         [always] madvise never
   hpage_pmd_size  2097152
   shmem_enabled   always within_size advise [never] deny force


   ----------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs   60000
   defrag                      1
   max_ptes_none             511
   max_ptes_shared           256
   max_ptes_swap              64
   pages_to_scan            4096
   scan_sleep_millisecs    10000


   ----------------------------------------------------------
19. OS release
   From /etc/*-release /etc/*-version
   os-release     Red Hat Enterprise Linux 9.0 (Plow)
   redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
   system-release Red Hat Enterprise Linux release 9.0 (Plow)


   ----------------------------------------------------------
20. Disk information
SPEC is set to: /home/cpu2017
   Filesystem             Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   372G   18G  354G   5% /home


   ----------------------------------------------------------
21. /sys/devices/virtual/dmi/id
     Vendor:         HPE
     Product:        ProLiant DL345 Gen10 Plus
     Product Family: ProLiant
     Serial:         CN70460YWF


   ----------------------------------------------------------
22. dmidecode
   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:
     8x Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200



   ----------------------------------------------------------
23. BIOS
```

(Continued on next page)

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Platform Notes (Continued)

```
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       HPE
    BIOS Version:      A43
    BIOS Date:         08/17/2023
    BIOS Revision:     2.84
    Firmware Revision: 2.96
```

Compiler Version Notes

```
==============================================================================
C            | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++          | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++, C       | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
Fortran      | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 157

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_peak = 159

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

Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
--------------------------------------------------------------------------------


================================================================================
Fortran, C    | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
--------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/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`

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

Base Portability Flags (Continued)

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`
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`
`-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM`
`-ffast-math -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-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang`

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`
`-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM`
`-ffast-math -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`
`-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang`

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`

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 157

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_peak = 159

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

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-loop-fusion -Hz,1,0x1 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -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 -mllvm -enable-loop-fusion
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -lflang
```

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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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-loop-fusion -Hz,1,0x1 -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -lflang
```

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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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-loop-fusion -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
```

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Hewlett Packard Enterprise
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ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
```
-lflang
```

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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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-loop-fusion -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 -Hz,1,0x1 -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -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
```

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

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,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-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
```

```
538.imagick_r: Same as 519.lbm_r
```

```
544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
```

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

SPEC CPU®2017 Floating Point Rate Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

Peak Optimization Flags (Continued)

544.nab_r (continued):
```
-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:
```
-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 -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

510.parest_r:
```
-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,-suppress-fmas
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-vrp -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

Fortran benchmarks:

503.bwaves_r:
```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-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 -ffast-math -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-lamdlibm -ljemalloc -lflang
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

Peak Optimization Flags (Continued)

549.fotonik3d_r: `-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching`
`-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 -ffast-math -Kieee`
`-Mrecursive -mllvm -reduce-array-computations=3`
`-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp`
`-lamdlibm -ljemalloc -lflang`

554.roms_r: `-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching`
`-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 -ffast-math -Mrecursive`
`-mllvm -reduce-array-computations=3`
`-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp`
`-Hz,1,0x1 -mllvm -fuse-tile-inner-loop -lamdlibm`
`-ljemalloc -lflang`

Benchmarks using both Fortran and C:

521.wrf_r: `-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching`
`-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 -ffast-math`
`-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 -Mrecursive -lamdlibm`
`-ljemalloc -lflang`

527.cam4_r: `basepeak = yes`

Benchmarks using both C and C++:

511.povray_r: `basepeak = yes`

526.blender_r: `basepeak = yes`

(Continued on next page)

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECrate®2017_fp_base = 157

SPECrate®2017_fp_peak = 159

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

Test Date: Nov-2023
Hardware Availability: Nov-2023
Software Availability: May-2022

Peak Optimization Flags (Continued)

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-V1.3-EPYC-revS.html`
`http://www.spec.org/cpu2017/flags/aocc320-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-V1.3-EPYC-revS.xml`
`http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml`

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

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