SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECrate®2017\_fp\_base = 715$

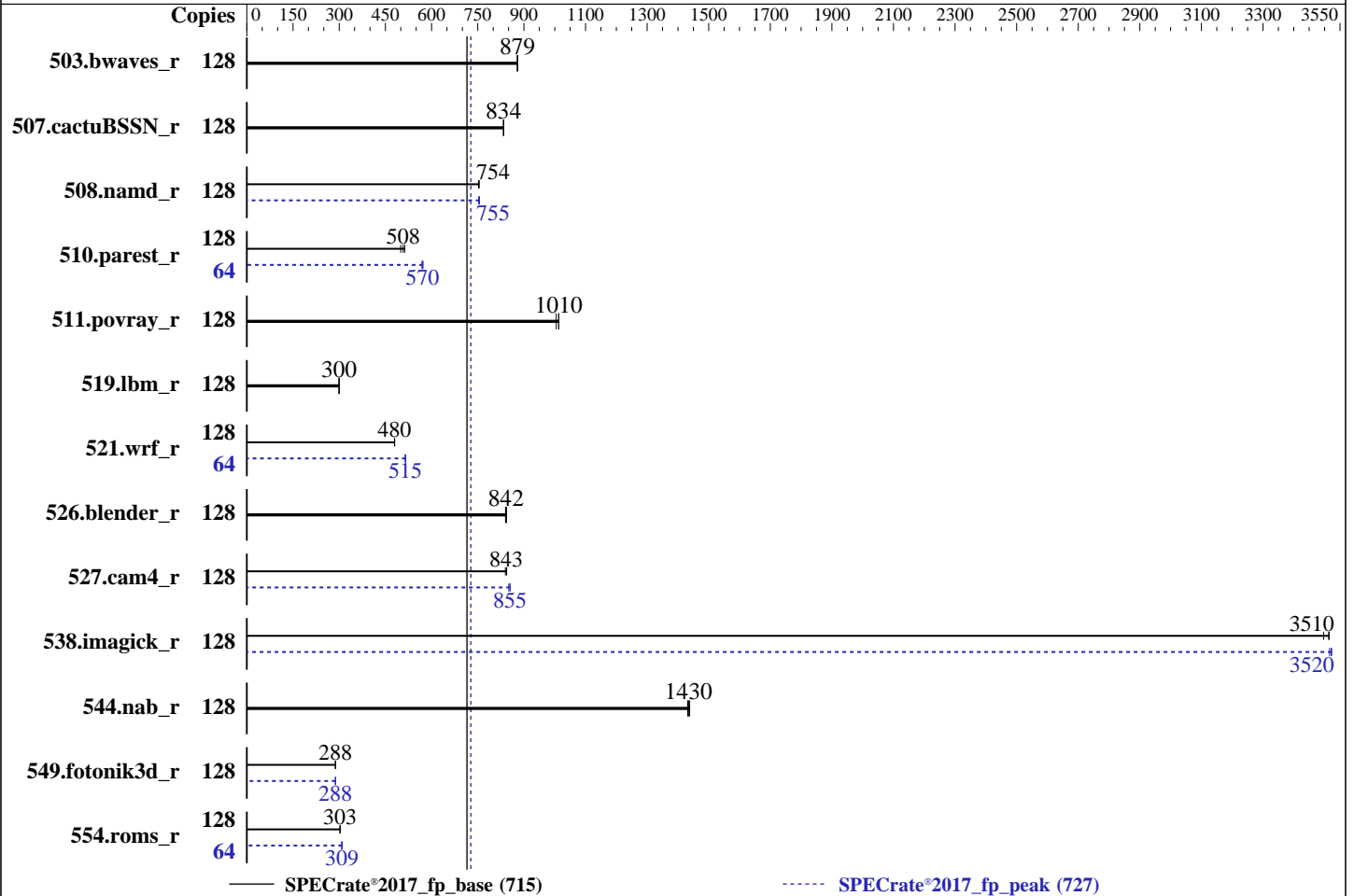$SPECrate®2017\_fp\_peak = 727$

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

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

Benchmark	Copies	base	peak
503.bwaves_r	128	879	
507.cactuBSSN_r	128	834	
508.namd_r	128	754	755
510.parest_r	128 / 64	508	570
511.povray_r	128	1010	
519.lbm_r	128	300	
521.wrf_r	128 / 64	480	515
526.blender_r	128	842	
527.cam4_r	128	843	855
538.imagick_r	128	3510	3520
544.nab_r	128	1430	
549.fotonik3d_r	128	288	288
554.roms_r	128 / 64	303	309

SPECrate®2017_fp_base (715)   SPECrate®2017_fp_peak (727)

Hardware
CPU Name: AMD EPYC 9754
 Max MHz: 3100
 Nominal: 2250
Enabled: 128 cores, 1 chip
Orderable: 1 chip
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,
  16 MB shared / 8 cores
 Other: None
Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 1 x 960 GB SATA 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 4.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version v1.30 03/06/2023 released
  Mar-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: BIOS and OS set to prefer performance at
  the cost of additional power usage

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Results Table

Benchmark	Base						Peak					
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	128	**1460**	**879**	1461	878	1460	879	128	**1460**	**879**	1461	878	1460	879
507.cactuBSSN_r	128	194	834	194	833	**194**	**834**	128	194	834	194	833	**194**	**834**
508.namd_r	128	**161**	**754**	162	752	161	754	128	**161**	**755**	161	753	161	756
510.parest_r	128	653	513	670	500	**660**	**508**	64	293	572	**294**	**570**	294	569
511.povray_r	128	295	1010	297	1000	**295**	**1010**	128	295	1010	297	1000	**295**	**1010**
519.lbm_r	128	450	300	450	300	**450**	**300**	128	450	300	450	300	**450**	**300**
521.wrf_r	128	598	480	**598**	**480**	597	480	64	**278**	**515**	279	514	278	516
526.blender_r	128	231	843	232	840	**232**	**842**	128	231	843	232	840	**232**	**842**
527.cam4_r	128	265	844	267	840	**266**	**843**	128	**262**	**855**	262	855	263	851
538.imagick_r	128	90.6	3510	**90.6**	**3510**	91.0	3500	128	90.5	3520	90.4	3520	**90.4**	**3520**
544.nab_r	128	150	1440	150	1430	**150**	**1430**	128	150	1440	150	1430	**150**	**1430**
549.fotonik3d_r	128	1733	288	1732	288	**1733**	**288**	128	1732	288	**1732**	**288**	1733	288
554.roms_r	128	673	302	670	304	**671**	**303**	64	330	308	**329**	**309**	329	309
SPECrate®2017_fp_base =	**715**											
SPECrate®2017_fp_peak =	**727**											

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,
```

(Continued on next page)

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Operating System Notes (Continued)

```
'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_aocc400_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
 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
 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
  L2 HW Prefetcher set to Disabled

The reported date by sysinfo is incorrect due to computer clock being not set correctly.
The correct test date is: May-2023.

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Thu Apr  7 05:31:25 2022

 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
```

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Platform Notes (Continued)

```
     6. /proc/cpuinfo
     7. lscpu
     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. sysctl
    16. /sys/kernel/mm/transparent_hugepage
    17. /sys/kernel/mm/transparent_hugepage/khugepaged
    18. OS release
    19. Disk information
    20. /sys/devices/virtual/dmi/id
    21. dmidecode
    22. 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
       05:31:25 up 1 min,  1 user,  load average: 0.51, 0.20, 0.07
      USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
      root     pts/0      05:30   21.00s  1.19s  0.05s /bin/bash ./amd_rate_aocc400_genoa_B1.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) 3094694
      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) 3094694
      virtual memory              (kbytes, -v) unlimited
      file locks                       (-x) unlimited

    ------------------------------------------------------------
    5. sysinfo process ancestry
     /usr/lib/systemd/systemd --switched-root --system --deserialize 27
     sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
     sshd: root [priv]
     sshd: root@pts/0
```

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Platform Notes (Continued)

```
   -bash
 python3 ./run_fprate.py
 /bin/bash ./amd_rate_aocc400_genoa_B1.sh
 runcpu --config amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 fprate
 runcpu --configfile amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower --runmode
   rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.004/templogs/preenv.fprate.004.0.log --lognum 004.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017


 ------------------------------------------------------------
6. /proc/cpuinfo
    model name      : AMD EPYC 9754 128-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 25
    model           : 160
    stepping        : 2
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 3584 4K pages
    cpu cores       : 128
    siblings        : 128
    1 physical ids (chips)
    128 processors (hardware threads)
    physical id 0: core ids
    0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119,128-135,144-151,160-167,176-183,192-199,208-215,224-231,
    240-247
    physical id 0: apicids
    0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119,128-135,144-151,160-167,176-183,192-199,208-215,224-231,
    240-247
  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:             52 bits physical, 57 bits virtual
  Byte Order:                Little Endian
  CPU(s):                    128
  On-line CPU(s) list:       0-127
  Vendor ID:                 AuthenticAMD
  BIOS Vendor ID:            Advanced Micro Devices, Inc.
  Model name:                AMD EPYC 9754 128-Core Processor
  BIOS Model name:           AMD EPYC 9754 128-Core Processor
  CPU family:                25
  Model:                     160
  Thread(s) per core:        1
  Core(s) per socket:        128
  Socket(s):                 1
  Stepping:                  2
  Frequency boost:           enabled
  CPU max MHz:               2250.0000
  CPU min MHz:               1500.0000
  BogoMIPS:                  4493.33
  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
```

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Platform Notes (Continued)

```
                            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 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 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:                4 MiB (128 instances)
  L1i cache:                4 MiB (128 instances)
  L2 cache:                 128 MiB (128 instances)
  L3 cache:                 256 MiB (16 instances)
  NUMA node(s):             16
  NUMA node0 CPU(s):        0-7
  NUMA node1 CPU(s):        8-15
  NUMA node2 CPU(s):        64-71
  NUMA node3 CPU(s):        72-79
  NUMA node4 CPU(s):        32-39
  NUMA node5 CPU(s):        40-47
  NUMA node6 CPU(s):        96-103
  NUMA node7 CPU(s):        104-111
  NUMA node8 CPU(s):        48-55
  NUMA node9 CPU(s):        56-63
  NUMA node10 CPU(s):       112-119
  NUMA node11 CPU(s):       120-127
  NUMA node12 CPU(s):       16-23
  NUMA node13 CPU(s):       24-31
  NUMA node14 CPU(s):       80-87
  NUMA node15 CPU(s):       88-95
  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 disabled, 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      4M    8 Data             1    64       1              64
    L1i       32K      4M    8 Instruction      1    64       1              64
    L2         1M    128M    8 Unified          2  2048       1              64
    L3        16M    256M   16 Unified          3 16384       1              64

  ------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 16 nodes (0-15)
  node 0 cpus: 0-7
  node 0 size: 48135 MB
  node 0 free: 47837 MB
  node 1 cpus: 8-15
```

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Platform Notes (Continued)

```
    node 1 size: 48382 MB
    node 1 free: 48140 MB
    node 2 cpus: 64-71
    node 2 size: 48382 MB
    node 2 free: 48116 MB
    node 3 cpus: 72-79
    node 3 size: 48382 MB
    node 3 free: 48029 MB
    node 4 cpus: 32-39
    node 4 size: 48382 MB
    node 4 free: 48213 MB
    node 5 cpus: 40-47
    node 5 size: 48382 MB
    node 5 free: 48211 MB
    node 6 cpus: 96-103
    node 6 size: 48382 MB
    node 6 free: 48185 MB
    node 7 cpus: 104-111
    node 7 size: 48382 MB
    node 7 free: 48197 MB
    node 8 cpus: 48-55
    node 8 size: 48382 MB
    node 8 free: 48108 MB
    node 9 cpus: 56-63
    node 9 size: 48382 MB
    node 9 free: 48257 MB
    node 10 cpus: 112-119
    node 10 size: 48382 MB
    node 10 free: 48175 MB
    node 11 cpus: 120-127
    node 11 size: 48382 MB
    node 11 free: 48201 MB
    node 12 cpus: 16-23
    node 12 size: 48382 MB
    node 12 free: 48221 MB
    node 13 cpus: 24-31
    node 13 size: 48345 MB
    node 13 free: 48161 MB
    node 14 cpus: 80-87
    node 14 size: 48382 MB
    node 14 free: 48205 MB
    node 15 cpus: 88-95
    node 15 size: 48328 MB
    node 15 free: 48163 MB
    node distances:
    node   0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
      0:  10   11   11   11   12   12   12   12   12   12   12   12   12   12   12   12
      1:  11   10   11   11   12   12   12   12   12   12   12   12   12   12   12   12
      2:  11   11   10   11   12   12   12   12   12   12   12   12   12   12   12   12
      3:  11   11   11   10   12   12   12   12   12   12   12   12   12   12   12   12
      4:  12   12   12   12   10   11   11   11   12   12   12   12   12   12   12   12
      5:  12   12   12   12   11   10   11   11   12   12   12   12   12   12   12   12
      6:  12   12   12   12   11   11   10   11   12   12   12   12   12   12   12   12
      7:  12   12   12   12   11   11   11   10   12   12   12   12   12   12   12   12
      8:  12   12   12   12   12   12   12   12   10   11   11   11   12   12   12   12
      9:  12   12   12   12   12   12   12   12   11   10   11   11   12   12   12   12
     10:  12   12   12   12   12   12   12   12   11   11   10   11   12   12   12   12
     11:  12   12   12   12   12   12   12   12   11   11   11   10   12   12   12   12
     12:  12   12   12   12   12   12   12   12   12   12   12   12   10   11   11   11
     13:  12   12   12   12   12   12   12   12   12   12   12   12   11   10   11   11
```

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Platform Notes (Continued)

```
    14:  12  12  12  12  12  12  12  12  12  12  12  12  11  11  10  11
    15:  12  12  12  12  12  12  12  12  12  12  12  12  11  11  11  10


   ----------------------------------------------------------
9. /proc/meminfo
   MemTotal:       792348920 kB


   ----------------------------------------------------------
10. who -r
   run-level 3 Apr 7 05:30


   ----------------------------------------------------------
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 udisks2
   enabled-runtime   systemd-remount-fs
   disabled          blk-availability console-getty cpupower debug-shell hwloc-dump-hwdata kvm_stat
                     man-db-restart-cache-update nftables 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 2.25 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:  2250MHz


   ----------------------------------------------------------
15. 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
```

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECrate®2017\_fp\_base = 715$

$SPECrate®2017\_fp\_peak = 727$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Jun-2023

Software Availability: Nov-2022

Platform Notes (Continued)

```
   vm.dirty_ratio                      8
   vm.dirty_writeback_centisecs      500
   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


   ----------------------------------------------------------------
16. /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


   ----------------------------------------------------------------
17. /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


   ----------------------------------------------------------------
18. 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)


   ----------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017
   Filesystem            Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   819G  9.9G  809G   2% /home


   ----------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
   Vendor:         HPE
   Product:        ProLiant DL345 Gen11
   Product Family: ProLiant
   Serial:         DL345G11-004


   ----------------------------------------------------------------
21. 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:
     12x Hynix HMCG94AEBRA103N 64 GB 2 rank 4800
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

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Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Jun-2023

Software Availability: Nov-2022

Platform Notes (Continued)

```
  ----------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       HPE
    BIOS Version:      1.30
    BIOS Date:         03/06/2023
    BIOS Revision:     1.30
    Firmware Revision: 1.20
```

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
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
------------------------------------------------------------------------------
```

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

SPECrate®2017_fp_peak = 727

Compiler Version Notes (Continued)

```
==============================================================================================
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
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
----------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

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

Benchmarks using Fortran, C, and C++:
`clang++ clang flang`

Base Portability Flags

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

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

SPECrate®2017_fp_peak = 727

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

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

Base Portability Flags (Continued)

510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
526.blender_r: `-funsigned-char -DSPEC_LP64`
527.cam4_r: `-DSPEC_CASE_FLAG -DSPEC_LP64`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang
```

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
```

(Continued on next page)

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECrate^{®}2017\_fp\_base = 715$

$SPECrate^{®}2017\_fp\_peak = 727$

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

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
```
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Benchmarks using both C and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Base Other Flags

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

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

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

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

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

SPECrate®2017_fp_peak = 727

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

Base Other Flags (Continued)

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

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

Peak Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

Fortran benchmarks:
```
flang
```

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

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

Benchmarks using Fortran, C, and C++:
```
clang++ clang flang
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes

538.imagick_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`
`-march=znver4 -fveclib=AMDLIBM -ffast-math`
`-fstruct-layout=7 -mllvm -unroll-threshold=50`

(Continued on next page)

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

SPECrate®2017_fp_peak = 727

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

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

Peak Optimization Flags (Continued)

538.imagick_r (continued):
```
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

510.parest_r: `-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: basepeak = yes

549.fotonik3d_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -Kieee
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -lflang
```

554.roms_r: `-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
```

(Continued on next page)

Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 715

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_peak = 727

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

Peak Optimization Flags (Continued)

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
-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
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECrate®2017_fp_base = 715

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

Peak Other Flags (Continued)

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-Bergamo-rev1.0.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-Bergamo-rev1.0.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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

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