SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

$SPECspeed^{®}2017\_fp\_base = 299$

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECspeed^{®}2017\_fp\_peak = 301$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Jun-2023

Software Availability: Nov-2022

Threads chart (128 threads per benchmark):

- 603.bwaves_s: base 898, peak 899
- 607.cactuBSSN_s: base 481, peak 489
- 619.lbm_s: base 179
- 621.wrf_s: base 188, peak 192
- 627.cam4_s: base 184, peak 184
- 628.pop2_s: base 86.0, peak 89.6
- 638.imagick_s: base 580
- 644.nab_s: base 759
- 649.fotonik3d_s: base 138
- 654.roms_s: base 408

SPECspeed®2017_fp_base (299) — SPECspeed®2017_fp_peak (301)

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: Yes
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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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Hewlett Packard Enterprise
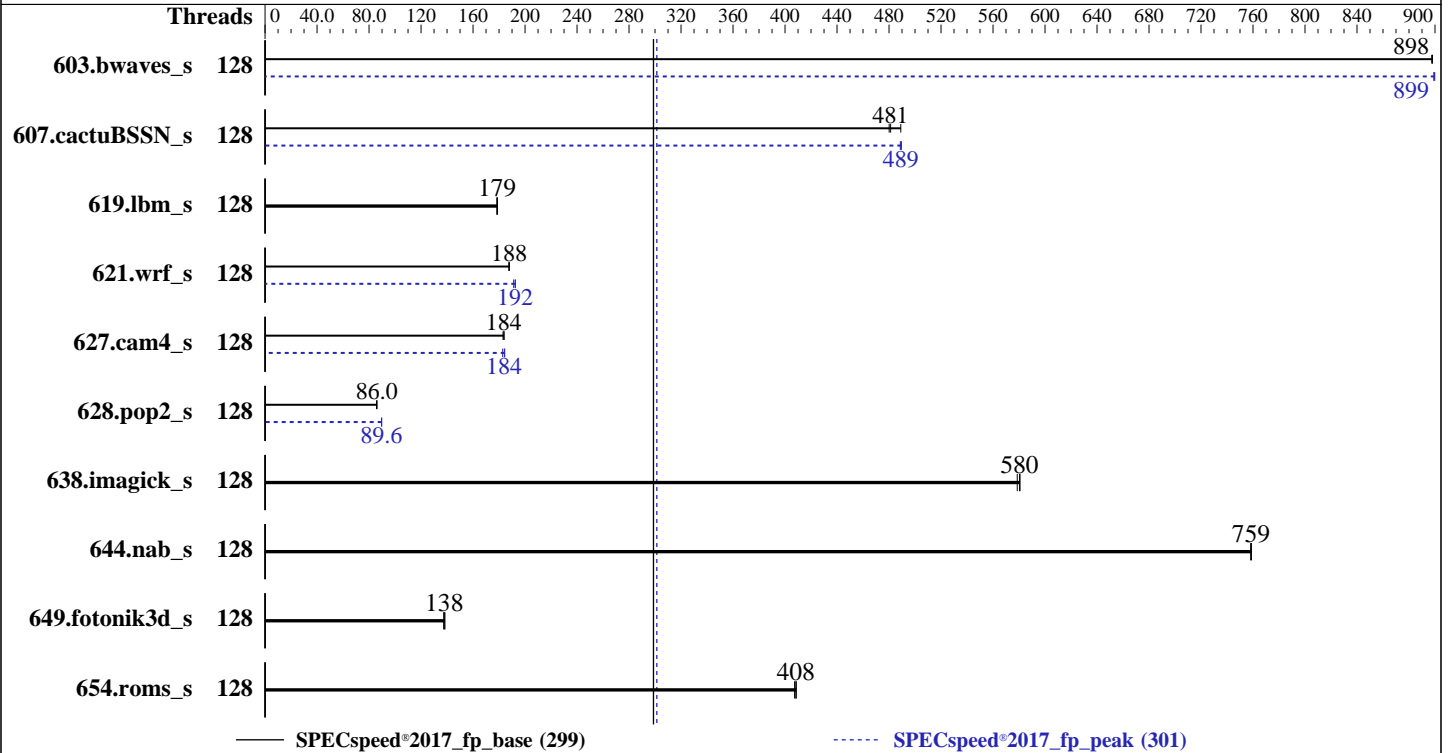
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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	128	65.7	898	**65.7**	**898**	65.7	898	128	65.6	899	65.6	900	**65.6**	**899**
607.cactuBSSN_s	128	**34.6**	**481**	34.7	480	34.1	489	128	34.1	490	**34.1**	**489**	34.1	489
619.lbm_s	128	29.4	178	**29.3**	**179**	29.3	179	128	29.4	178	**29.3**	**179**	29.3	179
621.wrf_s	128	**70.4**	**188**	70.4	188	70.5	188	128	69.2	191	68.7	193	**68.7**	**192**
627.cam4_s	128	48.4	183	**48.2**	**184**	48.2	184	128	48.5	183	**48.2**	**184**	48.1	184
628.pop2_s	128	138	86.0	138	85.8	**138**	**86.0**	128	**132**	**89.6**	132	89.7	133	89.6
638.imagick_s	128	24.9	579	24.8	581	**24.9**	**580**	128	24.9	579	24.8	581	**24.9**	**580**
644.nab_s	128	**23.0**	**759**	23.0	758	23.0	759	128	**23.0**	**759**	23.0	758	23.0	759
649.fotonik3d_s	128	66.3	137	**66.1**	**138**	65.9	138	128	66.3	137	**66.1**	**138**	65.9	138
654.roms_s	128	**38.6**	**408**	38.7	407	38.5	409	128	**38.6**	**408**	38.7	407	38.5	409
SPECspeed®2017_fp_base =	**299**													
SPECspeed®2017_fp_peak =	**301**													

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
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To always enable THP for peak runs of:
603.bwaves_s, 607.cactuBSSN_s, 619.lbm_s, 627.cam4_s, 628.pop2_s, 638.imagick_s, 644.nab_s, 649.fotonik3d_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
```

(Continued on next page)

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Operating System Notes (Continued)

```
To disable THP for peak runs of 621.wrf_s:
'echo never > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To enable THP only on request for peak runs of 654.roms_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo madvise > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-127"
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc400_genoa_B_lib/lib:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-127"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-127"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-127"

Environment variables set by runcpu during the 627.cam4_s peak run:
GOMP_CPU_AFFINITY = "0-127"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-127"
```

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 Peak Frequency 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
 Memory PStates set to Disabled
```

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Platform Notes (Continued)

```
  ACPI CST C2 Latency set to 18 microseconds
  Thermal Configuration set to Maximum Cooling

 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 07:58:24 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
   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
     07:58:24 up  2:28,  1 user,  load average: 0.07, 0.02, 0.46
    USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
    root     pts/0      05:31   15.00s  1.16s  0.09s /bin/bash ./amd_speed_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
```

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Platform Notes (Continued)

```
    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 28
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 -bash
 python3 ./run_fpspeed.py
 /bin/bash ./amd_speed_aocc400_genoa_B1.sh
 runcpu --config amd_speed_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 fpspeed
 runcpu --configfile amd_speed_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower
   --runmode speed --tune base:peak --size test:train:refspeed fpspeed --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.001/templogs/preenv.fpspeed.001.0.log --lognum 001.0 --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
```

(Continued on next page)

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Platform Notes (Continued)

```
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
BogoMIPS:                     4493.31
Flags:                        fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                              clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                              constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl
                              pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
                              popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy
                              abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext
                              perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3
                              invpcid_single hw_pstate ssbd mba ibrs 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
```

(Continued on next page)

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Platform Notes (Continued)

```
   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: 47479 MB
    node 1 cpus: 8-15
    node 1 size: 48382 MB
    node 1 free: 47730 MB
    node 2 cpus: 64-71
    node 2 size: 48382 MB
    node 2 free: 48101 MB
    node 3 cpus: 72-79
    node 3 size: 48382 MB
    node 3 free: 48068 MB
    node 4 cpus: 32-39
    node 4 size: 48382 MB
    node 4 free: 48071 MB
    node 5 cpus: 40-47
    node 5 size: 48382 MB
    node 5 free: 48047 MB
    node 6 cpus: 96-103
    node 6 size: 48382 MB
    node 6 free: 48021 MB
    node 7 cpus: 104-111
    node 7 size: 48382 MB
    node 7 free: 47853 MB
    node 8 cpus: 48-55
    node 8 size: 48382 MB
    node 8 free: 48144 MB
    node 9 cpus: 56-63
    node 9 size: 48345 MB
    node 9 free: 48070 MB
    node 10 cpus: 112-119
    node 10 size: 48382 MB
    node 10 free: 48020 MB
    node 11 cpus: 120-127
    node 11 size: 48328 MB
    node 11 free: 47970 MB
    node 12 cpus: 16-23
    node 12 size: 48382 MB
    node 12 free: 48067 MB
    node 13 cpus: 24-31
    node 13 size: 48382 MB
    node 13 free: 48129 MB
    node 14 cpus: 80-87
    node 14 size: 48382 MB
    node 14 free: 47975 MB
    node 15 cpus: 88-95
```

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Platform Notes (Continued)

```
    node 15 size: 48382 MB
    node 15 free: 47989 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  11  11  11  11  11  11  11  11  11  11  11  11
      1:  11  10  11  11  11  11  11  11  11  11  11  11  11  11  11  11
      2:  11  11  10  11  11  11  11  11  11  11  11  11  11  11  11  11
      3:  11  11  11  10  11  11  11  11  11  11  11  11  11  11  11  11
      4:  11  11  11  11  10  11  11  11  11  11  11  11  11  11  11  11
      5:  11  11  11  11  11  10  11  11  11  11  11  11  11  11  11  11
      6:  11  11  11  11  11  11  10  11  11  11  11  11  11  11  11  11
      7:  11  11  11  11  11  11  11  10  11  11  11  11  11  11  11  11
      8:  11  11  11  11  11  11  11  11  10  11  11  11  11  11  11  11
      9:  11  11  11  11  11  11  11  11  11  10  11  11  11  11  11  11
     10:  11  11  11  11  11  11  11  11  11  11  10  11  11  11  11  11
     11:  11  11  11  11  11  11  11  11  11  11  11  10  11  11  11  11
     12:  11  11  11  11  11  11  11  11  11  11  11  11  10  11  11  11
     13:  11  11  11  11  11  11  11  11  11  11  11  11  11  10  11  11
     14:  11  11  11  11  11  11  11  11  11  11  11  11  11  11  10  11
     15:  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  10


    ----------------------------------------------------------------
 9. /proc/meminfo
    MemTotal:       792348912 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:
      Unable to determine current policy
```

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECspeed®2017_fp_base = 299

SPECspeed®2017_fp_peak = 301

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

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

Platform Notes (Continued)

```
      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
      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  9.7G  809G   2% /home

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

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

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$SPECspeed^{®}2017\_fp\_base = 299$

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Platform Notes (Continued)

```
  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



     --------------------------------------------------------------
  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             | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(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, Fortran | 607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
Fortran       | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
```

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SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECspeed^{®}2017\_fp\_base = 299$

$SPECspeed^{®}2017\_fp\_peak = 301$

Compiler Version Notes (Continued)

```
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
--------------------------------------------------------------------------------------------


==============================================================================================
Fortran, C    | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(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`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

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

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
627.cam4_s: `-DSPEC_CASE_FLAG -DSPEC_LP64`
628.pop2_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECspeed®2017_fp_base = 299

SPECspeed®2017_fp_peak = 301

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

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

Base Optimization Flags

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

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

Benchmarks using both Fortran and C:
```
-m64 -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 -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -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 -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECspeed®2017_fp_base = 299

SPECspeed®2017_fp_peak = 301

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

Base Other Flags

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

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

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

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

Peak Compiler Invocation

C benchmarks:
```
clang
```

Fortran benchmarks:
```
flang
```

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

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

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

619.lbm_s: `basepeak = yes`

638.imagick_s: `basepeak = yes`

644.nab_s: `basepeak = yes`

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

$SPECspeed®2017\_fp\_base = 299$

$SPECspeed®2017\_fp\_peak = 301$

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)

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -Mrecursive -mllvm -reduce-array-computations=3
-fvector-transform -fscalar-transform -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -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 -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-O3 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

627.cam4_s: -m64 -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 -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang

628.pop2_s: -m64 -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 -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11
(2.25 GHz, AMD EPYC 9754)

SPECspeed®2017_fp_base = 299

SPECspeed®2017_fp_peak = 301

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)

628.pop2_s (continued):
```
-Mrecursive -fvector-transform -fscalar-transform
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -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 -fopenmp -flto -fstruct-layout=9
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -finline-aggressive -mllvm -unroll-threshold=100
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Peak Other Flags

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

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

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

Benchmarks using Fortran, C, and C++:
```
-Wno-return-type -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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