SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
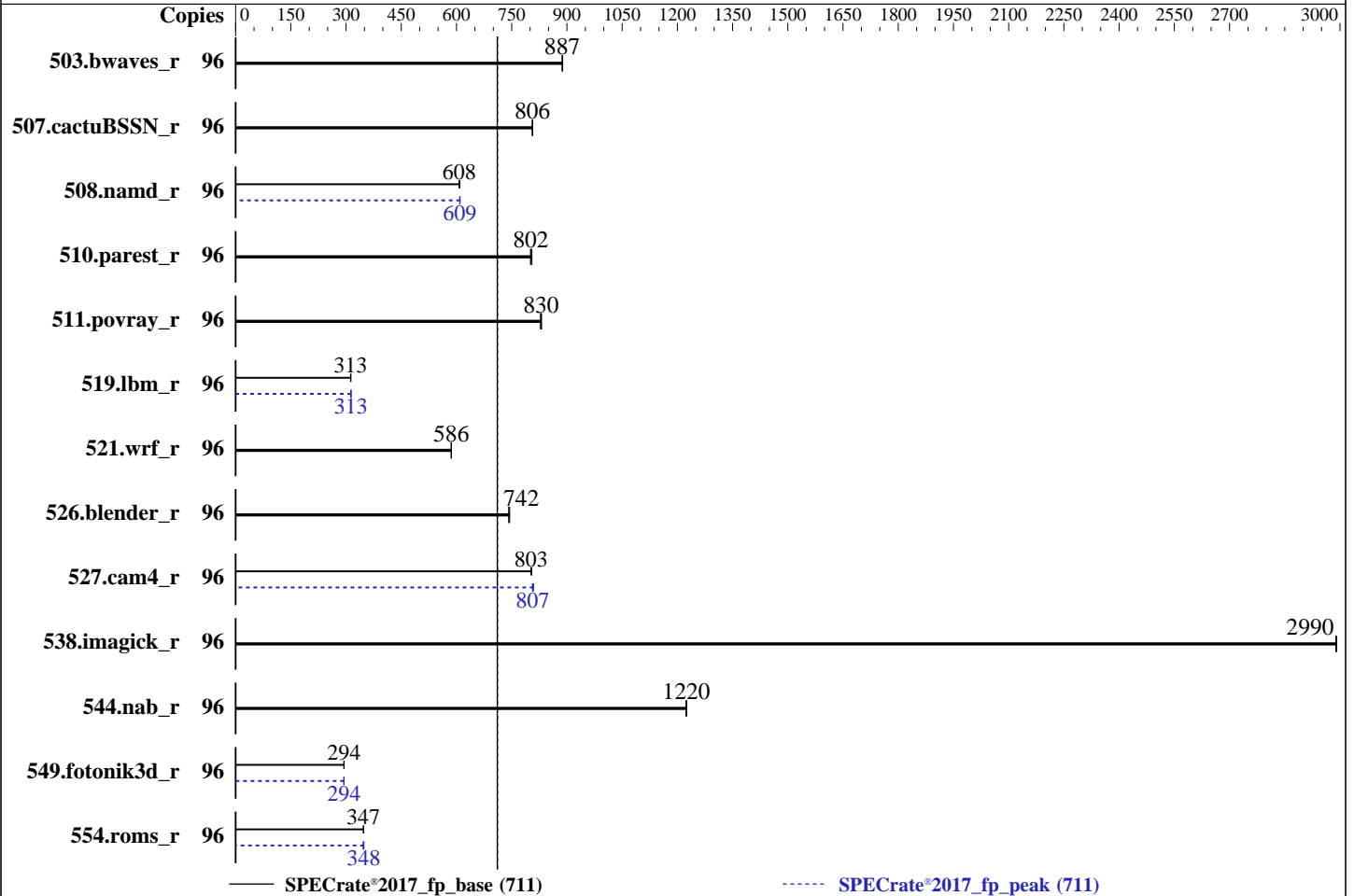
ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

$SPECrate®2017\_fp\_base = 711$

$SPECrate®2017\_fp\_peak = 711$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Benchmark	Copies	base	peak
503.bwaves_r	96	887	
507.cactuBSSN_r	96	806	
508.namd_r	96	608	609
510.parest_r	96	802	
511.povray_r	96	830	
519.lbm_r	96	313	313
521.wrf_r	96	586	
526.blender_r	96	742	
527.cam4_r	96	803	807
538.imagick_r	96	2990	
544.nab_r	96	1220	
549.fotonik3d_r	96	294	294
554.roms_r	96	347	348

SPECrate®2017_fp_base (711)

SPECrate®2017_fp_peak (711)

Hardware

CPU Name: AMD EPYC 9654P
 Max MHz: 3700
 Nominal: 2400
Enabled: 96 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: 384 MB I+D on chip per chip,
 32 MB shared / 8 cores
 Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 480 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 v1.42 08/16/2023 released
 Aug-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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CPU2017 License: 3	**Test Date:** Sep-2023
Test Sponsor: HPE	**Hardware Availability:** Aug-2023
Tested by: HPE	**Software Availability:** Apr-2023

Results Table

Benchmark	Base						Peak					
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	96	1085	887	1084	888	**1085**	**887**	96	1085	887	1084	888	**1085**	**887**
507.cactuBSSN_r	96	**151**	**806**	151	806	151	806	96	**151**	**806**	151	806	151	806
508.namd_r	96	**150**	**608**	150	607	150	609	96	150	610	**150**	**609**	150	609
510.parest_r	96	314	801	312	805	**313**	**802**	96	314	801	312	805	**313**	**802**
511.povray_r	96	**270**	**830**	270	831	271	828	96	**270**	**830**	270	831	271	828
519.lbm_r	96	324	312	**324**	**313**	323	313	96	**323**	**313**	322	314	323	313
521.wrf_r	96	367	586	367	586	**367**	**586**	96	367	586	367	586	**367**	**586**
526.blender_r	96	197	742	196	744	**197**	**742**	96	197	742	196	744	**197**	**742**
527.cam4_r	96	209	804	209	803	**209**	**803**	96	**208**	**807**	207	809	208	806
538.imagick_r	96	**79.8**	**2990**	79.8	2990	79.9	2990	96	**79.8**	**2990**	79.8	2990	79.9	2990
544.nab_r	96	132	1220	132	1230	**132**	**1220**	96	132	1220	132	1230	**132**	**1220**
549.fotonik3d_r	96	**1271**	**294**	1270	295	1271	294	96	**1271**	**294**	1272	294	1271	294
554.roms_r	96	439	347	439	348	**439**	**347**	96	**438**	**348**	441	346	438	348
SPECrate®2017_fp_base =		**711**												
SPECrate®2017_fp_peak =		**711**												

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_znver4_A_lib/lib:/home/cpu2017/amd_rate_aocc400_znver4_A_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
 Memory Patrol Scrubbing set to Disabled
 ACPI CST C2 Latency set to 18 microseconds
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to Custom
  Power Regulator set to OS Control Mode
 The system ROM used for this result contains microcode version 0xaa00212 for the
 AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this
 ROM is version Genoa-XPI 1.0.0.8

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Tue Sep 12 10:47:56 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
```

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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. 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
     10:47:56 up 1 min,  2 users,  load average: 0.38, 0.17, 0.06
    USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
    root     tty1       10:47   34.00s  0.00s  0.00s -bash
    root     pts/0      10:47   20.00s  0.96s  0.05s /bin/bash ./amd_rate_aocc400_znver4_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) 1546449
    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) 1546449
    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
```

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Platform Notes (Continued)

```
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 python3 ./run_fprate.py
 /bin/bash ./amd_rate_aocc400_znver4_A1.sh
 runcpu --config amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 fprate
 runcpu --configfile amd_rate_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 --nopower
   --runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.003/templogs/preenv.fprate.003.0.log --lognum 003.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017


-------------------------------------------------------------
6. /proc/cpuinfo
    model name      : AMD EPYC 9654P 96-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 25
    model           : 17
    stepping        : 1
    microcode       : 0xa10113e
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 3584 4K pages
    cpu cores       : 96
    siblings        : 96
    1 physical ids (chips)
    96 processors (hardware threads)
    physical id 0: core ids 0-95
    physical id 0: apicids 0-95
 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):                 96
  On-line CPU(s) list:    0-95
  Vendor ID:              AuthenticAMD
  BIOS Vendor ID:         Advanced Micro Devices, Inc.
  Model name:             AMD EPYC 9654P 96-Core Processor
  BIOS Model name:        AMD EPYC 9654P 96-Core Processor
  CPU family:             25
  Model:                  17
  Thread(s) per core:     1
  Core(s) per socket:     96
  Socket(s):              1
  Stepping:               1
  Frequency boost:        enabled
  CPU max MHz:            2400.0000
  CPU min MHz:            1500.0000
  BogoMIPS:               4792.82
  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
```

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Platform Notes (Continued)

```
                        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:                          3 MiB (96 instances)
    L1i cache:                          3 MiB (96 instances)
    L2 cache:                           96 MiB (96 instances)
    L3 cache:                           384 MiB (12 instances)
    NUMA node(s):                       12
    NUMA node0 CPU(s):                  0-7
    NUMA node1 CPU(s):                  8-15
    NUMA node2 CPU(s):                  16-23
    NUMA node3 CPU(s):                  24-31
    NUMA node4 CPU(s):                  32-39
    NUMA node5 CPU(s):                  40-47
    NUMA node6 CPU(s):                  48-55
    NUMA node7 CPU(s):                  56-63
    NUMA node8 CPU(s):                  64-71
    NUMA node9 CPU(s):                  72-79
    NUMA node10 CPU(s):                 80-87
    NUMA node11 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       3M   8 Data              1    64      1             64
      L1i      32K       3M   8 Instruction       1    64      1             64
      L2        1M      96M   8 Unified           2  2048      1             64
      L3       32M     384M  16 Unified           3 32768      1             64

    -----------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 12 nodes (0-11)
    node 0 cpus: 0-7
    node 0 size: 32007 MB
    node 0 free: 31660 MB
    node 1 cpus: 8-15
    node 1 size: 32254 MB
    node 1 free: 32056 MB
    node 2 cpus: 16-23
    node 2 size: 32254 MB
    node 2 free: 32045 MB
```

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Platform Notes (Continued)

```
   node 3 cpus: 24-31
   node 3 size: 32254 MB
   node 3 free: 32083 MB
   node 4 cpus: 32-39
   node 4 size: 32254 MB
   node 4 free: 32096 MB
   node 5 cpus: 40-47
   node 5 size: 32217 MB
   node 5 free: 31917 MB
   node 6 cpus: 48-55
   node 6 size: 32254 MB
   node 6 free: 32037 MB
   node 7 cpus: 56-63
   node 7 size: 32254 MB
   node 7 free: 32070 MB
   node 8 cpus: 64-71
   node 8 size: 32254 MB
   node 8 free: 32088 MB
   node 9 cpus: 72-79
   node 9 size: 32254 MB
   node 9 free: 32123 MB
   node 10 cpus: 80-87
   node 10 size: 32254 MB
   node 10 free: 32102 MB
   node 11 cpus: 88-95
   node 11 size: 32203 MB
   node 11 free: 32046 MB
   node distances:
   node   0   1   2   3   4   5   6   7   8   9  10  11
     0:  10  11  11  12  12  12  12  12  12  12  12  12
     1:  11  10  11  12  12  12  12  12  12  12  12  12
     2:  11  11  10  12  12  12  12  12  12  12  12  12
     3:  12  12  12  10  11  11  12  12  12  12  12  12
     4:  12  12  12  11  10  11  12  12  12  12  12  12
     5:  12  12  12  11  11  10  12  12  12  12  12  12
     6:  12  12  12  12  12  12  10  11  11  12  12  12
     7:  12  12  12  12  12  12  11  10  11  12  12  12
     8:  12  12  12  12  12  12  11  11  10  12  12  12
     9:  12  12  12  12  12  12  12  12  12  10  11  11
    10:  12  12  12  12  12  12  12  12  12  11  10  11
    11:  12  12  12  12  12  12  12  12  12  11  11  10


  ----------------------------------------------------------
  9. /proc/meminfo
     MemTotal:       395997968 kB


  ----------------------------------------------------------
  10. who -r
    run-level 3 Sep 12 10:46


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

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Platform Notes (Continued)

```
                   nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd
                   systemd-network-generator tuned udisks2 upower
   enabled-runtime systemd-remount-fs
   disabled        blk-availability canberra-system-bootup canberra-system-shutdown
                   canberra-system-shutdown-reboot chrony-wait chronyd console-getty cpupower debug-shell
                   hwloc-dump-hwdata ipsec 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=(hd2,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
   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
```

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Platform Notes (Continued)

```
  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   15G  358G   4% /home


  ----------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:        HPE
    Product:       ProLiant DL325 Gen11
    Product Family: ProLiant
    Serial:        DL325GEN11-002


  ----------------------------------------------------------------
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:
      12x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800



  ----------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:      HPE
    BIOS Version:     1.42
    BIOS Date:        08/16/2023
    BIOS Revision:    1.42
    Firmware Revision: 1.40
```

Compiler Version Notes

```
==========================================================================================================
C            | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
----------------------------------------------------------------------------------------------------------
```

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

SPECrate®2017_fp_peak = 711

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

Test Date: Sep-2023
Hardware Availability: Aug-2023
Software Availability: Apr-2023

Compiler Version Notes (Continued)

```
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
-------------------------------------------------------------------------------------------------------


==========================================================================================================
C++              | 508.namd_r(base, peak) 510.parest_r(base, peak)
-------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/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#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
-------------------------------------------------------------------------------------------------------


==========================================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
-------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
-------------------------------------------------------------------------------------------------------


==========================================================================================================
Fortran          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
-------------------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/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#434 2022_10_28) (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 Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

$SPECrate^{®}2017\_fp\_base = 711$

$SPECrate^{®}2017\_fp\_peak = 711$

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

Test Date: Sep-2023
Hardware Availability: Aug-2023
Software Availability: Apr-2023

Compiler Version Notes (Continued)

```
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

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

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

Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
526.blender_r: `-funsigned-char -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`

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

SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

SPECrate®2017_fp_peak = 711

CPU2017 License: 3		**Test Date:**	Sep-2023
Test Sponsor: HPE		**Hardware Availability:**	Aug-2023
Tested by: HPE		**Software Availability:**	Apr-2023

Base Optimization Flags

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

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

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

Benchmarks using both Fortran and C:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

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

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

SPECrate®2017_fp_peak = 711

CPU2017 License: 3		**Test Date:**	Sep-2023
Test Sponsor: HPE		**Hardware Availability:**	Aug-2023
Tested by: HPE		**Software Availability:**	Apr-2023

Base Optimization Flags (Continued)

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

Base Other Flags

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

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

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

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

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

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

Peak Compiler Invocation

C benchmarks:
```
clang
```

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

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

SPECrate®2017_fp_peak = 711

CPU2017 License: 3		**Test Date:**	Sep-2023
Test Sponsor: HPE		**Hardware Availability:** Aug-2023
Tested by: HPE		**Software Availability:** Apr-2023

Peak Compiler Invocation (Continued)

Fortran benchmarks:
```
flang
```

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

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

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

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -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
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

```
538.imagick_r: basepeak = yes
```

```
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
```

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

SPECrate®2017_fp_peak = 711

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

Test Date: Sep-2023
Hardware Availability: Aug-2023
Software Availability: Apr-2023

Peak Optimization Flags (Continued)

510.parest_r: basepeak = yes

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

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

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

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.40 GHz, AMD EPYC 9654P)

SPECrate®2017_fp_base = 711

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CPU2017 License: 3
Test Sponsor: HPE
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Test Date: Sep-2023
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Software Availability: Apr-2023

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-Genoa-X-rev1.0.html`
`http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-X-rev1.0.xml`
`http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.xml`

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

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