SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
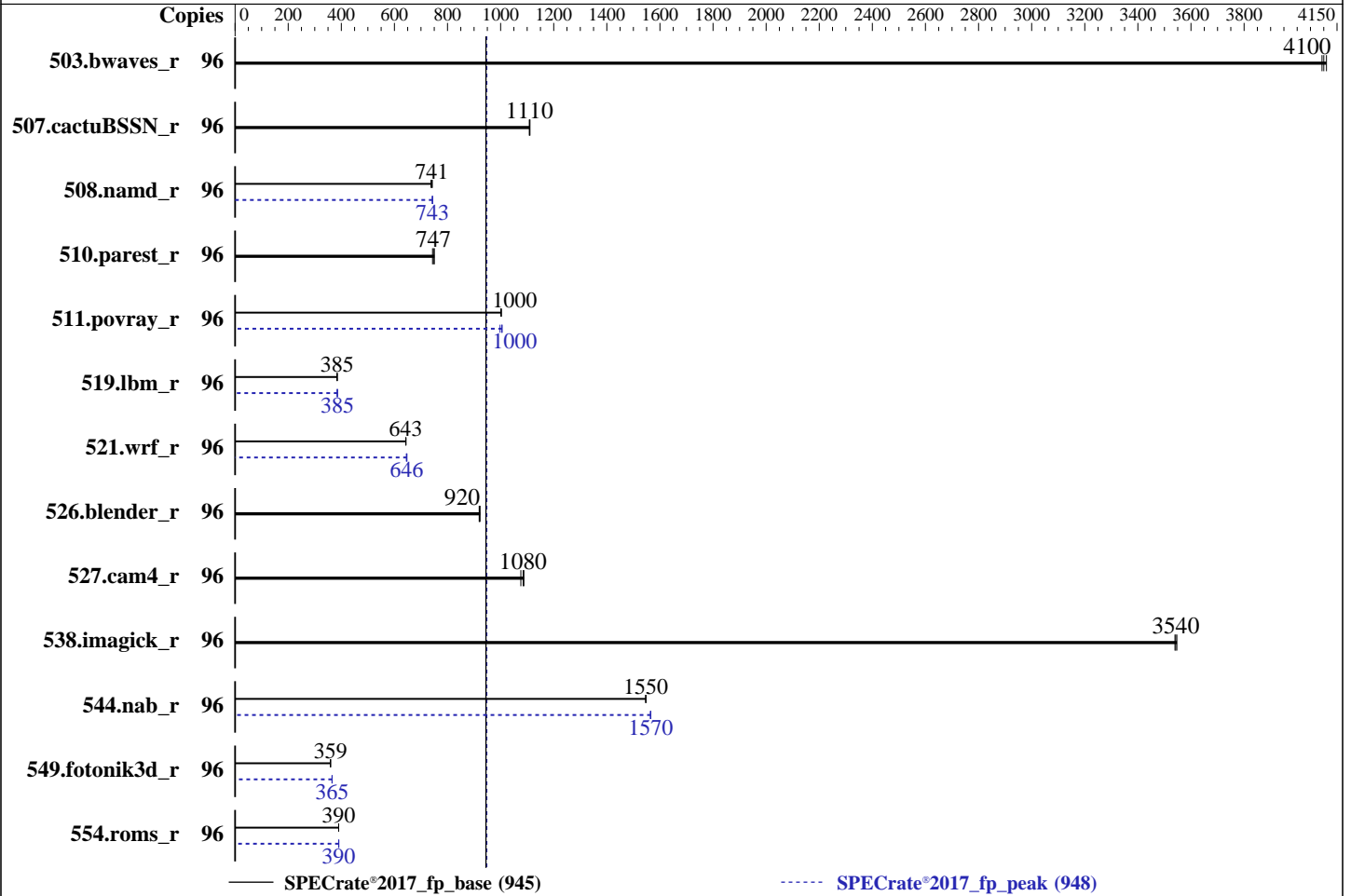
ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

$SPECrate®2017\_fp\_base = 945$

$SPECrate®2017\_fp\_peak = 948$

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

Test Date: Nov-2024
Hardware Availability: Jan-2025
Software Availability: Oct-2024

Benchmark	Copies	Value
503.bwaves_r	96	4100
507.cactuBSSN_r	96	1110
508.namd_r	96	741 (base), 743 (peak)
510.parest_r	96	747
511.povray_r	96	1000 (base), 1000 (peak)
519.lbm_r	96	385 (base), 385 (peak)
521.wrf_r	96	643 (base), 646 (peak)
526.blender_r	96	920
527.cam4_r	96	1080
538.imagick_r	96	3540
544.nab_r	96	1550 (base), 1570 (peak)
549.fotonik3d_r	96	359 (base), 365 (peak)
554.roms_r	96	390 (base), 390 (peak)

SPECrate®2017_fp_base (945)
SPECrate®2017_fp_peak (948)

Hardware

CPU Name: AMD EPYC 9645
 Max MHz: 3700
 Nominal: 2300
Enabled: 96 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 256 MB I+D on chip per chip,
 32 MB shared / 12 cores
 Other: None
Memory: 384 GB (12 x 32 GB 2Rx8 PC5-6400B-R,
 running at 6000)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: CLC

Software

OS: SUSE Linux Enterprise Server 15 SP6
 Kernel 6.4.0-150600.21-default
Compiler: C/C++/Fortran: Version 5.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version v2.20 10/31/2024 released
 Oct-2024
File System: btrfs
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	96	235	4090	234	4110	**235**	**4100**	96	235	4090	234	4110	**235**	**4100**
507.cactuBSSN_r	96	**110**	**1110**	109	1110	110	1110	96	**110**	**1110**	109	1110	110	1110
508.namd_r	96	124	738	**123**	**741**	123	743	96	123	744	123	743	**123**	**743**
510.parest_r	96	335	750	338	744	**336**	**747**	96	335	750	338	744	**336**	**747**
511.povray_r	96	223	1000	**224**	**1000**	224	1000	96	225	998	**223**	**1000**	223	1010
519.lbm_r	96	263	385	264	384	**263**	**385**	96	262	386	263	384	**263**	**385**
521.wrf_r	96	**334**	**643**	335	643	334	644	96	332	647	333	645	**333**	**646**
526.blender_r	96	**159**	**920**	158	923	159	919	96	**159**	**920**	158	923	159	919
527.cam4_r	96	156	1080	**155**	**1080**	154	1090	96	156	1080	**155**	**1080**	154	1090
538.imagick_r	96	**67.4**	**3540**	67.3	3550	67.5	3540	96	**67.4**	**3540**	67.3	3550	67.5	3540
544.nab_r	96	104	1550	**104**	**1550**	104	1550	96	103	1570	103	1560	**103**	**1570**
549.fotonik3d_r	96	1041	360	1042	359	**1041**	**359**	96	1024	365	1024	365	**1024**	**365**
554.roms_r	96	391	390	391	390	**391**	**390**	96	**391**	**390**	391	390	391	391
SPECrate®2017_fp_base =		**945**										
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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,
```

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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_aocc500_znver5_A_lib/lib:/home/cpu2017/amd_rate_aocc500_znver5_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
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Memory Patrol Scrubbing set to Disabled
Last-Level Cache (LLC) as NUMA Node set to Enabled
ACPI CST C2 Latency set to 18 microseconds
NUMA memory domains per socket set to Four memory domains per socket
Thermal Configuration set to Maximum Cooling
AMD SMT Option set to Disabled
Workload Profile set to Custom
 Power Regulator set to OS Control Mode
The reference code/AGESA version used in this ROM is version Turin-PI 1.0.0.2

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Tue Nov 26 17:01:58 2024

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
```

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Platform Notes (Continued)

```
   8. numactl --hardware
   9. /proc/meminfo
  10. who -r
  11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)
  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 6.4.0-150600.21-default #1 SMP PREEMPT_DYNAMIC Thu May 16 11:09:22 UTC 2024 (36c1e09)
    x86_64 x86_64 x86_64 GNU/Linux


  ----------------------------------------------------------
  2. w
    17:01:58 up 5 min,  2 users,  load average: 1.53, 1.72, 0.98
    USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
    root     pts/0    172.17.1.114     22Apr24 22.00s  0.90s  0.05s /bin/bash ./amd_rate_aocc500_znver5_A1.sh


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


  ----------------------------------------------------------
  4. ulimit -a
    core file size          (blocks, -c) unlimited
    data seg size           (kbytes, -d) unlimited
    scheduling priority             (-e) 0
    file size               (blocks, -f) unlimited
    pending signals                 (-i) 1546344
    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) 1546344
    virtual memory          (kbytes, -v) unlimited
    file locks                      (-x) unlimited


  ----------------------------------------------------------
  5. sysinfo process ancestry
  /usr/lib/systemd/systemd --switched-root --system --deserialize=31
  sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
  sshd: root [priv]
  sshd: root@pts/0
  -bash
  python3 ./run_fprate.py
```

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Platform Notes (Continued)

```
 /bin/bash ./amd_rate_aocc500_znver5_A1.sh
 runcpu --config amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 fprate
 runcpu --configfile amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 --nopower
   --runmode rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017


    ----------------------------------------------------------
 6. /proc/cpuinfo
    model name      : AMD EPYC 9645 96-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 26
    model           : 17
    stepping        : 0
    microcode       : 0xb101025
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 192 4K pages
    cpu cores       : 96
    siblings        : 96
    1 physical ids (chips)
    96 processors (hardware threads)
    physical id 0: core ids 0-11,16-27,32-43,48-59,64-75,80-91,96-107,112-123
    physical id 0: apicids 0-11,16-27,32-43,48-59,64-75,80-91,96-107,112-123
 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 2.39.3:
  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 9645 96-Core Processor
  BIOS Model name:           AMD EPYC 9645 96-Core Processor              CPU @ 2.3GHz
  BIOS CPU family:           107
  CPU family:                26
  Model:                     17
  Thread(s) per core:        1
  Core(s) per socket:        96
  Socket(s):                 1
  Stepping:                  0
  Frequency boost:           enabled
  CPU(s) scaling MHz:        106%
  CPU max MHz:               2300.0000
  CPU min MHz:               1500.0000
  BogoMIPS:                  4593.18
  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 amd_lbr_v2 nopl nonstop_tsc cpuid
                             extd_apicid aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid
                             sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm
                             cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
                             osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext
```

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Platform Notes (Continued)

```
                      perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate ssbd mba perfmon_v2
                      ibrs ibpb stibp ibrs_enhanced vmmcall fsgsbase tsc_adjust 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 user_shstk avx_vnni avx512_bf16 clzero irperf
                      xsaveerptr rdpru wbnoinvd amd_ppin cppc arat npt lbrv svm_lock
                      nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
                      pfthreshold avic v_vmsave_vmload vgif x2avic v_spec_ctrl vnmi
                      avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
                      avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid bus_lock_detect
                      movdiri movdir64b overflow_recov succor smca fsrm avx512_vp2intersect
                      flush_l1d debug_swap
  Virtualization:     AMD-V
  L1d cache:          4.5 MiB (96 instances)
  L1i cache:          3 MiB (96 instances)
  L2 cache:           96 MiB (96 instances)
  L3 cache:           256 MiB (8 instances)
  NUMA node(s):       8
  NUMA node0 CPU(s):  0-11
  NUMA node1 CPU(s):  12-23
  NUMA node2 CPU(s):  24-35
  NUMA node3 CPU(s):  36-47
  NUMA node4 CPU(s):  48-59
  NUMA node5 CPU(s):  60-71
  NUMA node6 CPU(s):  72-83
  NUMA node7 CPU(s):  84-95
  Vulnerability Gather data sampling:  Not affected
  Vulnerability Itlb multihit:         Not affected
  Vulnerability L1tf:                  Not affected
  Vulnerability Mds:                   Not affected
  Vulnerability Meltdown:              Not affected
  Vulnerability Mmio stale data:       Not affected
  Vulnerability Reg file data sampling: Not affected
  Vulnerability Retbleed:              Not affected
  Vulnerability Spec rstack overflow:  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; Enhanced / Automatic IBRS; IBPB conditional; STIBP
                                       disabled; RSB filling; PBRSB-eIBRS Not affected; BHI Not affected
  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      48K     4.5M   12 Data            1    64     1              64
      L1i      32K       3M    8 Instruction     1    64     1              64
      L2        1M      96M   16 Unified         2  1024     1              64
      L3       32M     256M   16 Unified         3 32768     1              64


  ------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0-11
    node 0 size: 48065 MB
    node 0 free: 47813 MB
    node 1 cpus: 12-23
    node 1 size: 48380 MB
    node 1 free: 48193 MB
```

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Platform Notes (Continued)

```
   node 2 cpus: 24-35
   node 2 size: 48342 MB
   node 2 free: 48146 MB
   node 3 cpus: 36-47
   node 3 size: 48380 MB
   node 3 free: 48199 MB
   node 4 cpus: 48-59
   node 4 size: 48380 MB
   node 4 free: 48149 MB
   node 5 cpus: 60-71
   node 5 size: 48380 MB
   node 5 free: 48140 MB
   node 6 cpus: 72-83
   node 6 size: 48380 MB
   node 6 free: 48211 MB
   node 7 cpus: 84-95
   node 7 size: 48299 MB
   node 7 free: 48076 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  12  12  12  12  12  12
     1:  11  10  12  12  12  12  12  12
     2:  12  12  10  11  12  12  12  12
     3:  12  12  11  10  12  12  12  12
     4:  12  12  12  12  10  11  12  12
     5:  12  12  12  12  11  10  12  12
     6:  12  12  12  12  12  12  10  11
     7:  12  12  12  12  12  12  11  10


   ------------------------------------------------------------
 9. /proc/meminfo
    MemTotal:       395889668 kB


   ------------------------------------------------------------
 10. who -r
    run-level 3 Apr 22 17:32


   ------------------------------------------------------------
 11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)
    Default Target  Status
    multi-user      running


   ------------------------------------------------------------
 12. Services, from systemctl list-unit-files
    STATE           UNIT FILES
    enabled         apparmor auditd cron getty@ irqbalance issue-generator kbdsettings lvm2-monitor postfix
                    purge-kernels rollback sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4
                    wickedd-dhcp6 wickedd-nanny
    enabled-runtime systemd-remount-fs
    disabled        blk-availability boot-sysctl ca-certificates chrony-wait chronyd console-getty debug-shell
                    grub2-once haveged hwloc-dump-hwdata issue-add-ssh-keys kexec-load lunmask rpmconfigcheck
                    serial-getty@ systemd-boot-check-no-failures systemd-confext systemd-network-generator
                    systemd-sysext systemd-time-wait-sync systemd-timesyncd tuned
    generated       jexec
    indirect        pcscd systemd-userdbd wickedd


   ------------------------------------------------------------
 13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
    root=UUID=3b533ede-c3a8-4098-83c6-01dcf22acfe9
```

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Platform Notes (Continued)

```
    splash=silent
    mitigations=auto
    quiet
    security=apparmor


  ----------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 63:
    current policy: frequency should be within 1.50 GHz and 2.30 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes


  ----------------------------------------------------------
15. tuned-adm active
  It seems that tuned daemon is not running, preset profile is not activated.
  Preset 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
  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

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

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Platform Notes (Continued)

```
   19. OS release
     From /etc/*-release /etc/*-version
     os-release SUSE Linux Enterprise Server 15 SP6


   ----------------------------------------------------------
   20. Disk information
   SPEC is set to: /home/cpu2017
     Filesystem      Type    Size  Used Avail Use% Mounted on
     /dev/sda2       btrfs   447G   44G  400G  10% /home


   ----------------------------------------------------------
   21. /sys/devices/virtual/dmi/id
       Vendor:        HPE
       Product:       ProLiant DL325 Gen11
       Product Family: ProLiant
       Serial:        DL325G11-011


   ----------------------------------------------------------
   22. dmidecode
     Additional information from dmidecode 3.4 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 HMCG88AHBRA471N 32 GB 2 rank 6400, configured at 6000



   ----------------------------------------------------------
   23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
       BIOS Vendor:      HPE
       BIOS Version:     2.20
       BIOS Date:        10/31/2024
       BIOS Revision:    2.20
       Firmware Revision: 1.65
```

Compiler Version Notes

```
==================================================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
--------------------------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
--------------------------------------------------------------------------------------------------


==================================================================================================
C++             | 508.namd_r(base, peak) 510.parest_r(base, peak)
--------------------------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
--------------------------------------------------------------------------------------------------


==================================================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
--------------------------------------------------------------------------------------------------
```

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License: 3	**Test Date:**	Nov-2024
Test Sponsor: HPE	**Hardware Availability:**	Jan-2025
Tested by: HPE	**Software Availability:**	Oct-2024

Compiler Version Notes (Continued)

```
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:

```
clang
```

C++ benchmarks:

```
clang++
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License:	3	**Test Date:**	Nov-2024
Test Sponsor:	HPE	**Hardware Availability:**	Jan-2025
Tested by:	HPE	**Software Availability:**	Oct-2024

Base 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`

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`

Base Optimization Flags

C benchmarks:
```
-m64 -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=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang -ldl
```

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ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2024

Hardware Availability: Jan-2025

Software Availability: Oct-2024

Base Optimization Flags (Continued)

C++ benchmarks:
```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-extra-inliner
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang -ldl
```

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-aggressive-gather=true
-Wl,-mllvm -Wl,-enable-masked-gather-sequence=false -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -flto -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang -ldl
```

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
-Wl,-mllvm -Wl,-enable-aggressive-gather=true
-Wl,-mllvm -Wl,-enable-masked-gather-sequence=false -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang -ldl
```

Benchmarks using both C and C++:
```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-extra-inliner
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie
-flto -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
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
-ldl
```

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
```

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License: 3	**Test Date:** Nov-2024
Test Sponsor: HPE	**Hardware Availability:** Jan-2025
Tested by: HPE	**Software Availability:** Oct-2024

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-extra-inliner
-O3 -march=znver5 -fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie
-flto -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
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang -ldl
```

Base Other Flags

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

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

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

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

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

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

Peak Compiler Invocation

C benchmarks:
```
clang
```

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

Fortran benchmarks:
```
flang
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License: 3		**Test Date:**	Nov-2024
Test Sponsor:	HPE	**Hardware Availability:**	Jan-2025
Tested by:	HPE	**Software Availability:**	Oct-2024

Peak Compiler Invocation (Continued)

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 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc -ldl
```

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

```
544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-ldist-scalar-expand
-fenable-aggressive-gather -Ofast -march=znver5
-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 -ldl
```

C++ benchmarks:

```
508.namd_r: -m64 -std=c++14
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License: 3		**Test Date:**	Nov-2024
Test Sponsor:	HPE	**Hardware Availability:**	Jan-2025
Tested by:	HPE	**Software Availability:**	Oct-2024

Peak Optimization Flags (Continued)

508.namd_r (continued):
```
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc -ldl
```

510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -ldl -lflang
```

554.roms_r: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm
-lamdalloc -ldl -lflang
```

Benchmarks using both Fortran and C:

521.wrf_r: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-ldl -lflang
```

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: `-m64 -std=c++14`
```
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
```

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
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SPECrate®2017_fp_base = 945

ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_peak = 948

CPU2017 License: 3	**Test Date:** Nov-2024
Test Sponsor: HPE	**Hardware Availability:** Jan-2025
Tested by: HPE	**Software Availability:** Oct-2024

Peak Optimization Flags (Continued)

511.povray_r (continued):
```
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-extra-inliner -Ofast -march=znver5
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt
-mllvm -unroll-threshold=100
-mllvm -loop-unswitch-threshold=200000 -lamdlibm
-lamdalloc -ldl
```

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
```

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-Turin-rev1.0.html
http://www.spec.org/cpu2017/flags/aocc500-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-Turin-rev1.0.xml
http://www.spec.org/cpu2017/flags/aocc500-flags.xml

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ProLiant DL325 Gen11
(2.30 GHz, AMD EPYC 9645)

SPECrate®2017_fp_base = 945

SPECrate®2017_fp_peak = 948

CPU2017 License:	3	**Test Date:**	Nov-2024
Test Sponsor:	HPE	**Hardware Availability:**	Jan-2025
Tested by:	HPE	**Software Availability:**	Oct-2024

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

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