SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem SR665 V3
(2.60 GHz, AMD EPYC 9655)

$SPECrate®2017\_fp\_base = 1950$
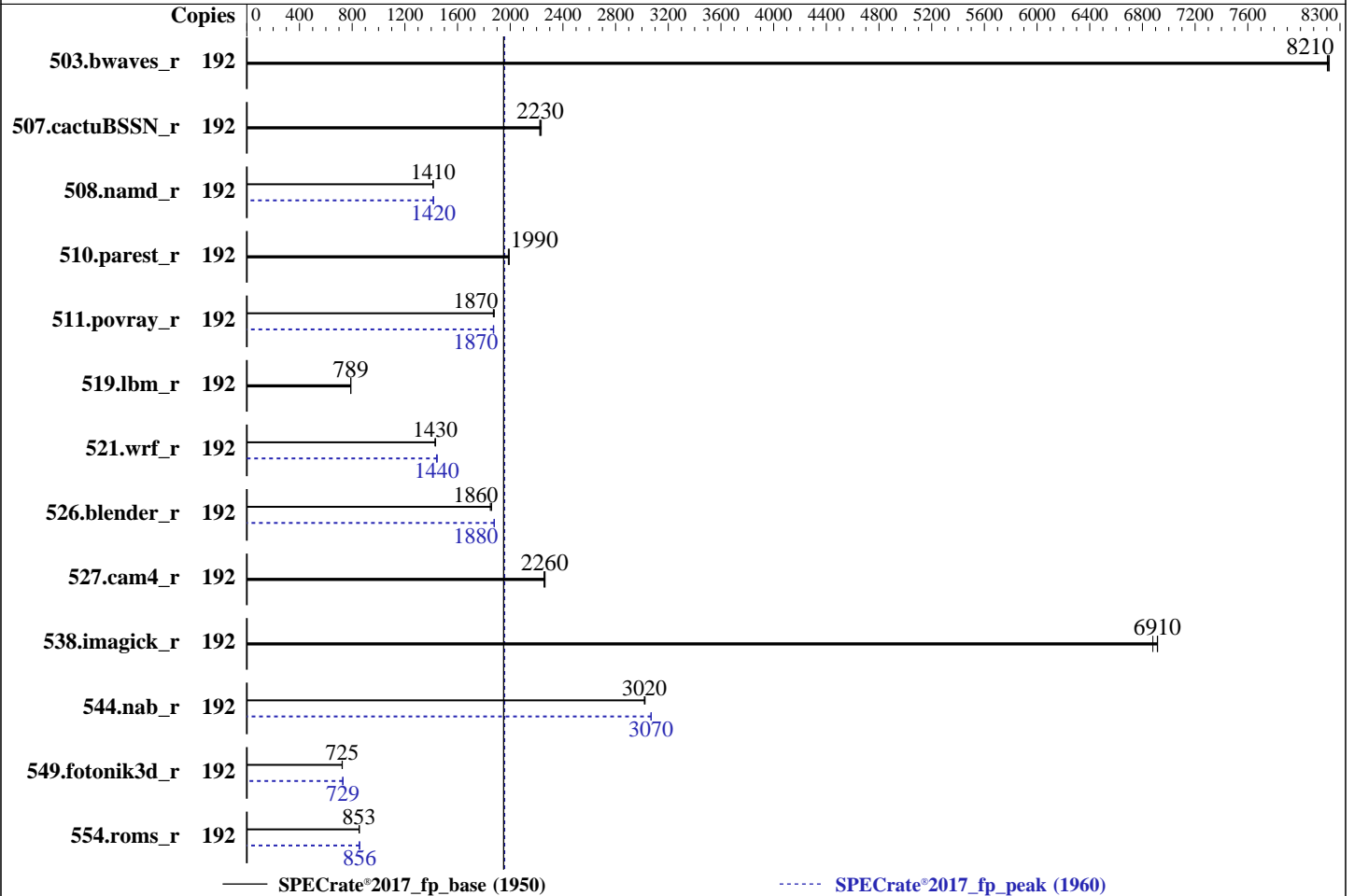
$SPECrate®2017\_fp\_peak = 1960$

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Sep-2024
Hardware Availability: Nov-2024
Software Availability: Oct-2024

Copies

Benchmark	Copies	Base	Peak
503.bwaves_r	192	8210	
507.cactuBSSN_r	192	2230	
508.namd_r	192	1410	1420
510.parest_r	192	1990	
511.povray_r	192	1870	1870
519.lbm_r	192	789	
521.wrf_r	192	1430	1440
526.blender_r	192	1860	1880
527.cam4_r	192	2260	
538.imagick_r	192	6910	
544.nab_r	192	3020	3070
549.fotonik3d_r	192	725	729
554.roms_r	192	853	856

SPECrate®2017_fp_base (1950)   SPECrate®2017_fp_peak (1960)

Hardware

CPU Name: AMD EPYC 9655
Max MHz: 4500
Nominal: 2600
Enabled: 192 cores, 2 chips
Orderable: 1,2 chips
Cache L1: 32 KB I + 48 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: 768 GB (24 x 32 GB 2Rx8 PC5-6400B-R, running at 6000)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: Air

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: Lenovo BIOS Version KAE125W 5.10 released Aug-2024
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage

Standard Performance Evaluation Corporation (info@spec.org)
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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	192	234	8220	235	8200	**234**	**8210**	192	234	8220	235	8200	**234**	**8210**
507.cactuBSSN_r	192	109	2220	109	2240	**109**	**2230**	192	109	2220	109	2240	**109**	**2230**
508.namd_r	192	129	1420	129	1410	**129**	**1410**	192	129	1420	**129**	**1420**	129	1420
510.parest_r	192	252	1990	**252**	**1990**	253	1990	192	252	1990	**252**	**1990**	253	1990
511.povray_r	192	**239**	**1870**	239	1880	239	1870	192	**239**	**1870**	240	1870	239	1870
519.lbm_r	192	257	788	**256**	**789**	256	790	192	257	788	**256**	**789**	256	790
521.wrf_r	192	300	1430	**300**	**1430**	301	1430	192	297	1450	**298**	**1440**	299	1440
526.blender_r	192	**158**	**1860**	157	1860	158	1850	192	156	1880	**156**	**1880**	156	1880
527.cam4_r	192	148	2260	149	2260	**149**	**2260**	192	148	2260	149	2260	**149**	**2260**
538.imagick_r	192	**69.1**	**6910**	69.4	6880	69.1	6920	192	**69.1**	**6910**	69.4	6880	69.1	6920
544.nab_r	192	**107**	**3020**	107	3020	107	3020	192	105	3070	**105**	**3070**	105	3070
549.fotonik3d_r	192	**1032**	**725**	1032	725	1035	723	192	1027	729	1026	729	**1026**	**729**
554.roms_r	192	**358**	**853**	357	855	358	852	192	357	855	357	856	**357**	**856**
SPECrate®2017_fp_base =		**1950**											
SPECrate®2017_fp_peak =		**1960**											

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/cpu2017-1.1.9-amd-aocc500_znver5_A1/amd_rate_aocc500_znver5_A_lib/lib:/home/cpu2017-1.1.9-amd-a
    occ500_znver5_A1/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:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
NUMA nodes per socket set to NPS4
SMT Mode set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-amd-aocc500_znver5_A1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Thu Sep 19 11:33:47 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
  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. sysctl
```

(Continued on next page)

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Platform Notes (Continued)

```
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 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
   11:33:47 up 4 min,  1 user,  load average: 0.09, 0.45, 0.25
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT


--------------------------------------------------------------
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) 3093993
  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) 3093993
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited


--------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize=42
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@notty
 /bin/bash ./02.remote_local_SPECcpu_1.01.sh
 /bin/bash ./Run026-compliant-amd-ratefp.sh
 python3 ./run_amd_rate_aocc500_znver5_A1.py
 /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/CPU2017.009/templogs/preenv.fprate.009.0.log --lognum 009.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-amd-aocc500_znver5_A1


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

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Platform Notes (Continued)

```
6. /proc/cpuinfo
     model name        : AMD EPYC 9655 96-Core Processor
     vendor_id         : AuthenticAMD
     cpu family        : 26
     model             : 2
     stepping          : 1
     microcode         : 0xb00210e
     bugs              : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
     TLB size          : 192 4K pages
     cpu cores         : 96
     siblings          : 96
     2 physical ids (chips)
     192 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
     physical id 1: 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
     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
     physical id 1: apicids
     256-263,272-279,288-295,304-311,320-327,336-343,352-359,368-375,384-391,400-407,416-423,432-439
  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):                  192
  On-line CPU(s) list:     0-191
  Vendor ID:               AuthenticAMD
  BIOS Vendor ID:          Advanced Micro Devices, Inc.
  Model name:              AMD EPYC 9655 96-Core Processor
  BIOS Model name:         AMD EPYC 9655 96-Core Processor                Unknown CPU @ 2.6GHz
  BIOS CPU family:         107
  CPU family:              26
  Model:                   2
  Thread(s) per core:      1
  Core(s) per socket:      96
  Socket(s):               2
  Stepping:                1
  BogoMIPS:                5192.38
  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 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 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
```

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Platform Notes (Continued)

```
                                    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:                      9 MiB (192 instances)
    L1i cache:                      6 MiB (192 instances)
    L2 cache:                       192 MiB (192 instances)
    L3 cache:                       768 MiB (24 instances)
    NUMA node(s):                   8
    NUMA node0 CPU(s):              0-23
    NUMA node1 CPU(s):              24-47
    NUMA node2 CPU(s):              48-71
    NUMA node3 CPU(s):              72-95
    NUMA node4 CPU(s):              96-119
    NUMA node5 CPU(s):              120-143
    NUMA node6 CPU(s):              144-167
    NUMA node7 CPU(s):              168-191
    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       9M  12 Data             1     64       1            64
        L1i      32K       6M   8 Instruction      1     64       1            64
        L2        1M     192M  16 Unified          2   1024       1            64
        L3       32M     768M  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: 0-23
      node 0 size: 96300 MB
      node 0 free: 95671 MB
      node 1 cpus: 24-47
      node 1 size: 96761 MB
      node 1 free: 96329 MB
      node 2 cpus: 48-71
      node 2 size: 96761 MB
      node 2 free: 96360 MB
      node 3 cpus: 72-95
      node 3 size: 96761 MB
      node 3 free: 96315 MB
      node 4 cpus: 96-119
      node 4 size: 96761 MB
      node 4 free: 96302 MB
      node 5 cpus: 120-143
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 5 size: 96761 MB
   node 5 free: 96355 MB
   node 6 cpus: 144-167
   node 6 size: 96761 MB
   node 6 free: 96359 MB
   node 7 cpus: 168-191
   node 7 size: 96654 MB
   node 7 free: 96208 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  12  12  12  32  32  32  32
     1:  12  10  12  12  32  32  32  32
     2:  12  12  10  12  32  32  32  32
     3:  12  12  12  10  32  32  32  32
     4:  32  32  32  32  10  12  12  12
     5:  32  32  32  32  12  10  12  12
     6:  32  32  32  32  12  12  10  12
     7:  32  32  32  32  12  12  12  10


  ----------------------------------------------------------
  9. /proc/meminfo
     MemTotal:       792088924 kB


  ----------------------------------------------------------
  10. who -r
    run-level 3 Sep 19 11:30


  ----------------------------------------------------------
  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          YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator
                     kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd
                     systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
    enabled-runtime  systemd-remount-fs
    disabled         autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                     chronyd console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
                     firewalld fsidd gpm grub2-once haveged hwloc-dump-hwdata ipmi ipmievd issue-add-ssh-keys
                     kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rpcbind rpmconfigcheck rsyncd
                     serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                     systemd-confext systemd-network-generator systemd-sysext systemd-time-wait-sync
                     systemd-timesyncd
    indirect         systemd-userdbd wickedd

  ----------------------------------------------------------
  13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
    root=UUID=7b8fe170-8cd6-4f33-a048-ee31798eab65
    splash=silent
    mitigations=auto
    quiet
    security=apparmor


  ----------------------------------------------------------
  14. cpupower frequency-info
    analyzing CPU 96:
```

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Platform Notes (Continued)

```
    Unable to determine current policy
    boost state support:
      Supported: yes
      Active: yes


    ------------------------------------------------------------
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 SUSE Linux Enterprise Server 15 SP6


    ------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-amd-aocc500_znver5_A1
  Filesystem      Type   Size  Used Avail Use% Mounted on
  /dev/sda3       btrfs  444G   70G  371G  16% /home


    ------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        ThinkSystem SR665 V3
    Product Family: ThinkSystem
```

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Platform Notes (Continued)

```
     Serial:         1234567890


   ----------------------------------------------------------
 21. 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:
     13x SK Hynix HMCG88AHBRA471N 32 GB 2 rank 6400, configured at 6000
      4x SK Hynix HMCG88AHBRA472N 32 GB 2 rank 6400, configured at 6000
      7x SK Hynix HMCG88AHBRA478N 32 GB 2 rank 6400, configured at 6000



   ----------------------------------------------------------
 22. BIOS
 (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:       Lenovo
     BIOS Version:      KAE125W-5.10
     BIOS Date:         08/02/2024
     BIOS Revision:     5.10
     Firmware Revision: 53.9
```

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)
----------------------------------------------------------------------------------------------
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)
----------------------------------------------------------------------------------------------
```

(Continued on next page)

Lenovo Global Technology

ThinkSystem SR665 V3
(2.60 GHz, AMD EPYC 9655)

SPECrate®2017_fp_base = 1950

SPECrate®2017_fp_peak = 1960

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Sep-2024

Hardware Availability: Nov-2024

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
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++
```

Fortran benchmarks:
```
flang
```

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

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

(Continued on next page)

Lenovo Global Technology

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Hardware Availability: Nov-2024
Software Availability: Oct-2024

Base Compiler Invocation (Continued)

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
```

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
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-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
-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
```

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Tested by: Lenovo Global Technology

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Hardware Availability: Nov-2024
Software Availability: Oct-2024

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
```

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
```

Lenovo Global Technology

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Test Date: Sep-2024
Hardware Availability: Nov-2024
Software Availability: Oct-2024

Peak Optimization Flags

C benchmarks:

519.lbm_r: `basepeak = yes`

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`
`-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`

Lenovo Global Technology

ThinkSystem SR665 V3
(2.60 GHz, AMD EPYC 9655)

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SPECrate®2017_fp_peak = 1960

CPU2017 License:	9017	**Test Date:**	Sep-2024
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Nov-2024
Tested by:	Lenovo Global Technology	**Software Availability:**	Oct-2024

Peak Optimization Flags (Continued)

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`
`-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: `-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`
`-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`
`-mllvm -unroll-threshold=100 -lamdlibm -lamdalloc -ldl`

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: `basepeak = yes`

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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/aocc500-flags.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Turin-A.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc500-flags.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Turin-A.xml

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

Tested with SPEC CPU®2017 v1.1.9 on 2024-09-18 23:33:47-0400.
Report generated on 2024-10-10 09:54:46 by CPU2017 PDF formatter v6716.
Originally published on 2024-10-10.