SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SD665 V3
(2.90 GHz, AMD EPYC 9254)

$SPECrate®2017\_fp\_base = 725$
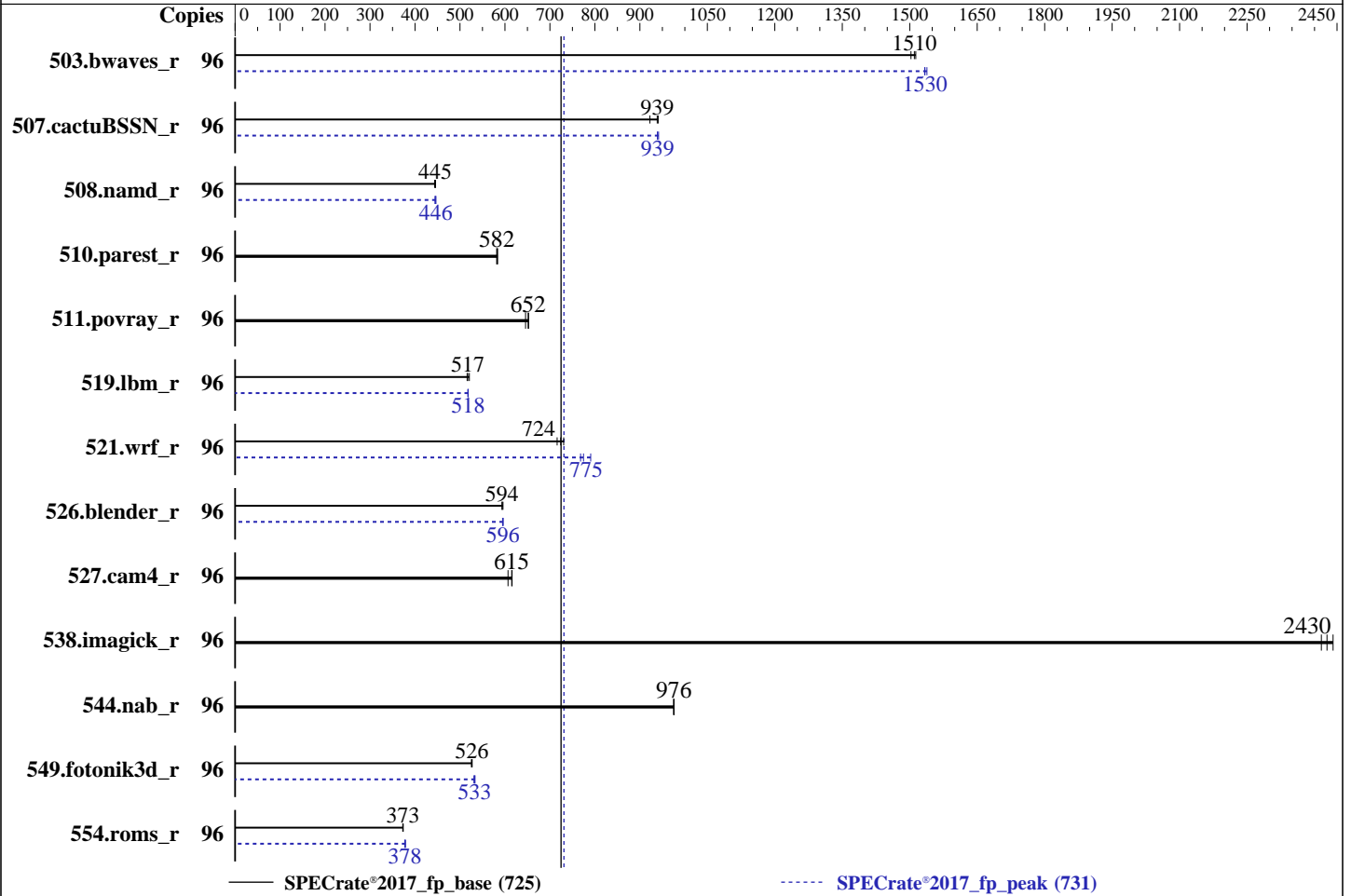
$SPECrate®2017\_fp\_peak = 731$

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

Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Benchmark	Copies	Base	Peak
503.bwaves_r	96	1510	1530
507.cactuBSSN_r	96	939	939
508.namd_r	96	445	446
510.parest_r	96	582	
511.povray_r	96	652	
519.lbm_r	96	517	518
521.wrf_r	96	724	775
526.blender_r	96	594	596
527.cam4_r	96	615	
538.imagick_r	96	2430	
544.nab_r	96	976	
549.fotonik3d_r	96	526	533
554.roms_r	96	373	378

SPECrate®2017_fp_base (725)   SPECrate®2017_fp_peak (731)

Hardware

CPU Name: AMD EPYC 9254
 Max MHz: 4150
 Nominal: 2900
Enabled: 48 cores, 2 chips, 2 threads/core
Orderable: 2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 128 MB I+D on chip per chip,
 32 MB shared / 6 cores
 Other: None
Memory: 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 3.84 TB NVME SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4
 Kernel 5.14.21-150400.22-default
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version QGE109D 1.20 released Jan-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: BIOS and OS set to prefer performance at the cost
 of additional power usage

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	96	641	1500	**637**	**1510**	636	1510	96	626	1540	628	1530	**628**	**1530**
507.cactuBSSN_r	96	129	941	**129**	**939**	132	922	96	129	939	**129**	**939**	129	942
508.namd_r	96	**205**	**445**	206	444	205	446	96	204	446	**204**	**446**	205	444
510.parest_r	96	430	584	432	582	**431**	**582**	96	430	584	432	582	**431**	**582**
511.povray_r	96	347	646	343	653	**344**	**652**	96	347	646	343	653	**344**	**652**
519.lbm_r	96	**196**	**517**	194	521	196	516	96	**195**	**518**	195	518	196	517
521.wrf_r	96	294	731	300	716	**297**	**724**	96	272	791	280	768	**278**	**775**
526.blender_r	96	246	593	**246**	**594**	245	596	96	245	596	**246**	**596**	246	595
527.cam4_r	96	**273**	**615**	273	616	277	607	96	**273**	**615**	273	616	277	607
538.imagick_r	96	98.9	2420	**98.3**	**2430**	97.8	2440	96	98.9	2420	**98.3**	**2430**	97.8	2440
544.nab_r	96	166	976	**166**	**976**	166	975	96	166	976	**166**	**976**	166	975
549.fotonik3d_r	96	710	527	**711**	**526**	712	525	96	**703**	**533**	705	531	701	533
554.roms_r	96	**409**	**373**	408	374	409	373	96	402	379	**404**	**378**	404	377
SPECrate®2017_fp_base =		**725**												
SPECrate®2017_fp_peak =		**731**												

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.
```

(Continued on next page)

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Operating System Notes (Continued)

```
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.9-amd-aocc400-genoa-B1e/amd_rate_aocc400_genoa_B_lib/
     lib:/home/cpu2017-1.1.9-amd-aocc400-genoa-B1e/amd_rate_aocc400_genoa_B_l
     ib/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:
Operating Mode set to Maximum Performance and then set it to Custom Mode
NUMA Nodes per Socket set to NPS4

 Sysinfo program /home/cpu2017-1.1.9-amd-aocc400-genoa-B1e/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Fri Feb 10 20:59:18 2023

 SUT (System Under Test) info as seen by some common utilities.

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

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Platform Notes (Continued)

```
 ----------------------------------------------------------
 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 249 (249.11+suse.124.g2bc0b2c447)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS
 ----------------------------------------------------------


 ----------------------------------------------------------
1. uname -a
  Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
  x86_64 x86_64 x86_64 GNU/Linux


 ----------------------------------------------------------
2. w
   20:59:18 up 4 min,  1 user,  load average: 0.22, 0.07, 0.01
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1     -                20:58    8.00s  1.03s  0.08s /bin/bash ./amd_rate_aocc400_genoa_B1.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) 3094066
```

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Platform Notes (Continued)

```
    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) 3094066
    virtual memory            (kbytes, -v) unlimited
    file locks                       (-x) unlimited


    ------------------------------------------------------------
 5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 30
 login -- root
 -bash
 /bin/bash ./run_SD665V3_genoa.sh
 /bin/bash ./Run026-compliant-amd-ratefp.sh
 python3 ./run_amd_rate_aocc400_genoa_B1.py
 /bin/bash ./amd_rate_aocc400_genoa_B1.sh
 runcpu --config amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 fprate
 runcpu --configfile amd_rate_aocc400_genoa_B1.cfg --tune all --reportable --iterations 3 --nopower --runmode
   rate --tune base:peak --size test:train:refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.004/templogs/preenv.fprate.004.0.log --lognum 004.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-amd-aocc400-genoa-B1e


    ------------------------------------------------------------
 6. /proc/cpuinfo
    model name        : AMD EPYC 9254 24-Core Processor
    vendor_id         : AuthenticAMD
    cpu family        : 25
    model             : 17
    stepping          : 1
    microcode         : 0xa101111
    bugs              : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size          : 3584 4K pages
    cpu cores         : 24
    siblings          : 48
    2 physical ids (chips)
    96 processors (hardware threads)
    physical id 0: core ids 0-5,8-13,16-21,24-29
    physical id 1: core ids 0-5,8-13,16-21,24-29
    physical id 0: apicids 0-11,16-27,32-43,48-59
    physical id 1: apicids 64-75,80-91,96-107,112-123
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
```

(Continued on next page)

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Platform Notes (Continued)

```
    virtualized systems.  Use the above data carefully.


    --------------------------------------------------------------
7. lscpu

From lscpu from util-linux 2.37.2:
  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
  Model name:                 AMD EPYC 9254 24-Core Processor
  CPU family:                 25
  Model:                      17
  Thread(s) per core:         2
  Core(s) per socket:         24
  Socket(s):                  2
  Stepping:                   1
  Frequency boost:            enabled
  CPU max MHz:                4151.7568
  CPU min MHz:                1500.0000
  BogoMIPS:                   5800.01
  Flags:                       fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                              clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                              constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl
                               pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
                              popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy
                                abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext
                                perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3
                              invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1
                               avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                                avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt
                              xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                              avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt lbrv
                                svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
                                pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi
                              umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                               avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
  Virtualization:             AMD-V
  L1d cache:                  1.5 MiB (48 instances)
  L1i cache:                  1.5 MiB (48 instances)
  L2 cache:                   48 MiB (48 instances)
  L3 cache:                   256 MiB (8 instances)
  NUMA node(s):               8
  NUMA node0 CPU(s):          0-5,48-53
```

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Platform Notes (Continued)

```
   NUMA node1 CPU(s):              6-11,54-59
   NUMA node2 CPU(s):              12-17,60-65
   NUMA node3 CPU(s):              18-23,66-71
   NUMA node4 CPU(s):              24-29,72-77
   NUMA node5 CPU(s):              30-35,78-83
   NUMA node6 CPU(s):              36-41,84-89
   NUMA node7 CPU(s):              42-47,90-95
   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 and seccomp
  Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Vulnerability Spectre v2:        Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, 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     1.5M    8 Data            1     64       1              64
      L1i      32K     1.5M    8 Instruction     1     64       1              64
      L2        1M      48M    8 Unified         2   2048       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: 0-5,48-53
   node 0 size: 96505 MB
   node 0 free: 95053 MB
   node 1 cpus: 6-11,54-59
   node 1 size: 96752 MB
   node 1 free: 96345 MB
   node 2 cpus: 12-17,60-65
   node 2 size: 96752 MB
   node 2 free: 96488 MB
   node 3 cpus: 18-23,66-71
   node 3 size: 96752 MB
   node 3 free: 96399 MB
   node 4 cpus: 24-29,72-77
   node 4 size: 96752 MB
   node 4 free: 96485 MB
   node 5 cpus: 30-35,78-83
   node 5 size: 96717 MB
   node 5 free: 96448 MB
```

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Platform Notes (Continued)

```
   node 6 cpus: 36-41,84-89
   node 6 size: 96752 MB
   node 6 free: 96529 MB
   node 7 cpus: 42-47,90-95
   node 7 size: 96557 MB
   node 7 free: 96296 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:       792105616 kB


  ----------------------------------------------------------------
10. who -r
  run-level 3 Feb 10 20:56


  ----------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
   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@ haveged irqbalance
                     issue-generator kbdsettings klog lvm2-monitor nscd nvmefc-boot-connections postfix
                      purge-kernels rollback rsyslog smartd sshd 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 gpm grub2-once haveged-switch-root hwloc-dump-hwdata ipmi ipmievd
                        issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap
                      nvmf-autoconnect rdisc rpcbind rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts
                      snmpd snmptrapd systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                        systemd-time-wait-sync systemd-timesyncd
   indirect          wickedd
```

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Platform Notes (Continued)

```
  ----------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
    root=UUID=598fe0ff-3760-4e42-a9c0-1c1fd78e40fa
    splash=silent
    mitigations=auto
    quiet
    security=apparmor


  ----------------------------------------------------------------
14. cpupower frequency-info
    analyzing CPU 0:
      current policy: frequency should be within 1.50 GHz and 2.90 GHz.
                      The governor "performance" may decide which speed to use
                      within this range.
      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
```

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Platform Notes (Continued)

```
     ----------------------------------------------------------
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 SP4


     ----------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-amd-aocc400-genoa-B1e
  Filesystem      Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p3 xfs    3.5T   77G  3.5T   3% /


     ----------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        ThinkSystem SD665 V3
    Product Family: ThinkSystem
    Serial:         1234567890


     ----------------------------------------------------------
21. dmidecode
  Additional information from dmidecode 3.2 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:
    2x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
    3x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800
    7x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800
    5x Samsung M321R4GA3BB6-CQKEG 32 GB 2 rank 4800
    7x Samsung M321R4GA3BB6-CQKVG 32 GB 2 rank 4800


     ----------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:        Lenovo
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem SD665 V3
(2.90 GHz,AMD EPYC 9254)

SPECrate®2017_fp_base = 725

SPECrate®2017_fp_peak = 731

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

Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Platform Notes (Continued)

```
     BIOS Version:       QGE109D-1.20
     BIOS Date:          01/19/2023
     BIOS Revision:      1.20
     Firmware Revision: 0.90
```

Compiler Version Notes

```
==============================================================================
C                   | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                    | 544.nab_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++                 | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++, C              | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
```

(Continued on next page)

Lenovo Global Technology

SPECrate®2017_fp_base = 725

ThinkSystem SD665 V3
(2.90 GHz,AMD EPYC 9254)

SPECrate®2017_fp_peak = 731

Compiler Version Notes (Continued)

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


================================================================================
Fortran          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                 | 554.roms_r(base, peak)
--------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------


================================================================================
Fortran, C       | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
--------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------
```

Lenovo Global Technology

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

Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

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`

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
```

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Lenovo Global Technology

ThinkSystem SD665 V3
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Tested by: Lenovo Global Technology

Test Date: Feb-2023

Hardware Availability: Feb-2023

Software Availability: Nov-2022

Base Optimization Flags (Continued)

C benchmarks (continued):
```
-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
```

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
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result
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Hardware Availability: Feb-2023
Software Availability: Nov-2022

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
```
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -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++
```

Fortran benchmarks:
```
flang
```

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

(Continued on next page)

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

SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

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Test Sponsor: Lenovo Global Technology
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Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Peak Compiler Invocation (Continued)

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
```

```
510.parest_r: basepeak = yes
```

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Lenovo Global Technology

ThinkSystem SD665 V3
(2.90 GHz,AMD EPYC 9254)

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CPU2017 License: 9017
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Tested by: Lenovo Global Technology

Test Date: Feb-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Peak Optimization Flags (Continued)

Fortran benchmarks:

503.bwaves_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`

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: `Same as 503.bwaves_r`

Benchmarks using both Fortran and C:

521.wrf_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast`
`-march=znver4 -fveclib=AMDLIBM -ffast-math`
`-fstruct-layout=7 -mllvm -unroll-threshold=50`
`-fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`
`-mllvm -reduce-array-computations=3 -zopt -Mrecursive`
`-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc`
`-lflang`

527.cam4_r: `basepeak = yes`

Benchmarks using both C and C++:

511.povray_r: `basepeak = yes`

526.blender_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`
`-fstruct-layout=7 -mllvm -unroll-threshold=50`
`-fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`

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(2.90 GHz,AMD EPYC 9254)

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CPU2017 License: 9017   **Test Date:** Feb-2023
Test Sponsor: Lenovo Global Technology   **Hardware Availability:** Feb-2023
Tested by: Lenovo Global Technology   **Software Availability:** Nov-2022

Peak Optimization Flags (Continued)

526.blender_r (continued):
```
-mllvm -reduce-array-computations=3 -zopt
-finline-aggressive -mllvm -unroll-threshold=100 -lamdlibm
-lamdalloc
```

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 -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
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-finline-aggressive -faggressive-loop-transform -fvector-transform
-fscalar-transform -Mrecursive -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang
```

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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Genoa-Q.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html

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Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Feb-2023
Tested by:	Lenovo Global Technology	**Software Availability:**	Nov-2022

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Genoa-Q.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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Tested with SPEC CPU®2017 v1.1.9 on 2023-02-10 07:59:18-0500.
Report generated on 2023-03-02 11:24:25 by CPU2017 PDF formatter v6442.
Originally published on 2023-02-28.