SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

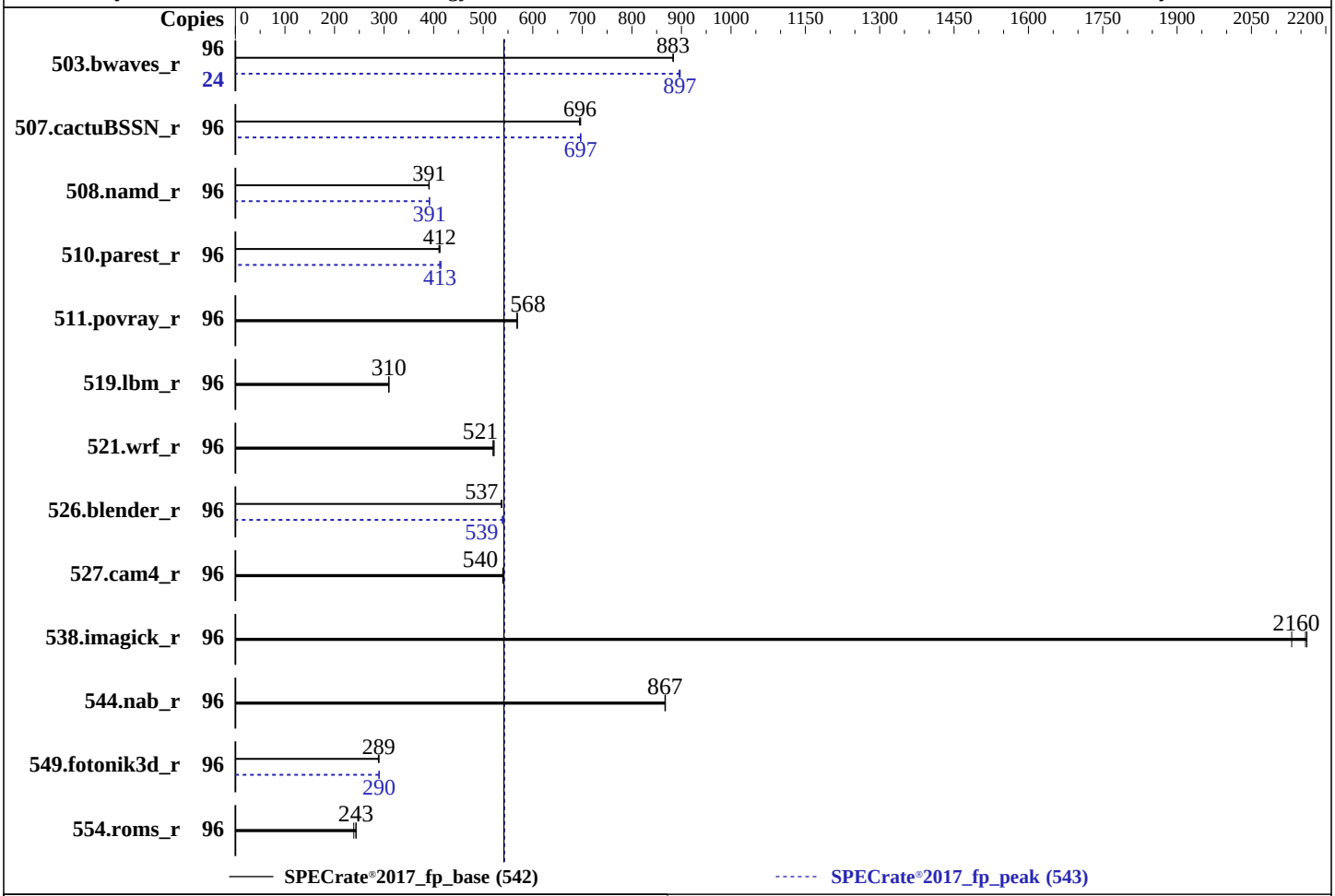
ThinkSystem SR655 V3
(2.75 GHz,AMD EPYC 9454)

SPECrate®2017_fp_base = 542

SPECrate®2017_fp_peak = 543

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

Test Date: Mar-2023
Hardware Availability: Apr-2023
Software Availability: Nov-2022



Hardware

CPU Name:	AMD EPYC 9454
Max MHz:	3800
Nominal:	2750
Enabled:	48 cores, 1 chip, 2 threads/core
Orderable:	1 chip
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	256 MB I+D on chip per chip, 32 MB shared / 6 cores
Other:	None
Memory:	384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)
Storage:	1 x 480 GB SATA SSD
Other:	None

Software

OS:	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 KAE109F 1.40 released Feb-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

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	96	1090	883	1089	884	**1090**	**883**	24	**268**	**897**	269	895	268	897
507.cactuBSSN_r	96	175	694	174	697	**175**	**696**	96	**174**	**697**	175	696	174	697
508.namd_r	96	233	391	234	390	**233**	**391**	96	**233**	**391**	233	391	233	392
510.parest_r	96	612	411	**609**	**412**	608	413	96	**609**	**413**	605	415	609	413
511.povray_r	96	394	568	394	569	**394**	**568**	96	394	568	394	569	**394**	**568**
519.lbm_r	96	327	309	**327**	**310**	327	310	96	327	309	**327**	**310**	327	310
521.wrf_r	96	412	522	**413**	**521**	414	520	96	412	522	**413**	**521**	414	520
526.blender_r	96	**272**	**537**	273	536	272	537	96	272	538	270	541	**271**	**539**
527.cam4_r	96	310	541	311	539	**311**	**540**	96	310	541	311	539	**311**	**540**
538.imagick_r	96	**111**	**2160**	110	2160	112	2130	96	**111**	**2160**	110	2160	112	2130
544.nab_r	96	**186**	**867**	186	868	186	867	96	**186**	**867**	186	868	186	867
549.fotonik3d_r	96	**1292**	**289**	1292	290	1297	288	96	1291	290	1290	290	**1290**	**290**
554.roms_r	96	626	244	**627**	**243**	639	239	96	626	244	**627**	**243**	639	239

SPECrate®2017_fp_base = 542

SPECrate®2017_fp_peak = 543

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.
```

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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 Thu Mar  9 22:10:48 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
   22:10:48 up  5:02,  1 user,  load average: 3.01, 47.05, 75.56
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1     -                17:08    4:59m  1.12s  0.09s /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) 1546702
```

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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) 1546702
   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 ./speccpu_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/CPU2017.084/templogs/preenv.fprate.084.0.log --lognum 084.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-amd-aocc400-genoa-B1e

 ------------------------------------------------------------
 6. /proc/cpuinfo
     model name      : AMD EPYC 9454 48-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       : 48
     siblings        : 96
     1 physical ids (chips)
     96 processors (hardware threads)
     physical id 0: core ids 0-5,8-13,16-21,24-29,32-37,40-45,48-53,56-61
     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.
```

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Platform Notes (Continued)

```
------------------------------------------------------------
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 9454 48-Core Processor
  CPU family:                      25
  Model:                           17
  Thread(s) per core:              2
  Core(s) per socket:              48
  Socket(s):                       1
  Stepping:                        1
  Frequency boost:                 enabled
  CPU max MHz:                     3810.7910
  CPU min MHz:                     1500.0000
  BogoMIPS:                        5491.71
  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):                    4
  NUMA node0 CPU(s):               0-11,48-59
  NUMA node1 CPU(s):               12-23,60-71
  NUMA node2 CPU(s):               24-35,72-83
```

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Platform Notes (Continued)

```
   NUMA node3 CPU(s):                36-47,84-95
   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: 4 nodes (0-3)
   node 0 cpus: 0-11,48-59
   node 0 size: 96515 MB
   node 0 free: 95906 MB
   node 1 cpus: 12-23,60-71
   node 1 size: 96761 MB
   node 1 free: 95990 MB
   node 2 cpus: 24-35,72-83
   node 2 size: 96761 MB
   node 2 free: 96397 MB
   node 3 cpus: 36-47,84-95
   node 3 size: 96660 MB
   node 3 free: 96232 MB
   node distances:
   node   0   1   2   3
     0:  10  12  12  12
     1:  12  10  12  12
     2:  12  12  10  12
     3:  12  12  12  10

 ------------------------------------------------------------
 9. /proc/meminfo
    MemTotal:       395980364 kB

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

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Platform Notes (Continued)

```
 10. who -r
   run-level 3 Mar 9 17:08

 ------------------------------------------------------------
 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 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 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
   generated        ntp_sync
   indirect         wickedd

 ------------------------------------------------------------
 13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
   root=UUID=b688f3c1-4135-48b5-a7b5-149c36a17cd9
   splash=silent
   mitigations=auto
   quiet
   security=apparmor

 ------------------------------------------------------------
 14. cpupower frequency-info
   analyzing CPU 0:
     current policy: frequency should be within 1.50 GHz and 2.75 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
```

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Platform Notes (Continued)

```
  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 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/sda3      xfs   446G   54G  392G  13% /
```

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Platform Notes (Continued)

```
------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        ThinkSystem SR655V3
    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:
     11x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
     1x Samsung M321R4GA3BB0-CQKMG 32 GB 2 rank 4800


------------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       Lenovo
   BIOS Version:      KAE109F-1.40
   BIOS Date:         02/27/2023
   BIOS Revision:     1.40
   Firmware Revision: 1.40
```

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
```

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Compiler Version Notes (Continued)

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

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Compiler Version Notes (Continued)

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

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`

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Base Portability Flags (Continued)

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
-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

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Base Optimization Flags (Continued)

Benchmarks using both Fortran 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 -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
-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

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Base Other Flags (Continued)

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`

Peak Optimization Flags

C benchmarks:

519.lbm_r: `basepeak = yes`

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

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Peak Optimization Flags (Continued)

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: -m64 -flto -Wl,-mllvm -Wl,-suppress-fmas
-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

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: basepeak = yes

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

(Continued on next page)

Peak Optimization Flags (Continued)

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
-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-R.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html

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

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Tested with SPEC CPU®2017 v1.1.9 on 2023-03-09 09:10:47-0500.
Report generated on 2023-04-12 12:48:03 by CPU2017 PS formatter v6442.
Originally published on 2023-04-11.