SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

$SPECspeed®2017\_fp\_base = 196$

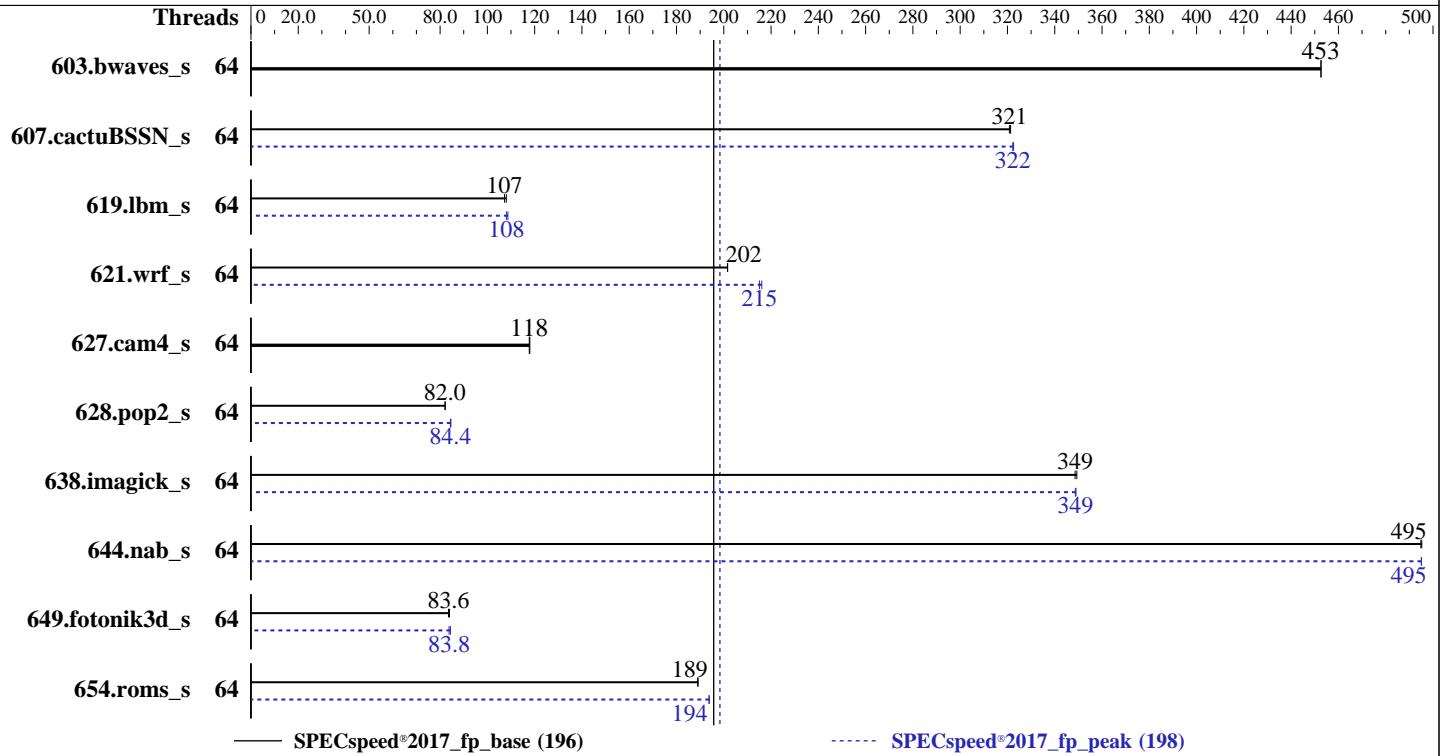$SPECspeed®2017\_fp\_peak = 198$

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Threads

Benchmark	Threads	base	peak
603.bwaves_s	64	453	
607.cactuBSSN_s	64	321	322
619.lbm_s	64	107	108
621.wrf_s	64	202	215
627.cam4_s	64	118	
628.pop2_s	64	82.0	84.4
638.imagick_s	64	349	349
644.nab_s	64	495	495
649.fotonik3d_s	64	83.6	83.8
654.roms_s	64	189	194

——— SPECspeed®2017_fp_base (196)   - - - - SPECspeed®2017_fp_peak (198)

Hardware

CPU Name: AMD EPYC 8534P
 Max MHz: 3100
 Nominal: 2300
Enabled: 64 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 128 MB I+D on chip per chip, 16 MB shared / 8 cores
 Other: None
Memory: 192 GB (6 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 60 GB on tmpfs
Other: None

Software

OS: Ubuntu 22.04.2 LTS
  5.15.0-78-generic
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: Yes
Firmware: Version 1.0.2 released Jul-2023
File System: tmpfs
System State: Run level 5 (graphical 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	64	**130**	**453**	130	453			64	**130**	**453**	130	453		
607.cactuBSSN_s	64	**52.0**	**321**	51.9	321			64	51.7	323	**51.7**	**322**		
619.lbm_s	64	48.5	108	**48.8**	**107**			64	**48.5**	**108**	48.2	109		
621.wrf_s	64	65.6	202	**65.6**	**202**			64	61.2	216	**61.5**	**215**		
627.cam4_s	64	75.1	118	**75.3**	**118**			64	75.1	118	**75.3**	**118**		
628.pop2_s	64	**145**	**82.0**	144	82.2			64	140	84.6	**141**	**84.4**		
638.imagick_s	64	41.3	349	**41.4**	**349**			64	41.3	349	**41.4**	**349**		
644.nab_s	64	**35.3**	**495**	35.3	495			64	35.3	495	**35.3**	**495**		
649.fotonik3d_s	64	**109**	**83.6**	109	84.0			64	**109**	**83.8**	108	84.4		
654.roms_s	64	**83.3**	**189**	83.2	189			64	81.2	194	**81.3**	**194**		
SPECspeed®2017_fp_base =	**196**													
SPECspeed®2017_fp_peak =	**198**													

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,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To always enable THP for peak runs of:
603.bwaves_s, 607.cactuBSSN_s, 619.lbm_s, 627.cam4_s, 628.pop2_s, 638.imagick_s, 644.nab_s, 649.fotonik3d_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
```

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Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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Operating System Notes (Continued)

```
run as root.
To disable THP for peak runs of 621.wrf_s:
'echo never > /sys/kernel/mm/transparent_hugepage/enabled; echo always > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
To enable THP only on request for peak runs of 654.roms_s:
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled; echo madvise > /sys/kernel/mm/transparent_hugepage/defrag'
run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-63"
LD_LIBRARY_PATH = "/mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1/amd_speed_aocc400_znver4_A_lib/lib:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-63"
PGHPF_ZMEM = "yes"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0 32 1 33 2 34 3 35 4 36 5 37 6 38 7 39 8 40 9 41 10 42 11 43 12 44 13 45 14 46 15 47
       16 48 17 49 18 50 19 51 20 52 21 53 22 54 23 55 24 56 25 57 26 58 27 59 28 60 29 61 30 62 31 63"
```

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.
```

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General Notes (Continued)

Benchmark run from a 60 GB ramdisk created with the cmd: "mount -t tmpfs -o size=60G tmpfs /mnt/ramdisk"

Platform Notes

```
BIOS settings:
            DRAM Refresh Delay : Performance
        DIMM Self Healing on
    Uncorrectable Memory Error : Disabled
             Logical Processor : Disabled
      Virtualization Technology : Disabled
        L3 Cache as NUMA Domain : Enabled

                System Profile : Custom
                      C-States : Disabled
            Memory Patrol Scrub : Disabled
            PCI ASPM L1 Link
              Power Management : Disabled
            Determinism Slider : Power Determinism
      Algorithm Performance
        Boost Disable (ApbDis) : Enabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on nt2 Wed Aug 16 20:54:20 2023

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

------------------------------------------------------------
Table of contents
------------------------------------------------------------
 1. uname -a
 2. w
 3. Username
 4. ulimit -a
 5. sysinfo process ancestry
 6. /proc/cpuinfo
 7. lscpu
 8. numactl --hardware
 9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.7)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS
------------------------------------------------------------

------------------------------------------------------------
 1. uname -a
```

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Platform Notes (Continued)

```
  Linux nt2 5.15.0-78-generic #85-Ubuntu SMP Fri Jul 7 15:25:09 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux


  ----------------------------------------------------------
2. w
   20:54:20 up  3:04,  2 users,  load average: 5.57, 5.82, 3.40
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  dell     tty1     -                18:02    2:52m  0.33s  0.00s -bash
  dell     pts/0    -                18:02    2:51m  1.55s  0.29s sudo su


  ----------------------------------------------------------
3. Username
  From environment variable $USER:  root
  From the command 'logname':       dell


  ----------------------------------------------------------
4. ulimit -a
  time(seconds)        unlimited
  file(blocks)         unlimited
  data(kbytes)         unlimited
  stack(kbytes)        unlimited
  coredump(blocks)     0
  memory(kbytes)       unlimited
  locked memory(kbytes) 2097152
  process              771445
  nofiles              1024
  vmemory(kbytes)      unlimited
  locks                unlimited
  rtprio               0


  ----------------------------------------------------------
5. sysinfo process ancestry
 /sbin/init
 /bin/login -p --
 -bash
 sudo su
 sudo su
 su
 bash
 /bin/bash ./DELL_speed.sh
 /bin/bash ./dell-run-main.sh speed
 /bin/bash ./dell-run-main.sh speed
 /bin/bash ./dell-run-speccpu.sh speed --define DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-LogProcD=1
   --define DL-BIOS-VirtD=1 --define DL-VERS=v4.6 --output_format html,pdf,txt
 python3 ./run_amd_speed_aocc400_znver4_A1.py
 /bin/bash ./amd_speed_aocc400_znver4_A1.sh
 runcpu --config amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 2 --define
   DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-LogProcD=1 --define DL-BIOS-VirtD=1 --define DL-VERS=v4.6
   --output_format html,pdf,txt fpspeed
 runcpu --configfile amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 2 --define
   DL-BIOSinc=Dell-BIOS_EPYC-4.inc --define DL-BIOS-LogProcD=1 --define DL-BIOS-VirtD=1 --define DL-VERS=v4.6
   --output_format html,pdf,txt --nopower --runmode speed --tune base:peak --size test:train:refspeed fpspeed
   --nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.002/templogs/preenv.fpspeed.002.0.log --lognum 002.0
   --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1


  ----------------------------------------------------------
6. /proc/cpuinfo
     model name       : AMD EPYC 8534P 64-Core Processor
     vendor_id        : AuthenticAMD
```

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Platform Notes (Continued)

```
     cpu family      : 25
     model           : 160
     stepping        : 2
     microcode       : 0xaa00212
     bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
     TLB size        : 3584 4K pages
     cpu cores       : 64
     siblings        : 64
     1 physical ids (chips)
     64 processors (hardware threads)
     physical id 0: core ids 0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119
     physical id 0: apicids 0-7,16-23,32-39,48-55,64-71,80-87,96-103,112-119
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


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

From lscpu from util-linux 2.37.2:
  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):                      64
  On-line CPU(s) list:         0-63
  Vendor ID:                   AuthenticAMD
  Model name:                  AMD EPYC 8534P 64-Core Processor
  CPU family:                  25
  Model:                       160
  Thread(s) per core:          1
  Core(s) per socket:          64
  Socket(s):                   1
  Stepping:                    2
  Frequency boost:             enabled
  CPU max MHz:                 3101.8550
  CPU min MHz:                 1500.0000
  BogoMIPS:                    4593.18
  Flags:                       fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                               clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
                               constant_tsc rep_good 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 cppc 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:                   2 MiB (64 instances)
  L1i cache:                   2 MiB (64 instances)
  L2 cache:                    64 MiB (64 instances)
  L3 cache:                    128 MiB (8 instances)
  NUMA node(s):                8
  NUMA node0 CPU(s):           0-7
```

(Continued on next page)

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Platform Notes (Continued)

```
   NUMA node1 CPU(s):             8-15
   NUMA node2 CPU(s):             16-23
   NUMA node3 CPU(s):             24-31
   NUMA node4 CPU(s):             32-39
   NUMA node5 CPU(s):             40-47
   NUMA node6 CPU(s):             48-55
   NUMA node7 CPU(s):             56-63
   Vulnerability Itlb multihit:   Not affected
   Vulnerability L1tf:            Not affected
   Vulnerability Mds:             Not affected
   Vulnerability Meltdown:        Not affected
   Vulnerability Mmio stale data: Not affected
   Vulnerability Retbleed:        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 disabled, RSB
                                  filling, PBRSB-eIBRS 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       32K       2M    8 Data            1    64        1             64
     L1i       32K       2M    8 Instruction     1    64        1             64
     L2         1M      64M    8 Unified         2  2048        1             64
     L3        16M     128M   16 Unified         3 16384        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: 0-7
   node 0 size: 23736 MB
   node 0 free: 23575 MB
   node 1 cpus: 8-15
   node 1 size: 24189 MB
   node 1 free: 23998 MB
   node 2 cpus: 16-23
   node 2 size: 24189 MB
   node 2 free: 24038 MB
   node 3 cpus: 24-31
   node 3 size: 24142 MB
   node 3 free: 23824 MB
   node 4 cpus: 32-39
   node 4 size: 24189 MB
   node 4 free: 23968 MB
   node 5 cpus: 40-47
   node 5 size: 24146 MB
   node 5 free: 24002 MB
   node 6 cpus: 48-55
   node 6 size: 24189 MB
   node 6 free: 20468 MB
   node 7 cpus: 56-63
   node 7 size: 24189 MB
   node 7 free: 23999 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  11  11  11  11  11  11
     1:  11  10  11  11  11  11  11  11
     2:  11  11  10  11  11  11  11  11
```

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Platform Notes (Continued)

```
   3:  11  11  11  10  11  11  11  11
   4:  11  11  11  11  10  11  11  11
   5:  11  11  11  11  11  10  11  11
   6:  11  11  11  11  11  11  10  11
   7:  11  11  11  11  11  11  11  10


   --------------------------------------------------------------
 9. /proc/meminfo
   MemTotal:       197606692 kB


   --------------------------------------------------------------
10. who -r
   run-level 5 Aug 16 17:50


   --------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.7)
   Default Target  Status
   graphical       running


   --------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE             UNIT FILES
   enabled           apparmor blk-availability cloud-config cloud-final cloud-init cloud-init-local
                     console-setup e2scrub_reap finalrd getty@ gpu-manager grub-common grub-initrd-fallback
                     keyboard-setup lm-sensors lvm2-monitor multipathd networkd-dispatcher open-iscsi pollinate
                     secureboot-db setvtrgb ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
                     systemd-resolved systemd-timesyncd thermald tuned
   enabled-runtime   netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
   disabled          console-getty debug-shell iscsid rsync serial-getty@ systemd-boot-check-no-failures
                     systemd-network-generator systemd-sysext systemd-time-wait-sync upower
   generated         apport
   masked            cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS sudo x11-common


   --------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/vmlinuz-5.15.0-78-generic
   root=/dev/mapper/ubuntu--vg-ubuntu--lv
   ro


   --------------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 0:
     current policy: frequency should be within 1.50 GHz and 2.30 GHz.
                     The governor "performance" may decide which speed to use
                     within this range.
   boost state support:
     Supported: yes
     Active: yes
     Boost States: 0
     Total States: 3
     Pstate-P0:  2300MHz


   --------------------------------------------------------------
15. tuned-adm active
   Current active profile: throughput-performance


   --------------------------------------------------------------
16. sysctl
   kernel.numa_balancing                1
   kernel.randomize_va_space            0
```

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Platform Notes (Continued)

```
    vm.compaction_proactiveness         20
    vm.dirty_background_bytes            0
    vm.dirty_background_ratio           10
    vm.dirty_bytes                       0
    vm.dirty_expire_centisecs         3000
    vm.dirty_ratio                       8
    vm.dirty_writeback_centisecs       500
    vm.dirtytime_expire_seconds      43200
    vm.extfrag_threshold               500
    vm.min_unmapped_ratio                1
    vm.nr_hugepages                      0
    vm.nr_hugepages_mempolicy            0
    vm.nr_overcommit_hugepages           0
    vm.swappiness                        1
    vm.watermark_boost_factor        15000
    vm.watermark_scale_factor           10
    vm.zone_reclaim_mode                 1


  ----------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
  defrag          [always] defer defer+madvise madvise never
  enabled         [always] madvise never
  hpage_pmd_size  2097152
  shmem_enabled   always within_size advise [never] deny force


  ----------------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs  60000
  defrag                     1
  max_ptes_none            511
  max_ptes_shared          256
  max_ptes_swap             64
  pages_to_scan           4096
  scan_sleep_millisecs   10000


  ----------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release Ubuntu 22.04.2 LTS


  ----------------------------------------------------------------
20. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-aocc400-znver4-A1
  Filesystem      Type  Size  Used Avail Use% Mounted on
  tmpfs           tmpfs  60G  3.5G   57G   6% /mnt/ramdisk


  ----------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:        Dell Inc.
    Product:       PowerEdge C6615
    Product Family: PowerEdge
    Serial:        SC665C2


  ----------------------------------------------------------------
22. dmidecode
  Additional information from dmidecode 3.3 follows.  WARNING: Use caution when you interpret this section.
  The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately
  determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the
  "DMTF SMBIOS" standard.
  Memory:
```

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Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

SPECspeed®2017_fp_base = 196

SPECspeed®2017_fp_peak = 198

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Platform Notes (Continued)

```
    6x 80CE000080CE M321R4GA3BB6-CQKVG 32 GB 2 rank 4800


    ------------------------------------------------------------
 23. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:        Dell Inc.
    BIOS Version:       1.0.2
    BIOS Date:          07/26/2023
    BIOS Revision:      1.0
```

Compiler Version Notes

```
==============================================================================================
C                | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
----------------------------------------------------------------------------------------------


==============================================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
----------------------------------------------------------------------------------------------


==============================================================================================
Fortran          | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
----------------------------------------------------------------------------------------------


==============================================================================================
Fortran, C       | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
----------------------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#434 2022_10_28) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin
```

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Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

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Software Availability: Jul-2023

Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:
```
clang
```

Fortran benchmarks:
```
flang
```

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

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

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
627.cam4_s: `-DSPEC_CASE_FLAG -DSPEC_LP64`
628.pop2_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

Base Optimization Flags

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

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
```

(Continued on next page)

Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp
-lamdlibm -lamdalloc -lflang
```

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 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -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 -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-lflang
```

Base Other Flags

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

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

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

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

Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

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$SPECspeed®2017\_fp\_peak = 198$

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

Peak Compiler Invocation

C benchmarks:
```
clang
```

Fortran benchmarks:
```
flang
```

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

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

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
619.lbm_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

```
638.imagick_s: Same as 619.lbm_s
```

```
644.nab_s: -m64 -Wl,-mllvm -Wl,-region-vectorize -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Fortran benchmarks:

(Continued on next page)

Dell Inc.

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Peak Optimization Flags (Continued)

603.bwaves_s: `basepeak = yes`

649.fotonik3d_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP`
`-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math`
`-fopenmp -flto -Mrecursive`
`-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp`
`-lomp -lamdlibm -lamdalloc -lflang`

654.roms_s: `-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP`
`-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math`
`-fopenmp -Mrecursive -mllvm -reduce-array-computations=3`
`-fvector-transform -fscalar-transform -fopenmp=libomp`
`-lomp -lamdlibm -lamdalloc -lflang`

Benchmarks using both Fortran and C:

621.wrf_s: `-m64 -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 -fopenmp`
`-flto -fstruct-layout=9 -mllvm -unroll-threshold=50`
`-fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`
`-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt`
`-O3 -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop`
`-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

627.cam4_s: `basepeak = yes`

628.pop2_s: `-m64 -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 -fopenmp`
`-flto -fstruct-layout=9 -mllvm -unroll-threshold=50`
`-fremap-arrays -fstrip-mining`
`-mllvm -inline-threshold=1000`
`-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt`
`-Mrecursive -fvector-transform -fscalar-transform`
`-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang`

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

(Continued on next page)

SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

PowerEdge C6615 (AMD EPYC 8534P 64-Core Processor)

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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
```
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=9
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -finline-aggressive -mllvm -unroll-threshold=100
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

Peak Other Flags

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

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

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

Benchmarks using Fortran, C, and C++:
```
-Wno-return-type -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/aocc400-flags.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.1.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc400-flags.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.1.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 2023-08-16 16:54:20-0400.
Report generated on 2023-09-18 21:00:16 by CPU2017 PDF formatter v6716.
Originally published on 2023-09-18.