SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

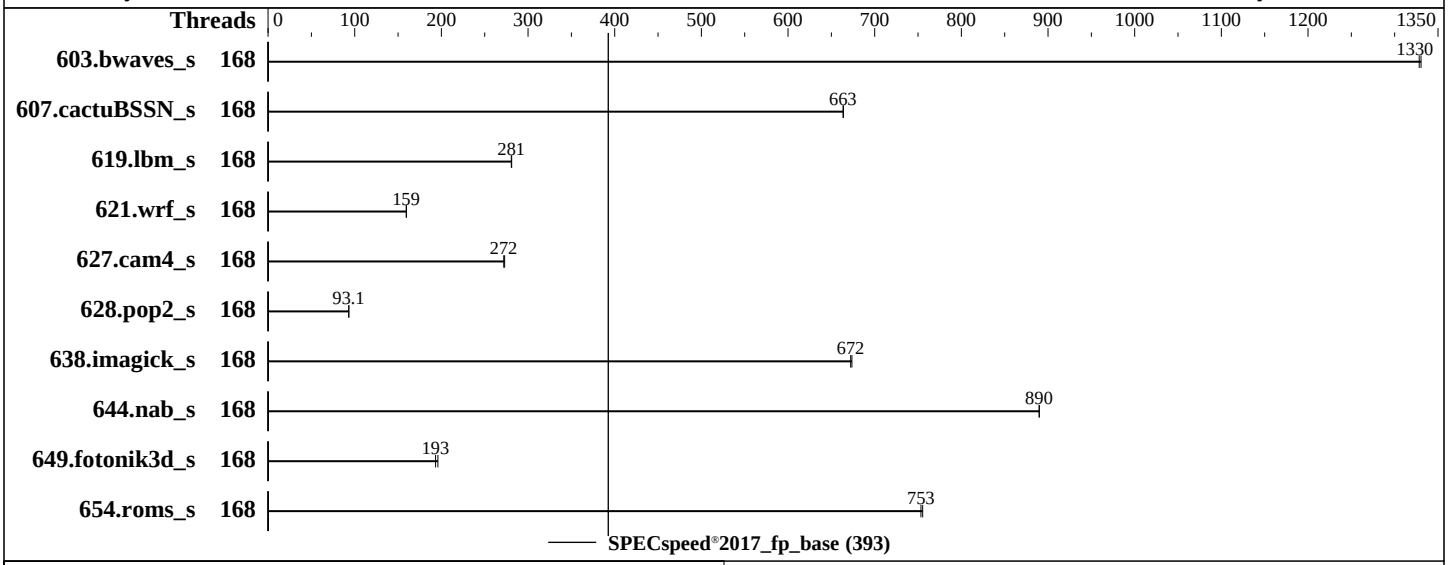
PowerEdge R6625 (AMD EPYC 9634 84-Core Processor)

SPECspeed®2017_fp_base = 393

SPECspeed®2017_fp_peak = Not Run

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

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



Hardware

CPU Name:	AMD EPYC 9634
Max MHz:	3700
Nominal:	2250
Enabled:	168 cores, 2 chips
Orderable:	1,2 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	384 MB I+D on chip per chip, 32 MB shared / 7 cores
Other:	None
Memory:	1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)
Storage:	125 GB on tmpfs
Other:	None

Software

OS:	Ubuntu 22.04.1 LTS 5.15.0-46-generic
Compiler:	C/C++/Fortran: Version 4.0.0 of AOCC
Parallel:	Yes
Firmware:	Version 1.3.7 released Mar-2023
File System:	tmpfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	None
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage.

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	168	44.3	1330	**44.4**	**1330**									
607.cactuBSSN_s	168	**25.1**	**663**	25.1	664									
619.lbm_s	168	18.6	281	**18.7**	**281**									
621.wrf_s	168	82.8	160	**83.0**	**159**									
627.cam4_s	168	32.5	273	**32.6**	**272**									
628.pop2_s	168	127	93.3	**128**	**93.1**									
638.imagick_s	168	**21.5**	**672**	21.4	674									
644.nab_s	168	**19.6**	**890**	19.6	890									
649.fotonik3d_s	168	**47.2**	**193**	46.5	196									
654.roms_s	168	20.8	755	**20.9**	**753**									

SPECspeed®2017_fp_base = 393

SPECspeed®2017_fp_peak = Not Run

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'
run as root.
```

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Operating System Notes (Continued)

```
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 = "0-167"
LD_LIBRARY_PATH = "/mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e/amd_speed_aocc400_genoa_B_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 = "168"
```

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.


 Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G 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-B1e/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
```

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Platform Notes (Continued)

```
running on genoa-sut Thu Mar  9 21:26:25 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 (249.11-0ubuntu3.4)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux genoa-sut 5.15.0-46-generic #49-Ubuntu SMP Thu Aug 4 18:03:25 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux

------------------------------------------------------------
2. w
   21:26:25 up 2 min,  1 user,  load average: 1.00, 1.80, 0.85
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1     -                21:24   41.00s  1.84s  0.37s /bin/bash ./amd_speed_aocc400_genoa_B1.sh

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

------------------------------------------------------------
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              6190359
  nofiles              1024
  vmemory(kbytes)      unlimited
  locks                unlimited
  rtprio               0
```

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Platform Notes (Continued)

```
------------------------------------------------------------
5. sysinfo process ancestry
 /sbin/init
 /bin/login -p --
 -bash
 /bin/bash ./DELL_speed.sh
 /bin/bash ./dell-run-main.sh speed
 /bin/bash ./dell-run-main.sh speed
 /bin/bash ./dell-run-specspeed.sh --output_format csv,html,pdf,txt -define
   Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc --define Dell-BIOS-LogProcD=1
 python3 ./run_amd_speed_aocc400_genoa_B1.py
 /bin/bash ./amd_speed_aocc400_genoa_B1.sh
 runcpu --config amd_speed_aocc400_genoa_B1.cfg --tune base --reportable --iterations 2 --output_format
   csv,html,pdf,txt -define Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc --define Dell-BIOS-LogProcD=1 fpspeed
 runcpu --configfile amd_speed_aocc400_genoa_B1.cfg --tune base --reportable --iterations 2 --output_format
   csv,html,pdf,txt --define Dell-BIOS-inc=Dell-BIOS_EPYC-4.inc --define Dell-BIOS-LogProcD=1 --nopower
   --runmode speed --tune base --size test:train:refspeed fpspeed --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.001/templogs/preenv.fpspeed.001.0.log --lognum 001.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : AMD EPYC 9634 84-Core Processor
    vendor_id       : AuthenticAMD
    cpu family      : 25
    model           : 17
    stepping        : 1
    microcode       : 0xa101116
    bugs            : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
    TLB size        : 3584 4K pages
    cpu cores       : 84
    siblings        : 84
    2 physical ids (chips)
    168 processors (hardware threads)
    physical id 0: core ids 0-6,16-22,32-38,48-54,64-70,80-86,96-102,112-118,128-134,144-150,160-166,176-182
    physical id 1: core ids 0-6,16-22,32-38,48-54,64-70,80-86,96-102,112-118,128-134,144-150,160-166,176-182
    physical id 0: apicids 0-6,16-22,32-38,48-54,64-70,80-86,96-102,112-118,128-134,144-150,160-166,176-182
    physical id 1: apicids
    256-262,272-278,288-294,304-310,320-326,336-342,352-358,368-374,384-390,400-406,416-422,432-438
  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):                          168
  On-line CPU(s) list:             0-167
  Vendor ID:                       AuthenticAMD
  Model name:                      AMD EPYC 9634 84-Core Processor
  CPU family:                      25
  Model:                           17
  Thread(s) per core:              1
  Core(s) per socket:              84
```

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Platform Notes (Continued)

```
Socket(s):                    2
Stepping:                     1
Frequency boost:              enabled
CPU max MHz:                  3701.0000
CPU min MHz:                  400.0000
BogoMIPS:                     4501.05
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:                    5.3 MiB (168 instances)
L1i cache:                    5.3 MiB (168 instances)
L2 cache:                     168 MiB (168 instances)
L3 cache:                     768 MiB (24 instances)
NUMA node(s):                 24
NUMA node0 CPU(s):            0-6
NUMA node1 CPU(s):            28-34
NUMA node2 CPU(s):            56-62
NUMA node3 CPU(s):            14-20
NUMA node4 CPU(s):            42-48
NUMA node5 CPU(s):            70-76
NUMA node6 CPU(s):            21-27
NUMA node7 CPU(s):            49-55
NUMA node8 CPU(s):            77-83
NUMA node9 CPU(s):            7-13
NUMA node10 CPU(s):           35-41
NUMA node11 CPU(s):           63-69
NUMA node12 CPU(s):           84-90
NUMA node13 CPU(s):           112-118
NUMA node14 CPU(s):           140-146
NUMA node15 CPU(s):           98-104
NUMA node16 CPU(s):           126-132
NUMA node17 CPU(s):           154-160
NUMA node18 CPU(s):           105-111
NUMA node19 CPU(s):           133-139
NUMA node20 CPU(s):           161-167
NUMA node21 CPU(s):           91-97
NUMA node22 CPU(s):           119-125
NUMA node23 CPU(s):           147-153
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
```

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Platform Notes (Continued)

```
  Vulnerability Spectre v2:         Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, 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     5.3M    8 Data            1    64        1             64
     L1i       32K     5.3M    8 Instruction     1    64        1             64
     L2         1M     168M    8 Unified         2  2048        1             64
     L3        32M     768M   16 Unified         3 32768        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 24 nodes (0-23)
  node 0 cpus: 0-6
  node 0 size: 64056 MB
  node 0 free: 63825 MB
  node 1 cpus: 28-34
  node 1 size: 64510 MB
  node 1 free: 64342 MB
  node 2 cpus: 56-62
  node 2 size: 64510 MB
  node 2 free: 64335 MB
  node 3 cpus: 14-20
  node 3 size: 64510 MB
  node 3 free: 64321 MB
  node 4 cpus: 42-48
  node 4 size: 64510 MB
  node 4 free: 64340 MB
  node 5 cpus: 70-76
  node 5 size: 64510 MB
  node 5 free: 64334 MB
  node 6 cpus: 21-27
  node 6 size: 64510 MB
  node 6 free: 60697 MB
  node 7 cpus: 49-55
  node 7 size: 64510 MB
  node 7 free: 64331 MB
  node 8 cpus: 77-83
  node 8 size: 64488 MB
  node 8 free: 64326 MB
  node 9 cpus: 7-13
  node 9 size: 64510 MB
  node 9 free: 64338 MB
  node 10 cpus: 35-41
  node 10 size: 64510 MB
  node 10 free: 64339 MB
  node 11 cpus: 63-69
  node 11 size: 64510 MB
  node 11 free: 64314 MB
  node 12 cpus: 84-90
  node 12 size: 64510 MB
  node 12 free: 64398 MB
  node 13 cpus: 112-118
  node 13 size: 64510 MB
  node 13 free: 64379 MB
  node 14 cpus: 140-146
  node 14 size: 64510 MB
```

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Platform Notes (Continued)

```
  node 14 free: 64395 MB
  node 15 cpus: 98-104
  node 15 size: 64474 MB
  node 15 free: 64341 MB
  node 16 cpus: 126-132
  node 16 size: 64510 MB
  node 16 free: 64364 MB
  node 17 cpus: 154-160
  node 17 size: 64510 MB
  node 17 free: 64391 MB
  node 18 cpus: 105-111
  node 18 size: 64510 MB
  node 18 free: 64362 MB
  node 19 cpus: 133-139
  node 19 size: 64510 MB
  node 19 free: 64394 MB
  node 20 cpus: 161-167
  node 20 size: 64478 MB
  node 20 free: 64356 MB
  node 21 cpus: 91-97
  node 21 size: 64510 MB
  node 21 free: 64387 MB
  node 22 cpus: 119-125
  node 22 size: 64510 MB
  node 22 free: 64380 MB
  node 23 cpus: 147-153
  node 23 size: 64510 MB
  node 23 free: 64393 MB
  node distances:
  node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23
    0:  10  11  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    1:  11  10  11  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    2:  11  11  10  11  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    3:  11  11  11  10  11  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    4:  11  11  11  11  10  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    5:  11  11  11  11  11  10  11  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    6:  11  11  11  11  11  11  10  11  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    7:  11  11  11  11  11  11  11  10  11  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    8:  11  11  11  11  11  11  11  11  10  11  11  11  32  32  32  32  32  32  32  32  32  32  32  32
    9:  11  11  11  11  11  11  11  11  11  10  11  11  32  32  32  32  32  32  32  32  32  32  32  32
   10:  11  11  11  11  11  11  11  11  11  11  10  11  32  32  32  32  32  32  32  32  32  32  32  32
   11:  11  11  11  11  11  11  11  11  11  11  11  10  32  32  32  32  32  32  32  32  32  32  32  32
   12:  32  32  32  32  32  32  32  32  32  32  32  32  10  11  11  11  11  11  11  11  11  11  11  11
   13:  32  32  32  32  32  32  32  32  32  32  32  32  11  10  11  11  11  11  11  11  11  11  11  11
   14:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  10  11  11  11  11  11  11  11  11  11
   15:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  10  11  11  11  11  11  11  11  11
   16:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  10  11  11  11  11  11  11  11
   17:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  10  11  11  11  11  11  11
   18:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  10  11  11  11  11  11
   19:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  10  11  11  11  11
   20:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  10  11  11  11
   21:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11  10  11  11
   22:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11  11  10  11
   23:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  11  11  11  11  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1584845840 kB

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

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Platform Notes (Continued)

```
10. who -r
  run-level 3 Mar 9 21:23

------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.4)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          ModemManager blk-availability cloud-config cloud-final cloud-init cloud-init-local
                   console-setup cron dmesg e2scrub_reap finalrd getty@ grub-common grub-initrd-fallback
                   irqbalance keyboard-setup lm-sensors lvm2-monitor lxd-agent networkd-dispatcher open-iscsi
                   open-vm-tools pollinate rsync rsyslog secureboot-db setvtrgb ssh systemd-networkd
                   systemd-networkd-wait-online systemd-pstore systemd-resolved systemd-timesyncd thermald
                   tuned ua-reboot-cmds ubuntu-advantage udisks2 vgauth
  enabled-runtime  netplan-ovs-cleanup rc-local systemd-remount-fs
  disabled         apparmor console-getty debug-shell iscsid multipathd nftables powertop serial-getty@
                   smartmontools sysstat systemd-boot-check-no-failures systemd-network-generator
                   systemd-sysext systemd-time-wait-sync ufw upower
  generated        apport
  indirect         uuidd
  masked           accounts-daemon alsa-utils atd cryptdisks cryptdisks-early gpu-manager hwclock lvm2
                   multipath-tools-boot rc rcS screen-cleanup sudo x11-common

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/vmlinuz-5.15.0-46-generic
  root=/dev/mapper/ubuntu--vg-ubuntu--lv
  ro

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 400 MHz and 3.70 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:  2250MHz

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

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing               1
  kernel.randomize_va_space           0
  vm.compaction_proactiveness        20
  vm.dirty_background_bytes           0
  vm.dirty_background_ratio           3
  vm.dirty_bytes                      0
  vm.dirty_expire_centisecs        3000
  vm.dirty_ratio                      8
  vm.dirty_writeback_centisecs      500
```

(Continued on next page)

Platform Notes (Continued)

```
  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 22.04.1 LTS

------------------------------------------------------------
20. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-aocc400-B1e
  Filesystem     Type   Size  Used Avail Use% Mounted on
  tmpfs          tmpfs  125G  3.5G  122G   3% /mnt/ramdisk

------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         Dell Inc.
    Product:        PowerEdge R6625
    Product Family: PowerEdge
    Serial:         BGP4016

------------------------------------------------------------
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:
    24x 802C0000802C MTC40F2046S1RC48BA1 64 GB 2 rank 4800


------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       Dell Inc.
```

(Continued on next page)

Platform Notes (Continued)

```
    BIOS Version:      1.3.7
    BIOS Date:         03/06/2023
    BIOS Revision:     1.3
```

Compiler Version Notes

```
==============================================================================================================
C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
--------------------------------------------------------------------------------------------------------------
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 | 607.cactuBSSN_s(base)
--------------------------------------------------------------------------------------------------------------
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         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
--------------------------------------------------------------------------------------------------------------
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      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
--------------------------------------------------------------------------------------------------------------
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

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
-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

(Continued on next page)

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-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

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-v1.0.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-v1.0.xml

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