Dell Inc.

PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

SPECrate®2017_fp_base = 399
SPECrate®2017_fp_peak = Not Run

Hardware

CPU Name: AMD EPYC 9334
Max MHz: 3900
Nominal: 2700
Enabled: 32 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: 128 MB I+D on chip per chip, 32 MB shared / 8 cores
Other: None
Memory: 768 GB (12 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 125 GB on tmpfs
Other: None

Software

OS: Ubuntu 22.04.1 LTS
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Version 1.1.0 released Nov-2022
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.
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.
PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

Copyright 2017-2023 Standard Performance Evaluation Corporation

SPECrater®2017_fp_base = 399
SPECrater®2017_fp_peak = Not Run

Results Table

<table>
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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
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SPECrater®2017_fp_base = 399
SPECrater®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.

(Continued on next page)
Dell Inc.

PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

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

Test Date: Dec-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022

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/defrag' run as root.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_rate_aocc400_genoa_B_lib/lib:
/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_rate_aocc400_genoa_B_lib/lib
32:"

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.

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
Virtualization Technology : Disabled
L1 Stride Prefetcher: : Disabled
NUMA Nodes per Socket : 4
L3 Cache as NUMA Domain : Enabled

(Continued on next page)
Dell Inc.

PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

| SPECrate®2017_fp_base = 399 |
| SPECrate®2017_fp_peak = Not Run |

CPU2017 License: 6573
Test Sponsor: Dell Inc.
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Test Date: Dec-2022
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Software Availability: Nov-2022

Platform Notes (Continued)

- System Profile: Custom
- Memory Patrol Scrub: Disabled
- PCI ASPM L1 Link: Power Management: Disabled
- Determinism Slider: Power Determinism

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acacfd64d
running on amd-sut Tue Dec 13 22:03:18 2022

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
  model name: AMD EPYC 9334 32-Core Processor
  1 "physical id"s (chips)
  64 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
  cpu cores: 32
  siblings: 64
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

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 9334 32-Core Processor
  CPU family: 25
  Model: 17
  Thread(s) per core: 2
  Core(s) per socket: 32
  Socket(s): 1
  Stepping: 1
  Frequency boost: enabled
  CPU max MHz: 3911.000
  CPU min MHz: 400.0000
  BogoMIPS: 5401.80
  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
Platform Notes (Continued)

aperfmpref rapl pni pclmulqdq monitor ssse3 fma cx16 pcl mtrr lm cmp_legacy svm extatic cr8_legacy abm sse4a misalignment 3dnowprefetch osvw ibs skinit wdt tce topext perfctr_core perfctr_nb bext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bm1 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 cqmOccupy_llc cqm_mmb_total
cqm_mbm_local avx512_bf16 clzero iperf xsxveerptr rdpri wbnoinvd amdpin ccpp arat
npt lbrv svm_lock nrip_save tsc_scale vmbc_clean flushbyasis decodeassist
puasefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku
ospe avx512_vmbi2 gfin vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq
la57 rdpid overflow_reco conv succor smca fsma flush_l1d

Virtualization: AMD-V
L1d cache: 1 MiB (32 instances)
L1i cache: 1 MiB (32 instances)
L2 cache: 32 MiB (32 instances)
L3 cache: 128 MiB (4 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-7,32-39
NUMA node1 CPU(s): 16-23,48-55
NUMA node2 CPU(s): 24-31,56-63
NUMA node3 CPU(s): 8-15,40-47
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 swapping barriers and __user
pointer sanitization
Vulnerability Spectre v2: Mitigation; Retpolines, IBF conditional, IBRS_FW,
STIBP always-on, RSB filling
Vulnerability Srbd: 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 1M 8 Data 1 64 1 64
L1i 32K 1M 8 Instruction 1 64 1 64
L2 1M 32M 8 Unified 2 2048 1 64
L3 32M 128M 16 Unified 3 32768 1 64

/proc/cpuinfo cache data
cache size: 1024 KB

(Continued on next page)
## Platform Notes (Continued)

From `numactl --hardware`

WARNING: a `numactl 'node'` might or might not correspond to a physical chip.

<table>
<thead>
<tr>
<th>Node</th>
<th>CPUs</th>
<th>Size</th>
<th>Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39</td>
<td>193042 MB</td>
<td>192114 MB</td>
</tr>
<tr>
<td>1</td>
<td>16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55</td>
<td>193531 MB</td>
<td>192621 MB</td>
</tr>
<tr>
<td>2</td>
<td>24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63</td>
<td>193531 MB</td>
<td>189113 MB</td>
</tr>
<tr>
<td>3</td>
<td>8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47</td>
<td>193493 MB</td>
<td>192591 MB</td>
</tr>
</tbody>
</table>

Node distances:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
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<td>10</td>
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</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

From `/proc/meminfo`

- MemTotal: 792164584 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

/sbin/tuned-adm active

Current active profile: latency-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

/usr/bin/lsb_release -d

Ubuntu 22.04.1 LTS

From `/etc/*release*` /etc/*version*:

debian_version: bookworm/sid

os-release:

- PRETTY_NAME="Ubuntu 22.04.1 LTS"
- NAME="Ubuntu"
- VERSION_ID="22.04"
- VERSION="22.04.1 LTS (Jammy Jellyfish)"
- VERSION_CODENAME=jammy
- ID=ubuntu
- ID_LIKE=debian
- HOME_URL="https://www.ubuntu.com/"

(Continued on next page)
Platform Notes (Continued)

uname -a:
Linux amd-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

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
mmio_stale_data: Not affected
retbleed: Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Dec 13 20:22

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 3.4G 122G 3% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R6615
Product Family: PowerEdge
Serial: GLM4030

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:
12x 80AD000080AD HMCG94MEBRA109N 64 GB 2 rank 4800

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.0

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result
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SPECrater®2017_fp_base = 399
SPECrater®2017_fp_peak = Not Run

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Test Date: Dec-2022
Test by: Dell Inc.
Hardware Availability: Dec-2022
Software Availability: Nov-2022

Platform Notes (Continued)

BIOS Date: 11/25/2022
BIOS Revision: 1.1
(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
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<tr>
<th>C</th>
<th>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)</td>
</tr>
<tr>
<td></td>
<td>Target: x86_64-unknown-linux-gnu</td>
</tr>
<tr>
<td></td>
<td>Thread model: posix</td>
</tr>
<tr>
<td></td>
<td>InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin</td>
</tr>
<tr>
<td></td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>C++</td>
</tr>
<tr>
<td></td>
<td>-------------------------------------------------------</td>
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<td>C++, C, Fortran</td>
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## Dell Inc. PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

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### Compiler Version Notes (Continued)

- LLVM Mirror.Version.14.0.6
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- Base Compiler Invocation

  **C benchmarks:**
  - clang

  (Continued on next page)
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Software Availability: Nov-2022

Base Compiler Invocation (Continued)

C++ benchmarks:
clang++

Fortran benchmarks:
flang

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang

(Continued on next page)
Dell Inc.

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Tested by: Dell Inc.
Software Availability: Nov-2022

Base Optimization Flags (Continued)

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`
- `-fvecclib=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`
- `-fvecclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops`
- `-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3`
- `-feplio-vectorization-of-indices -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`
- `-fvecclib=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`
- `-feplio-vectorization-of-indices -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`
- `-fvecclib=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`
- `-fvecclib=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`

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.
PowerEdge R6615 (AMD EPYC 9334 32-Core Processor)

| SPECrate®2017_fp_base = 399 |
| SPECrate®2017_fp_peak = Not Run |

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

Test Date: Dec-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-mlllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mlllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -flang

Base Other Flags

C benchmarks:
-Wno-unused-command-line-argument

C++ benchmarks:
-Wno-unused-command-line-argument

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

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

Benchmarks using both C and C++:
-Wno-unused-command-line-argument

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

The flags files that were used to format this result can be browsed at
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/aocc400-flags.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-AMD-EPYC-v1.0.xml

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