# SPEC CPU®2017 Floating Point Rate Result

**Dell Inc.**

**PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)**

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## SPECrate®2017_fp_base

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<td>554.roms_r</td>
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### Hardware

- **CPU Name:** AMD EPYC 9124
- **Max MHz:** 3700
- **Nominal:** 3000
- **Enabled:** 16 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:** 64 MB I+D on chip per chip, 16 MB shared / 4 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.
Results Table

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SPECrate®2017_fp_base = 228
SPECrate®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,

(Continued on next page)
Operating System Notes (Continued)
'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.

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)
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 982a61ec0915b55891ef0e16acaf64d
running on amd-sut Fri Dec 2 19:32:46 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 9124 16-Core Processor
  1 "physical id"s (chips)
  32 "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: 16
  siblings: 32
  physical 0: cores 0 1 2 3 8 9 10 11 16 17 18 19 24 25 26 27

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): 32
  On-line CPU(s) list: 0-31
  Vendor ID: AuthenticAMD
  Model name: AMD EPYC 9124 16-Core Processor
  CPU family: 25
  Model: 17
  Thread(s) per core: 2
  Core(s) per socket: 16
  Socket(s): 1
  Stepping: 1
  Frequency boost: enabled
  CPU max MHz: 3713.0000
  CPU min MHz: 400.0000
  BogoMIPS: 6001.57
  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

(Continued on next page)
Dell Inc.

PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)

SPEC®2017 Floating Point Rate Result

SPECrate®2017_fp_base = 228
SPECrate®2017_fp_peak = Not Run

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Test Date: Dec-2022
Hardware Availability: Feb-2023
Tested by: Dell Inc.
Software Availability: Nov-2022

Platform Notes (Continued)

aperfmpref rapl pni pcmulqdq monitor ssse3 fma cx16 pclid sse4_1 sse4_2 x2apic movbe
popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extatic cr8_legacy abm sse4a
misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
bpolicy perfctr_1lc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
ibpbb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invvpclimd qc qd_a avx512f
avx512dq rdseed adv smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw
avx512vl xsaveopt xsaves xgetbv1 xsaves qcm_llc qcm_occup_llc qcm_mbb_total
qcm_mbb_local avx512_bf16 clzero irperf xsaverpr rdprr wbnoinvd amd_ppn cppc arat
npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512v bmi umip pku
ospe avx512_v bmi gfi vaes vpcmulqdq avx512_vnni avx512_bitalge avx512_vpopcntdq
la57 rdpid overflow_recover succor smca fsmc flush_l1d
Virtualization: AMD-V
L1d cache: 512 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
L2 cache: 16 MiB (16 instances)
L3 cache: 64 MiB (4 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-3,16-19
NUMA node1 CPU(s): 4-7,20-23
NUMA node2 CPU(s): 8-11,24-27
NUMA node3 CPU(s): 12-15,28-31

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 always-on, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Tx async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 32K 512K 8 Data 1 64 1 64
L1i 32K 512K 8 Instruction 1 64 1 64
L2 1M 16M 8 Unified 2 2048 1 64
L3 16M 64M 16 Unified 3 16384 1 64

/proc/cpuinfo cache data
cache size : 1024 KB

(Continued on next page)
Dell Inc. PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)

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

SPECrate®2017_fp_base = 228
SPECrate®2017_fp_peak = Not Run

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

Platform Notes (Continued)

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 16 17 18 19
node 0 size: 193079 MB
node 0 free: 192455 MB
node 1 cpus: 8 9 10 11 24 25 26 27
node 1 size: 193533 MB
node 1 free: 192894 MB
node 2 cpus: 12 13 14 15 28 29 30 31
node 2 size: 193497 MB
node 2 free: 189418 MB
node 3 cpus: 4 5 6 7 20 21 22 23
node 3 size: 193497 MB
node 3 free: 192944 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

From /proc/meminfo
MemTotal:       792174904 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):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):
run-level 3 Dec 2 16:38
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 R7615
Product Family: PowerEdge
Serial: RDB5031

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:
10x 80AD000080AD HMCG94MEBRA109N 64 GB 2 rank 4800
2x 80AD000080AD HMCG94MEBRA123N 64 GB 2 rank 4800

BIOS:
BIOS Vendor: Dell Inc.
Dell Inc.
PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)  

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SPECrater®2017_fp_base = 228
SPECrater®2017_fp_peak = Not Run

Platform Notes (Continued)

- BIOS Version: 1.1.0
- BIOS Date: 11/25/2022
- BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

C | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(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++ | 508.namd_r(base) 510.parest_r(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 | 511.povray_r(base) 526.blender_r(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 | 507.cactuBSSN_r(base)

(Continued on next page)
### Dell Inc. PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)

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<td>Software Availability: Nov-2022</td>
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**SPECrate®2017_fp_base = 228**

**SPECrate®2017_fp_peak = Not Run**

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### Compiler Version Notes (Continued)

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
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**Fortran**

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**Fortran, C**

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**Base Compiler Invocation**

C benchmarks:
clang

(Continued on next page)
Dell Inc.
PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)

SPECratenakedbody

SPECratenakedbody

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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

(Continued on next page)
### Base Optimization Flags (Continued)

*C benchmarks (continued):*
- `-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`
- `-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc -lflang`

*Fortran and C 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 -fstruct-layout=7`
- `-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000`
- `-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3`

*Fortran, C, and 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 -fstruct-layout=7`
- `-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang`

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

## Dell Inc.

**PowerEdge R7615 (AMD EPYC 9124 16-Core Processor)**

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**Base Optimization Flags (Continued)**

Benchmarks using Fortran, C, and C++ (continued):

- 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 -Klee -Mrecursive
- funroll-loops -mllvm -lsr-in-nested-loop
- fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang

---

**Base Other Flags**

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

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

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

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

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

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

---

The flags files that were used to format this result can be browsed at:


You can also download the XML flags sources by saving the following links:


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