



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017_fp_base = 298

PowerEdge R6615 (AMD EPYC 9174F 16-Core Processor)

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 6573

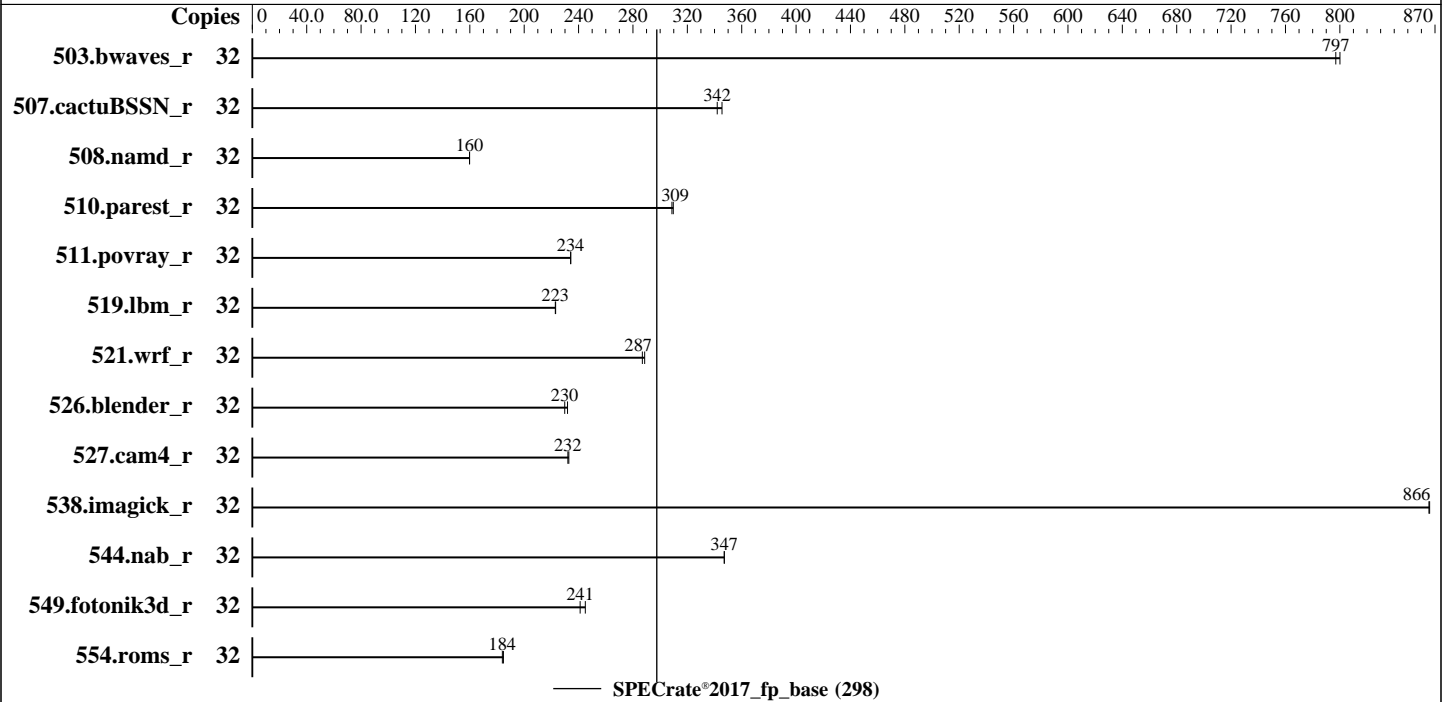
Test Date: Dec-2022

Test Sponsor: Dell Inc.

Hardware Availability: Dec-2022

Tested by: Dell Inc.

Software Availability: Nov-2022



Hardware

CPU Name: AMD EPYC 9174F
 Max MHz: 4400
 Nominal: 4100
 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: 256 MB I+D on chip per chip, 32 MB shared / 2 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
 5.15.0-46-generic
 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.



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	32	403	797	401	800									
507.cactuBSSN_r	32	118	342	117	346									
508.namd_r	32	190	160	190	160									
510.parest_r	32	271	309	270	310									
511.povray_r	32	319	234	319	234									
519.lbm_r	32	151	223	151	223									
521.wrf_r	32	250	287	248	289									
526.blender_r	32	212	230	210	232									
527.cam4_r	32	241	232	240	233									
538.imagick_r	32	91.9	866	91.9	866									
544.nab_r	32	155	347	155	347									
549.fotonik3d_r	32	509	245	517	241									
554.roms_r	32	276	184	275	185									

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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,

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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-Blb/amd_rate_aocc400_genoa_B_lib/lib
  :/mnt/ramdisk/cpu2017-1.1.8-aocc400-Blb/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

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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-Blb/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on amd-sut Tue Dec 6 13:25:31 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 9174F 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 8 9 16 17 24 25 32 33 40 41 48 49 56 57

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 9174F 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: 4409.0000
 CPU min MHz: 400.0000
 BogoMIPS: 8202.55
 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

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Platform Notes (Continued)

```

aperfmpperf 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_lld

```

```

Virtualization: AMD-V
L1d cache: 512 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
L2 cache: 16 MiB (16 instances)
L3 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0,1,16,17
NUMA node1 CPU(s): 8,9,24,25
NUMA node2 CPU(s): 4,5,20,21
NUMA node3 CPU(s): 12,13,28,29
NUMA node4 CPU(s): 6,7,22,23
NUMA node5 CPU(s): 14,15,30,31
NUMA node6 CPU(s): 2,3,18,19
NUMA node7 CPU(s): 10,11,26,27
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 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	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	32M	256M	16	Unified	3	32768	1	64

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Platform Notes (Continued)

```
/proc/cpuinfo cache data
cache size : 1024 KB
```

From numactl --hardware

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

```
available: 8 nodes (0-7)
node 0 cpus: 0 1 16 17
node 0 size: 96312 MB
node 0 free: 95894 MB
node 1 cpus: 8 9 24 25
node 1 size: 96765 MB
node 1 free: 96331 MB
node 2 cpus: 4 5 20 21
node 2 size: 96731 MB
node 2 free: 96308 MB
node 3 cpus: 12 13 28 29
node 3 size: 96765 MB
node 3 free: 96357 MB
node 4 cpus: 6 7 22 23
node 4 size: 96766 MB
node 4 free: 96333 MB
node 5 cpus: 14 15 30 31
node 5 size: 96765 MB
node 5 free: 96345 MB
node 6 cpus: 2 3 18 19
node 6 size: 96766 MB
node 6 free: 94655 MB
node 7 cpus: 10 11 26 27
node 7 size: 96729 MB
node 7 free: 94510 MB
node distances:
node  0  1  2  3  4  5  6  7
 0:  10 11 12 12 12 12 12 12
 1:  11 10 12 12 12 12 12 12
 2:  12 12 10 11 12 12 12 12
 3:  12 12 11 10 12 12 12 12
 4:  12 12 12 12 10 11 12 12
 5:  12 12 12 12 11 10 12 12
 6:  12 12 12 12 12 12 10 11
 7:  12 12 12 12 12 12 11 10
```

From /proc/meminfo

```
MemTotal: 792171852 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

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Platform Notes (Continued)

```

/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/"

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 Nov 25 18:05

```

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Platform Notes (Continued)

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 HMC94MEBRA109N 64 GB 2 rank 4800

BIOS:
BIOS Vendor: Dell Inc.
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
=====

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Compiler Version Notes (Continued)

=====
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
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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)

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

=====
Fortran | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_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

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Compiler Version Notes (Continued)

Fortran, C | 521.wrf_r(base) 527.cam4_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

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

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

Base Portability Flags

503.bwaves_r: -DSPEC_LP64

507.cactuBSSN_r: -DSPEC_LP64

508.namd_r: -DSPEC_LP64

510.parest_r: -DSPEC_LP64

511.povray_r: -DSPEC_LP64

519.lbm_r: -DSPEC_LP64

521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64

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Base Portability Flags (Continued)

```
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
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang
```

C++ benchmarks:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang
```

Fortran benchmarks:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
```

(Continued on next page)



SPEC CPU®2017 Floating Point Rate Result

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Dell Inc.

SPECrate®2017_fp_base = 298

PowerEdge R6615 (AMD EPYC 9174F 16-Core Processor)

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 both Fortran and C (continued):

-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang

Benchmarks using both C and C++:

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang

Benchmarks using Fortran, C, and C++:

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang

Base Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-Wno-unused-command-line-argument



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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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.8 on 2022-12-06 08:25:31-0500.

Report generated on 2023-03-02 11:22:15 by CPU2017 PDF formatter v6442.

Originally published on 2023-02-28.