SPEC CPU®2017 Integer Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge R6615 (AMD EPYC 9654P 96-Core Processor)
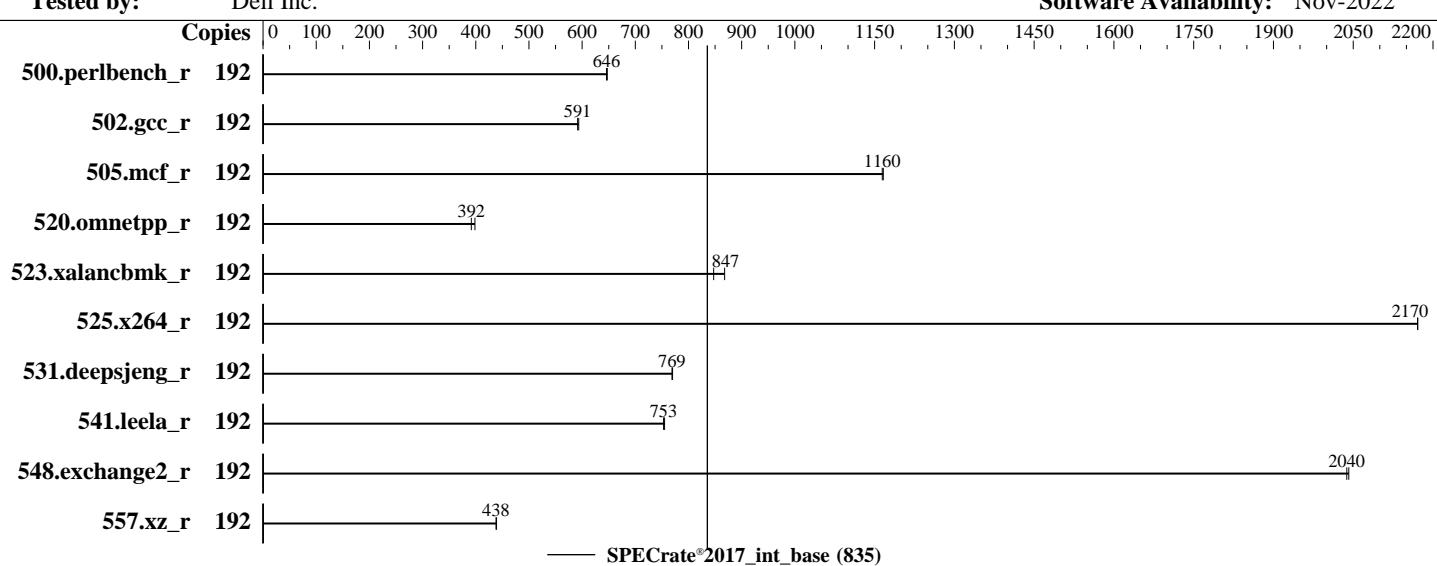
SPECrate®2017_int_base = 835

SPECrate®2017_int_peak = Not Run

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

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

Copies	
500.perlbench_r 192	646
502.gcc_r 192	591
505.mcf_r 192	1160
520.omnetpp_r 192	392
523.xalancbmk_r 192	847
525.x264_r 192	2170
531.deepsjeng_r 192	769
541.leela_r 192	753
548.exchange2_r 192	2040
557.xz_r 192	438

Scale: 0 100 200 300 400 500 600 700 800 900 1000 1150 1300 1450 1600 1750 1900 2050 2200

——— SPECrate®2017_int_base (835)

Hardware

CPU Name: AMD EPYC 9654P
 Max MHz: 3700
 Nominal: 2400
Enabled: 96 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: 384 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
 5.15.0-46-generic
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Version 0.5.3 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.

Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	192	**473**	**646**	472	647									
502.gcc_r	192	458	594	**460**	**591**									
505.mcf_r	192	**266**	**1160**	266	1170									
520.omnetpp_r	192	**643**	**392**	632	398									
523.xalancbmk_r	192	234	868	**239**	**847**									
525.x264_r	192	**155**	**2170**	155	2170									
531.deepsjeng_r	192	286	770	**286**	**769**									
541.leela_r	192	**422**	**753**	421	755									
548.exchange2_r	192	**247**	**2040**	246	2040									
557.xz_r	192	**473**	**438**	472	439									
SPECrate®2017_int_base =		**835**												
SPECrate®2017_int_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.
```

(Continued on next page)

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Operating System Notes (Continued)

```
To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'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
           NUMA Nodes per Socket : 4
       L3 Cache as NUMA Domain : Enabled

               System Profile : Custom
          Memory Patrol Scrub : Disabled
```

(Continued on next page)

Dell Inc.

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Platform Notes (Continued)

```
              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 982a61ec0915b55891ef0e16acafc64d
 running on amd-sut Fri Nov 11 21:28:23 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 9654P 96-Core Processor
       1  "physical id"s (chips)
       192 "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 : 96
       siblings  : 192
       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 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
       53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
        81 82 83 84 85 86 87 88 89 90 91 92 93 94 95


 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):                    192
       On-line CPU(s) list:       0-191
       Vendor ID:                 AuthenticAMD
       Model name:                AMD EPYC 9654P 96-Core Processor
       CPU family:                25
       Model:                     17
       Thread(s) per core:        2
       Core(s) per socket:        96
       Socket(s):                 1
       Stepping:                  1
       Frequency boost:           enabled
       CPU max MHz:               3709.0000
       CPU min MHz:               400.0000
       BogoMIPS:                  4801.51
       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)

```
    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:                     3 MiB (96 instances)
    L1i cache:                     3 MiB (96 instances)
    L2 cache:                      96 MiB (96 instances)
    L3 cache:                      384 MiB (12 instances)
    NUMA node(s):                  12
    NUMA node0 CPU(s):             0-7,96-103
    NUMA node1 CPU(s):             32-39,128-135
    NUMA node2 CPU(s):             64-71,160-167
    NUMA node3 CPU(s):             16-23,112-119
    NUMA node4 CPU(s):             48-55,144-151
    NUMA node5 CPU(s):             80-87,176-183
    NUMA node6 CPU(s):             24-31,120-127
    NUMA node7 CPU(s):             56-63,152-159
    NUMA node8 CPU(s):             88-95,184-191
    NUMA node9 CPU(s):             8-15,104-111
    NUMA node10 CPU(s):            40-47,136-143
    NUMA node11 CPU(s):            72-79,168-175
    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
```

(Continued on next page)

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Platform Notes (Continued)

```
     L1d       32K       3M    8 Data          1    64     1         64
     L1i       32K       3M    8 Instruction   1    64     1         64
     L2         1M      96M    8 Unified       2  2048     1         64
     L3        32M     384M   16 Unified       3 32768     1         64

  /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: 12 nodes (0-11)
    node 0 cpus: 0 1 2 3 4 5 6 7 96 97 98 99 100 101 102 103
    node 0 size: 64054 MB
    node 0 free: 63659 MB
    node 1 cpus: 32 33 34 35 36 37 38 39 128 129 130 131 132 133 134 135
    node 1 size: 64508 MB
    node 1 free: 64181 MB
    node 2 cpus: 64 65 66 67 68 69 70 71 160 161 162 163 164 165 166 167
    node 2 size: 64506 MB
    node 2 free: 64161 MB
    node 3 cpus: 16 17 18 19 20 21 22 23 112 113 114 115 116 117 118 119
    node 3 size: 64472 MB
    node 3 free: 60616 MB
    node 4 cpus: 48 49 50 51 52 53 54 55 144 145 146 147 148 149 150 151
    node 4 size: 64508 MB
    node 4 free: 64123 MB
    node 5 cpus: 80 81 82 83 84 85 86 87 176 177 178 179 180 181 182 183
    node 5 size: 64506 MB
    node 5 free: 64151 MB
    node 6 cpus: 24 25 26 27 28 29 30 31 120 121 122 123 124 125 126 127
    node 6 size: 64508 MB
    node 6 free: 64180 MB
    node 7 cpus: 56 57 58 59 60 61 62 63 152 153 154 155 156 157 158 159
    node 7 size: 64508 MB
    node 7 free: 64230 MB
    node 8 cpus: 88 89 90 91 92 93 94 95 184 185 186 187 188 189 190 191
    node 8 size: 64506 MB
    node 8 free: 64184 MB
    node 9 cpus: 8 9 10 11 12 13 14 15 104 105 106 107 108 109 110 111
    node 9 size: 64508 MB
    node 9 free: 64185 MB
    node 10 cpus: 40 41 42 43 44 45 46 47 136 137 138 139 140 141 142 143
    node 10 size: 64508 MB
    node 10 free: 64226 MB
    node 11 cpus: 72 73 74 75 76 77 78 79 168 169 170 171 172 173 174 175
    node 11 size: 64465 MB
    node 11 free: 64146 MB
```

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Platform Notes (Continued)

```
   node distances:
   node    0    1    2    3    4    5    6    7    8    9   10   11
     0:   10   11   11   12   12   12   12   12   12   12   12   12
     1:   11   10   11   12   12   12   12   12   12   12   12   12
     2:   11   11   10   12   12   12   12   12   12   12   12   12
     3:   12   12   12   10   11   11   12   12   12   12   12   12
     4:   12   12   12   11   10   11   12   12   12   12   12   12
     5:   12   12   12   11   11   10   12   12   12   12   12   12
     6:   12   12   12   12   12   12   10   11   11   12   12   12
     7:   12   12   12   12   12   12   11   10   11   12   12   12
     8:   12   12   12   12   12   12   11   11   10   12   12   12
     9:   12   12   12   12   12   12   12   12   12   10   11   11
    10:   12   12   12   12   12   12   12   12   12   11   10   11
    11:   12   12   12   12   12   12   12   12   12   11   11   10

 From /proc/meminfo
    MemTotal:       792126060 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/"

 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:
```

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Platform Notes (Continued)

```
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 11 21:21

  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:          GLM4018

  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 802C0000802C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

  BIOS:
     BIOS Vendor:       Dell Inc.
     BIOS Version:      0.5.3
     BIOS Date:         11/10/2022
     BIOS Revision:     0.5

  (End of data from sysinfo program)
```

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Compiler Version Notes

```
==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
         | 525.x264_r(base) 557.xz_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++      | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
         | 541.leela_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
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_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
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

Fortran benchmarks:
```
flang
```

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Base Portability Flags

500.perlbench_r: `-DSPEC_LINUX_X64 -DSPEC_LP64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LINUX -DSPEC_LP64`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_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
-z muldefs -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 -lflang
-lamdalloc
```

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -z muldefs -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
-lamdalloc-ext
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -z muldefs -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of-inductions
-mllvm -optimize-strided-mem-cost -floop-transform
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
-lflang -lamdalloc
```

Dell Inc.

PowerEdge R6615 (AMD EPYC 9654P 96-Core Processor)

SPECrate®2017_int_base =   835

SPECrate®2017_int_peak = Not Run

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

Base Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument
```

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

Fortran benchmarks:

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

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