Dell Inc. PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor) SPECrate®2017_int_base = 654 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

<table>
<thead>
<tr>
<th>SPECrate+ 2017 int_base</th>
<th>SPECrate+ 2017 int_peak</th>
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<tbody>
<tr>
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<tr>
<td>500.perlbench_r</td>
<td>128</td>
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<tr>
<td>502.gcc_r</td>
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<tr>
<td>523.xalancbmk_r</td>
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<tr>
<td>525.x264_r</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>548.exchange2_r</td>
<td>128</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>128</td>
</tr>
</tbody>
</table>

--- SPECrate® 2017 int_base (654) ---

Hardware

CPU Name: AMD EPYC 9554P
Max MHz: 3750
Nominal: 3100
Enabled: 64 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 / 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.
**SPEC CPU®2017 Integer Rate Result**

Dell Inc.  
PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor)  

<table>
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<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
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<td>417</td>
<td>489</td>
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<tr>
<td>gcc_r</td>
<td>128</td>
<td>367</td>
<td>494</td>
<td>364</td>
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<tr>
<td>mcf_r</td>
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<td>949</td>
<td>217</td>
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<td>560</td>
<td>300</td>
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<tr>
<td>xalancbmk_r</td>
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<td>695</td>
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<td></td>
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<tr>
<td>x264_r</td>
<td>128</td>
<td>195</td>
<td>695</td>
<td>197</td>
<td>686</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deepsjeng_r</td>
<td>128</td>
<td>251</td>
<td>585</td>
<td>250</td>
<td>587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>leela_r</td>
<td>128</td>
<td>375</td>
<td>565</td>
<td>375</td>
<td>565</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exchange2_r</td>
<td>128</td>
<td>205</td>
<td>1640</td>
<td>205</td>
<td>1640</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xx_r</td>
<td>128</td>
<td>422</td>
<td>328</td>
<td>422</td>
<td>328</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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)
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
Dell Inc.  
PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor) 

SPEC®CPU2017 Integer Rate Result  

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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 982a61ec0915b55891ef0e16aca64d  
running on amd-sut Thu Nov 17 23:56:14 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 9554P 64-Core Processor  
- 1 "physical id"s (chips)  
- 128 "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 : 64  
- siblings : 128

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

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): 128
- On-line CPU(s) list: 0-127
- Vendor ID: AuthenticAMD
- Model name: AMD EPYC 9554P 64-Core Processor
- CPU family: 25
- Model: 17
- Thread(s) per core: 2
- Core(s) per socket: 64
- Socket(s): 1
- Stepping: 1
- Frequency boost: enabled
- CPU max MHz: 3764.0000
- CPU min MHz: 400.0000
- BogoMIPS: 6201.32
- 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

(Continued on next page)
Dell Inc.

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Platform Notes (Continued)

popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibr s kinit 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 vmc mcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adv smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsavees cqm_llc cqm_occu p_llc cqm_mbm_total cqm_mbm_local avx512_bf16 clzero irreperf xsaverpr rdpru wbinvd amd_ppin cppc arat npt lbrv svm_lock nrip_save tscale vmcb_clean flushbyasis decodeassists pausefilter pffr Thread ape v_vmsetup vmload vgif v_spec_ctrl avx512vbmi umip pku ospke avx512_vmbi2 gfn va vs vclmuldq avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid overflow_recover succor smca frm flush_l1d

Virtualization: AMD-V
L1d cache: 2 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 64 MiB (64 instances)
L3 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-7, 64-71
NUMA node1 CPU(s): 32-39, 96-103
NUMA node2 CPU(s): 16-23, 80-87
NUMA node3 CPU(s): 48-55, 112-119
NUMA node4 CPU(s): 24-31, 88-95
NUMA node5 CPU(s): 56-63, 120-127
NUMA node6 CPU(s): 8-15, 72-79
NUMA node7 CPU(s): 40-47, 104-111

Vulnerability Itlb multi-hit: Not affected
Vulnerability L1ttf: 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 Tsx asyc abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>1M</td>
<td>64M</td>
<td>8</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>32M</td>
<td>256M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

(Continued on next page)
Dell Inc.  
PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor)  

SPEC CPU® 2017 Integer Rate Result
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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 2 3 4 5 6 7 64 65 66 67 68 69 70 71
  node 0 size: 96310 MB
  node 0 free: 95851 MB
  node 1 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
  node 1 size: 96763 MB
  node 1 free: 96357 MB
  node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
  node 2 size: 96764 MB
  node 2 free: 92862 MB
  node 3 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
  node 3 size: 96727 MB
  node 3 free: 96269 MB
  node 4 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
  node 4 size: 96764 MB
  node 4 free: 96335 MB
  node 5 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
  node 5 size: 96763 MB
  node 5 free: 96378 MB
  node 6 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
  node 6 size: 96764 MB
  node 6 free: 96385 MB
  node 7 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
  node 7 size: 96722 MB
  node 7 free: 96338 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 10 11 11
  7: 12 12 12 12 12 12 11 10

From /proc/meminfo
  MemTotal:    792144164 kB
  HugePages_Total:      0
  Hugepagesize:      2048 kB

/sbin/tuned-adm active

(Continued on next page)
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Platform Notes (Continued)

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:
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 17 23:45

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b

(Continued on next page)
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Platform Notes (Continued)

<table>
<thead>
<tr>
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<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>3.4G</td>
<td>122G</td>
<td>3%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

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 802C00000802C 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)

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

(Continued on next page)
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**Compiler Version Notes (Continued)**

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**Base Compiler Invocation**

**C benchmarks:**
- clang

**C++ benchmarks:**
- clang++

**Fortran benchmarks:**
- flang

**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

(Continued on next page)
### Dell Inc.

**PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor)**

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<tr>
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**Test Date:** Nov-2022  
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### Base Optimization Flags (Continued)

- C benchmarks (continued):
  - `-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`
  - `-lmdalloc`

- 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`
  - `-mlvm -unroll-threshold=100 -finline-aggressive`
  - `-mlvm -loop-uns witch-threshold=200000`
  - `-mlvm -reduce-array-computations=3 -zopt`
  - `-fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang`
  - `-lmdalloc-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`
  - `-mlvm -optimize-strided-mem-cost -floop-transform`
  - `-mlvm -unroll-aggressive -mlvm -unroll-threshold=500 -lamdlibm`
  - `-lflang -lmdalloc`

### 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:

**SPEC CPU®2017 Integer Rate Result**

**Dell Inc.**

PowerEdge R6615 (AMD EPYC 9554P 64-Core Processor)  

<table>
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<tr>
<th>SPECrate®2017_int_base = 654</th>
<th>SPECrate®2017_int_peak = Not Run</th>
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</thead>
</table>

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

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

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