Dell Inc. PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

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

<table>
<thead>
<tr>
<th>Thread</th>
<th>Specbench S</th>
<th>Specgcc S</th>
<th>Specmcf S</th>
<th>Specomnetpp S</th>
<th>Specxalancbmk S</th>
<th>Specx264 S</th>
<th>Specdeepjeng S</th>
<th>Specleela S</th>
<th>Specexchange2 S</th>
<th>Specxz S</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
</tr>
</tbody>
</table>

Threads

SPECspeed®2017_int_base = 13.9
SPECspeed®2017_int_base = Not Run

Hardware
CPU Name: AMD EPYC 9534
Max MHz: 3700
Nominal: 2450
Enabled: 64 cores, 1 chip
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: Yes
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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td>8.33</td>
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<td>14.4</td>
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<tr>
<td>605.mcf_s</td>
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<td>20.2</td>
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<tr>
<td>620.omnetpp_s</td>
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<td>159</td>
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<td>156</td>
<td>10.5</td>
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<td>623.xalancbmk_s</td>
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<td>74.6</td>
<td>19.0</td>
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<tr>
<td>625.x264_s</td>
<td>64</td>
<td>82.6</td>
<td>21.4</td>
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<td>631.deepsjeng_s</td>
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<tr>
<td>641.leela_s</td>
<td>64</td>
<td>292</td>
<td>5.84</td>
<td>64</td>
<td>292</td>
<td>5.85</td>
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<td>648.exchange2_s</td>
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<td>116</td>
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<tr>
<td>657.xz_s</td>
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<td>64</td>
<td>241</td>
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</tbody>
</table>

**SPECspeed®2017_int_base = 13.9**  
**SPECspeed®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)
Dell Inc.

PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

SPEC®2017 Integer Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Operating System Notes (Continued)

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:
GOMP_CPU_AFFINITY = "0-63"
LD_LIBRARY_PATH = 
"/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_speed_aocc400_genoa_B_lib/lib:
 LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOCS_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULER = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"

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
- Logical Processor : Disabled
- Virtualization Technology : Enabled
- NUMA Nodes per Socket : 4
- L3 Cache as NUMA Domain : Enabled

(Continued on next page)
Dell Inc.

PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

SPECspeed®2017_int_base = 13.9

SPECspeed®2017_int_peak = Not Run

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

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

Platform Notes (Continued)

System Profile: Custom
C-States: Disabled
Memory Patrol Scrub: Disabled
PCI ASPM L1 Link
Power Management: Disabled
Determinism Slider: Power Determinism
Algorithm Performance Boost Disable (ApbDis): Enabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on amd-sut Mon Jan 9 15:03:15 2023

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 9534 64-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: 64
  siblings: 64
  physical 0: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 32 33 34 35 36 37 38 39
  48 49 50 51 52 53 54 55 64 65 66 67 68 69 70 71 80 81 82 83 84 85 86 87 96 97 98 99
  100 101 102 103 112 113 114 115 116 117 118 119

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 9534 64-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 1
Core(s) per socket: 64
Socket(s): 1
Stepping: 1
Frequency boost: enabled
CPU max MHz: 3719.0000

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

**PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)**

<table>
<thead>
<tr>
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<tr>
<td>SPECspeed®2017_int_peak</td>
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<td>Feb-2023</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Nov-2022</td>
</tr>
</tbody>
</table>

#### Platform Notes (Continued)

CPU min MHz: 400.0000

BogoMIPS: 4901.54

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr

gpe mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt

dpdpgo gdcmpeq lms constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid

aperfmpcr perf racl pctlmulq4 monitor ssses 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

misaignment 3dnnowprefetch osw ibs skinit wdt tce topoexec perfctr_core perfctr_nb

bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs

ibpp stibp vmmcall fsqsbasis bni avx2 smp bni2 erms inyvpcid cqn rdt_a avx512f

avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha ni avx512bw

avx512vl xsaveopt xsavec xgetthread xsavec xsavec xsavec xsavec xsavec xsavec xsavec xsavec

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/swaps barriers and __user

pointer sanitization

Vulnerability Spectre v2: Mitigation; Retpolines, IBFB conditional, IBFS_FW,

STIBP disabled, RSB filling

Vulnerability Srbd: Not affected

Vulnerability Tsa async abort: Not affected

From lscpu --cache:
**SPEC CPU®2017 Integer Speed Result**

**Dell Inc.**

PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

- **SPECspeed®2017_int_base** = 13.9
- **SPECspeed®2017_int_peak** = Not Run

---

**Platform Notes (Continued)**

<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>
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<tr>
<td>L1d</td>
<td>32K</td>
<td>2M</td>
<td>8</td>
<td>Data</td>
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<td>64</td>
<td>1</td>
<td>64</td>
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<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>

/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
node 0 size: 96312 MB
node 0 free: 95995 MB

node 1 cpus: 32 33 34 35 36 37 38 39
node 1 size: 96764 MB
node 1 free: 96556 MB

node 2 cpus: 16 17 18 19 20 21 22 23
node 2 size: 96765 MB
node 2 free: 96504 MB

node 3 cpus: 48 49 50 51 52 53 54 55
node 3 size: 96729 MB
node 3 free: 96650 MB

node 4 cpus: 24 25 26 27 28 29 30 31
node 4 size: 96765 MB
node 4 free: 93072 MB

node 5 cpus: 56 57 58 59 60 61 62 63
node 5 size: 96764 MB
node 5 free: 96589 MB

node 6 cpus: 8 9 10 11 12 13 14 15
node 6 size: 96765 MB
node 6 free: 96623 MB

node 7 cpus: 40 41 42 43 44 45 46 47
node 7 size: 96726 MB
node 7 free: 96534 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

(Continued on next page)
Dell Inc.

PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

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

SPECspeed®2017_int_base = 13.9
SPECspeed®2017_int_peak = Not Run

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

Platform Notes (Continued)

From /proc/meminfo
MemTotal: 792162172 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:

CVE-2018-12207 (iTLB Multithit):
  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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):
  Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

(Continued on next page)
## Dell Inc.

**PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)**

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

### Platform Notes (Continued)

- **CVE-2020-0543 (Special Register Buffer Data Sampling):** Not affected
- **CVE-2019-11135 (TSX Asynchronous Abort):** Not affected

**run-level 3 Jan 9 15:02**

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

```
<table>
<thead>
<tr>
<th>Filesystem</th>
<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 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.
  - BIOS Version: 1.1.0
  - BIOS Date: 11/25/2022
  - BIOS Revision: 1.1

(End of data from `sysinfo` program)

### Compiler Version Notes

```
C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base)  
    | 625.x264_s(base) 657.xz_s(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++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
-----------------------------
```

(Continued on next page)
Dell Inc. PowerEdge R7615 (AMD EPYC 9534 64-Core Processor) Dell Inc.

Compiler Version Notes (Continued)

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<tr>
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</table>

Fortran | 648.exchange2_s(base)

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</tr>
<tr>
<td>InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin</td>
</tr>
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</table>

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Base Portability Flags

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64
Dell Inc. PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)

**SPECspeed®2017_int_base** = 13.9
**SPECspeed®2017_int_peak** = Not Run

### CPU2017 License:
6573

### Test Sponsor:
Dell Inc.

### Tested by:
Dell Inc.

### Test Date:
Jan-2023

### Hardware Availability:
Feb-2023

### Software Availability:
Nov-2022

#### Base Optimization Flags

**C** benchmarks:
- `-m64` `-Wl, -mllvm -Wl, -align-all-nofallthru-blocks=6`
- `-Wl, -mllvm -Wl, -reduce-array-computations=3`
- `-Wl, -allow-multiple-definition -O3 -march=znver4 -fveclib=AMDLIBM`
- `-ffast-math -fopenmp -flto -fstruct-layout=7`
- `-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000`
- `-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3`
- `-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -1flang -lamlalloc`

**C++** benchmarks:
- `-m64` `-Wl, -mllvm -Wl, -align-all-nofallthru-blocks=6`
- `-Wl, -mllvm -Wl, -reduce-array-computations=3 -O3 -march=znver4`
- `-fveclib=AMDLIBM -ffast-math -fopenmp -flto`
- `-mllvm -unroll-threshold=100 -finline-aggressive`
- `-mllvm -loop-unswitch-threshold=200000`
- `-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt`
- `-fvirtual-function-elimination -fvisibility=hidden -fopenmp=libomp`
- `-lomp -lamdlibm -1flang -lamlalloc-ext`

**Fortran** benchmarks:
- `-m64` `-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 -O3 -march=znver4 -fveclib=AMDLIBM`
- `-ffast-math -fopenmp -flto -mllvm -optimize-strided-mem-cost`
- `-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -fopenmp=libomp`
- `-lomp -lamdlibm -1flang -lamlalloc`

#### Base Other Flags

**C** benchmarks:
- `-Wno-return-type -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 Speed Result

**Dell Inc.**

**PowerEdge R7615 (AMD EPYC 9534 64-Core Processor)**

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<th>SPECspeed®2017_int_base</th>
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**CPU2017 License:** 6573  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Jan-2023  
**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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