**SPEC CPU®2017 Integer Speed Result**

**Dell Inc.**

PowerEdge R6615 (AMD EPYC 9354 32-Core Processor)

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<tr>
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### Threads

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<th>Threads (32)</th>
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<td>600.perlbench_s</td>
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<td>641.leela_s</td>
<td>6.00</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>25.9</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>26.2</td>
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**Hardware**

- **CPU Name:** AMD EPYC 9354
- **Max MHz:** 3800
- **Nominal:** 3250
- **Enabled:** 32 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 core, 32 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:** 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.
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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.
'nnumactl' 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.
Dell Inc. PowerEdge R6615 (AMD EPYC 9354 32-Core Processor) SPECspeed®2017_int_base = 14.2
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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 = "0-31"
LD_LIBRARY_PATH = "/mnt/ramdisk/cpu2017-1.1.8-aocc400-B1b/amd_speed_aocc400_genoa_B_lib/lib:":"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "32"

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 : Disabled
- NUMA Nodes per Socket : 4
- L3 Cache as NUMA Domain : Enabled

(Continued on next page)
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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 982a61ec0915b55891ef0e16aca64d
running on amd-sut Sat Jan 14 19:30:34 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 9354 32-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 : 32
  - siblings : 32
  - physical 0: cores 0 1 2 3 16 17 18 19 32 33 34 35 48 49 50 51 64 65 66 67 80 81 82 83 96 97 98 99 112 113 114 115

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 9354 32-Core Processor
- CPU family: 25
- Model: 17
- Thread(s) per core: 1
- Core(s) per socket: 32
- Socket(s): 1
- Stepping: 1
- Frequency boost: enabled
- CPU max MHz: 3800.0000
- CPU min MHz: 400.0000

(Continued on next page)
Platform Notes (Continued)

BogoMIPS: 6502.06
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 r Claire 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 3nowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
       bpxe perfctr_llc mwaitx cbp cat_l3 cdp_13 invpcid_single hw_pstate ssbd mba ibrs
       ibpb stibp vmcall fsgsbse bmis1 avx2 smep bmis2 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_mmb_total
       cqm_mmb_local avx512_bf16 clzero irperf xsaverptr rdpru whnoinvd amd_pini ccpp arat
       npt lbrv svm_lock nrip_save tsc_scale vmb_clean flushbyasis decodeassists
       pausefilter pfthresholdavic 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 fsma flush_l1d
Virtualization: AMD-V
L1d cache: 1 MiB (32 instances)
L1i cache: 1 MiB (32 instances)
L2 cache: 32 MiB (32 instances)
L3 cache: 256 MiB (8 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-3
NUMA node1 CPU(s): 16-19
NUMA node2 CPU(s): 8-11
NUMA node3 CPU(s): 24-27
NUMA node4 CPU(s): 12-15
NUMA node5 CPU(s): 28-31
NUMA node6 CPU(s): 4-7
NUMA node7 CPU(s): 20-23
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 sanitation
Vulnerability Spectre v2: Mitigation; Retpolines, IBFB conditional, IBRS_FW,
       STIBP disabled, RSB filling
Vulnerability Srbd: 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)
### Platform Notes (Continued)

```
L1d  32K  1M  8 Data  1  64  1  64
L1i  32K  1M  8 Instruction  1  64  1  64
L2   1M   32M  8 Unified  2  2048 1  64
L3   32M  256M 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: 8 nodes (0-7)
node 0 cpus: 0 1 2 3
node 0 size: 96312 MB
node 0 free: 92473 MB
node 1 cpus: 16 17 18 19
node 1 size: 96765 MB
node 1 free: 96597 MB
node 2 cpus: 8 9 10 11
node 2 size: 96766 MB
node 2 free: 96495 MB
node 3 cpus: 24 25 26 27
node 3 size: 96765 MB
node 3 free: 96582 MB
node 4 cpus: 12 13 14 15
node 4 size: 96766 MB
node 4 free: 96592 MB
node 5 cpus: 28 29 30 31
node 5 size: 96730 MB
node 5 free: 96508 MB
node 6 cpus: 4 5 6 7
node 6 size: 96766 MB
node 6 free: 96525 MB
node 7 cpus: 20 21 22 23
node 7 size: 96729 MB
node 7 free: 96569 MB
node distances:
```
```

From /proc/meminfo

(Continued on next page)
Platform Notes (Continued)

MemTotal: 792171852 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 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/swaps barriers and __user pointer sanitization

CVE-2017-5715 (Spectre variant 2):
Mitigation: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Not affected

(Continued on next page)
## Platform Notes (Continued)

CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jan 14 19:22

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

(End of data from sysinfo program)

## Compiler Version Notes

```
<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(base)</th>
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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)
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

**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
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### 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 -liflang -lamdalloc`

**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 -liflang -lamdalloc-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 -liflang -lamdalloc`

### 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

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


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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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