Lessons learned from leveling up RISC-V LLVM testing

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Background

- RISC-V

- LLVM's buildbot infrastructure

    - Important: this is focused on post-commit CI

Challenges

Challenge:

Lack of high performance commodity RISC-V hardware with support for all desired instruction set extensions.

Challenge:

A full bootstrap build and test under qemu-system is incredibly slow (>16h).

Challenge:

Limitations in bug finding ability of a two-stage Clang build followed by running LLVM's unit tests.

Challenge:

Missing a flow for iterative developing and testing builder configurations prior to commit and deployment from llvm-zorg.

Challenge:

Existing buildbot worker configurations/recipes are hard to customise to the needs of the RISC-V setup. e.g. cross-compilation followed by running tests under qemu-system.

Challenge:

Difficult to reproduce a failure locally.

Challenge:

It can be time consuming to manually root cause a regression with multiple candidate commits.

Challenge:

There is no single "best" builder approach given the pros/cons of different emulation choices and trade-offs of test coverage and speed.

Challenge:

The buildbot interface is hard to navigate to check the status of RISC-V bots at a glance, so failures can go unnoticed.

Dashboard: https://igalia.github.io/riscv-llvm-ci/

RISC-V LLVM CI status

Generated at 2025-04-06 13:59. All times were recalculated in your local timezone (Europe/London). Regenerated approximately every 20 minutes.

Bot	In progress build	Previous build
clang-riscv-rva20-2stage ▶ Info	● #802 1h31m ago	● #801 1h32m · 2025-04-06 12:28
clang-riscv-rva23-evl-vec-2stage ▶ Info	● #641 13m ago	● #640 1h57m · 2025-04-06 13:46
clang-riscv-rva23-2stage ▶ Info	● #531 5h59m ago	● #530 15h21m · 2025-04-06 07:59
libc-riscv64-debian-dbg ▶ Info		● #12799 9m · 2025-04-06 12:36
libc-riscv64-debian-fullbuild-dbg ▶ Info	● #11903 1m ago	● #11902 4m · 2025-04-06 12:41
libc-riscv32-qemu-yocto-fullbuild-dbg ▶ Info	● #6722 1m ago	● #6721 37m · 2025-04-06 13:36

This dashboard and the clang-* bots operated by Igalia 🟠, supported by RISE ▲.

Thank you

- Patch reviewers

- Everyone contributing to development and upkeep of LLVM's testing infrastructure.

- RISE for supporting this work.

Questions?

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Overflow

- Release testing

Future work:

- Performance testing and tracking.

- Wider ecosystem testing (e.g. large corpus of Linux packages)

- On-demand pre-commit CI.