



## The Road to Github Actions: Migrating LLVM's CI



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# THE ROAD TO GITHUB ACTIONS: MIGRATING LLVM'S CI

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Work performed while employed by LLNL.

# RELIABLE CI IS IMPORTANT

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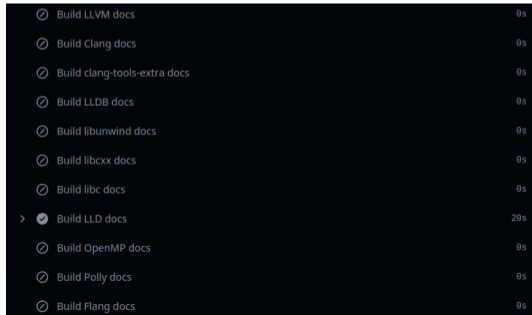
- » Fast, reliable feedback is extremely helpful for ensuring the relevant functionality works and for improving code quality.
- » A lack of reliability, or even just a poor perception of reliability, drastically reduces trust in the CI system.
- » Trust in the CI system is almost as important as the system working correctly.

# WHAT EXISTS CURRENTLY?

- » Code formatting checks (implemented by Tobias Hieta).
- » Full tests for the release branches (implemented by Tom Stellard).
- » Pipelines for testing specifics subprojects, like SPIRV and the libclang python bindings.
- » Documentation build tests.



A screenshot of a GitHub Actions bot comment. The comment header shows 'github-actions bot' commented 11 minutes ago. The main text contains a warning icon followed by 'C/C++ code formatter, clang-format found issues in your code.' Below this, there are two bullet points: 'You can test this locally with the following command:' and 'View the diff from clang-format here.' At the bottom left of the comment box is a smiley face emoji.



A screenshot of a GitHub Actions workflow run. The list of jobs includes: 'Build LLVM docs' (0s), 'Build Clang docs' (0s), 'Build clang-tools-extra docs' (0s), 'Build LLDB docs' (0s), 'Build libunwind docs' (0s), 'Build libcxx docs' (0s), 'Build libc docs' (0s), 'Build LLD docs' (20s), 'Build OpenMP docs' (0s), 'Build Polly docs' (0s), and 'Build Flang docs' (0s). The 'Build LLD docs' job is currently selected and expanded.

# LESSONS LEARNED

## » Testing is hard.

1. The testing story for Github Actions is not particularly good.
2. Automated fully integrated tests are not really possible.
3. Unit tests on components like python scripts are possible with mocking, but not yet implemented.

## » Reliability is even harder.

1. Lots of problems come up at scale that don't come up during testing.
2. Rare issues are often difficult for CI maintainers to find.
3. Rare issues can impact the perceived reliability of the system after they have been fixed!
4. It can be difficult to even find issues as the monorepo runs 1500 workflows per day.

Clang format action picking up diffs from other commits #73873

 Closed boomanaiden154 opened this issue on Nov 29, 2023 · 2 comments

[Github] Check code formatting sometimes gets stuck on checking out merge base #79661

 Open boomanaiden154 opened this issue on Jan 26 · 1 comment

- » Security is important, especially given LLVM's position in the software ecosystem.
- » There are a lot of security nuances with Github actions.
- » We try our best, but probably aren't perfect.
- » Not a large issue on Github-hosted runners (other than tokens potentially being accessible to untrusted code), but becomes a much larger issue on self-hosted runners.

## » Benefits

1. Much tighter integration with the review tooling, and makes it easier to implement tooling for nice to have like information rich failure comments.
2. Seems to be a much larger portion of the community familiar with Github Actions/interested in working on them.

## » Existing work - <https://discourse.llvm.org/t/rfc-llvm-precommit-ci-through-github-actions>

1. Some issues, designed to fit in constraints that were maybe somewhat artificial.
2. Some progress (fast Linux toolchain), not much else.

## [RFC] LLVM Precommit CI through Github Actions

■ LLVM Project



boomanaiden154-1

Jan 22

### Motivation

LLVM already has precommit CI in the form of the Buildkite pipeline that supports both Linux and Windows. However, this pipeline is not well integrated within Github, and there have sometimes been reliability issues. Moving over to Github actions allows for better integration within Github, allows for people to more easily hack on the CI pipeline as many more are familiar with Github actions over

# FINAL TAKEAWAYS

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- » Report issues!
- » Reliability seems to be improving over time.



# ACKNOWLEDGEMENTS

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Lots of people have already done work on the Github Actions. Here is a small sample:

- » Tom Stellard
- » Tobias Hieta
- » David Spickett

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