

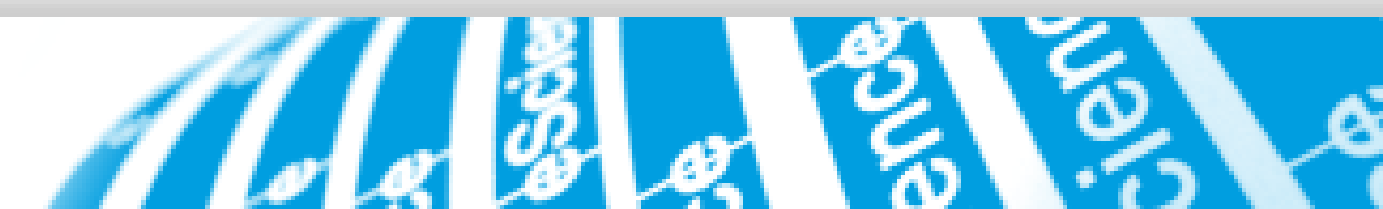
# Software Engineering

## Jens Wehner

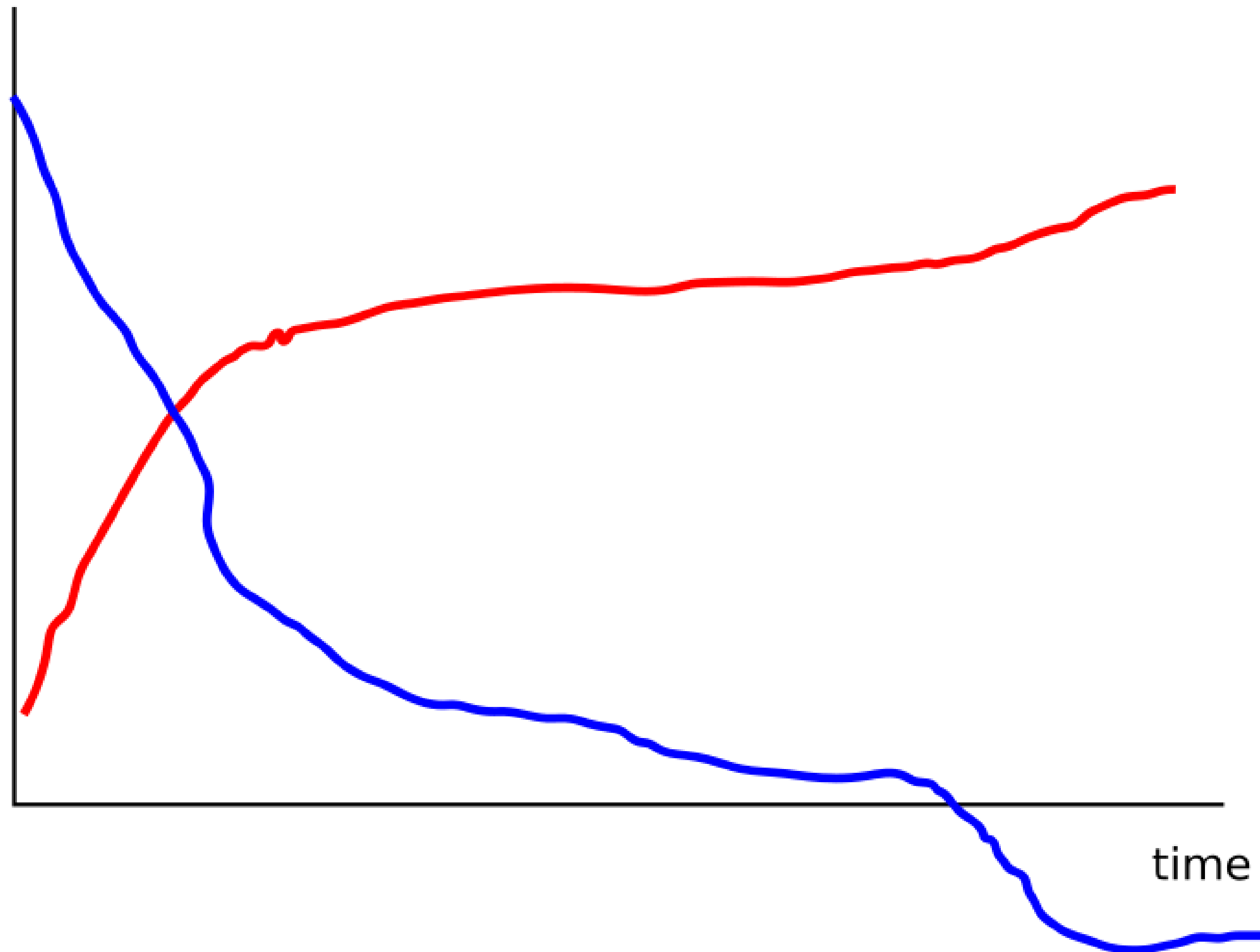


# Software Engineering is Programming integrated over **time**

Titus Winters, Google C++ devlead



development speed



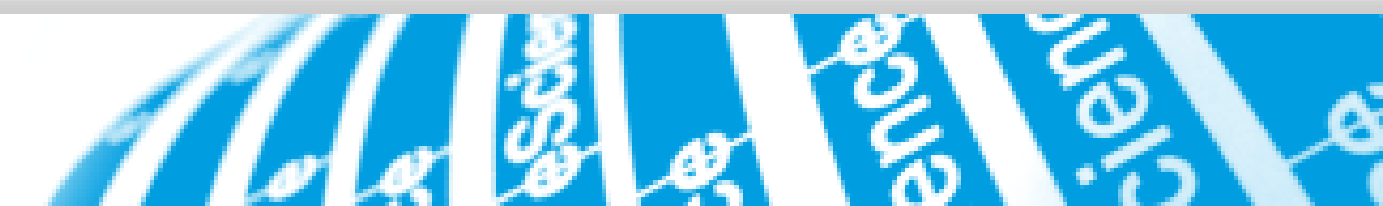
Version Control

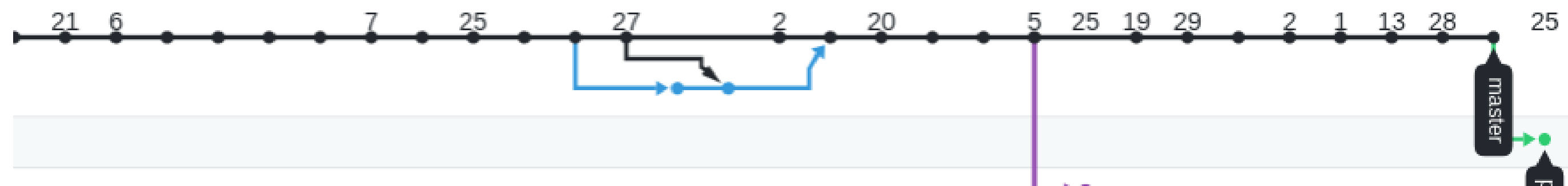
Gitlab/Github

Code Review

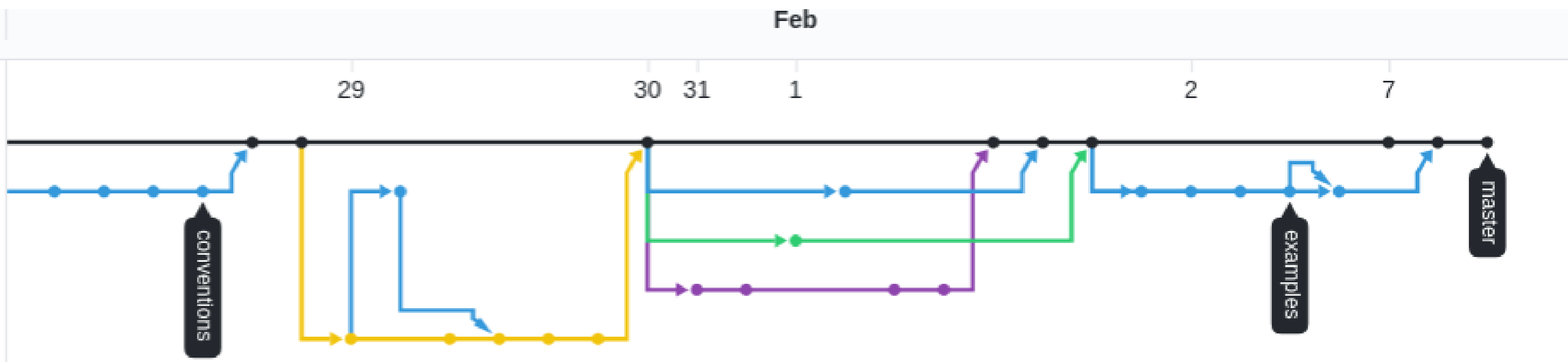
Testing

Documentation

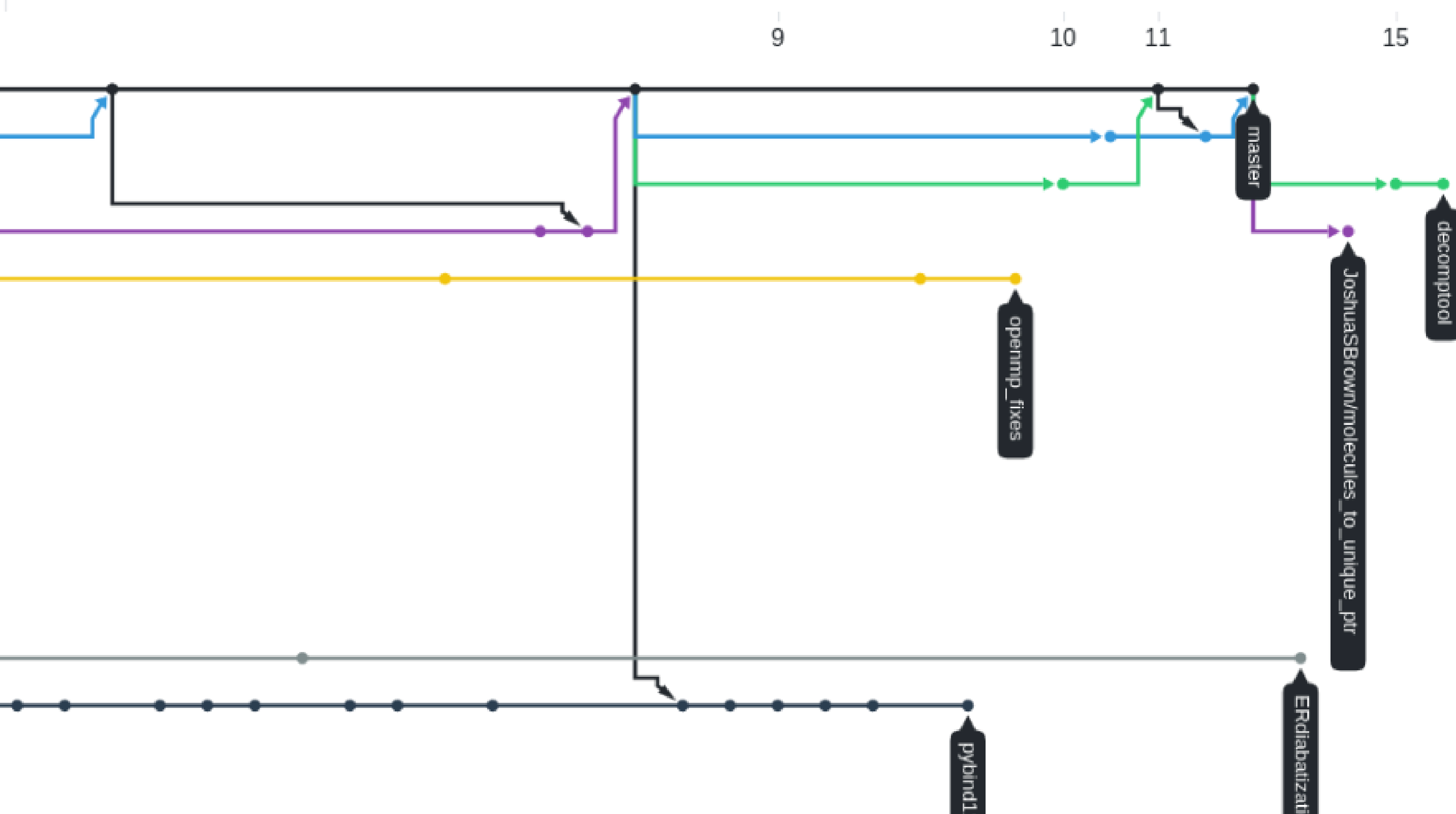




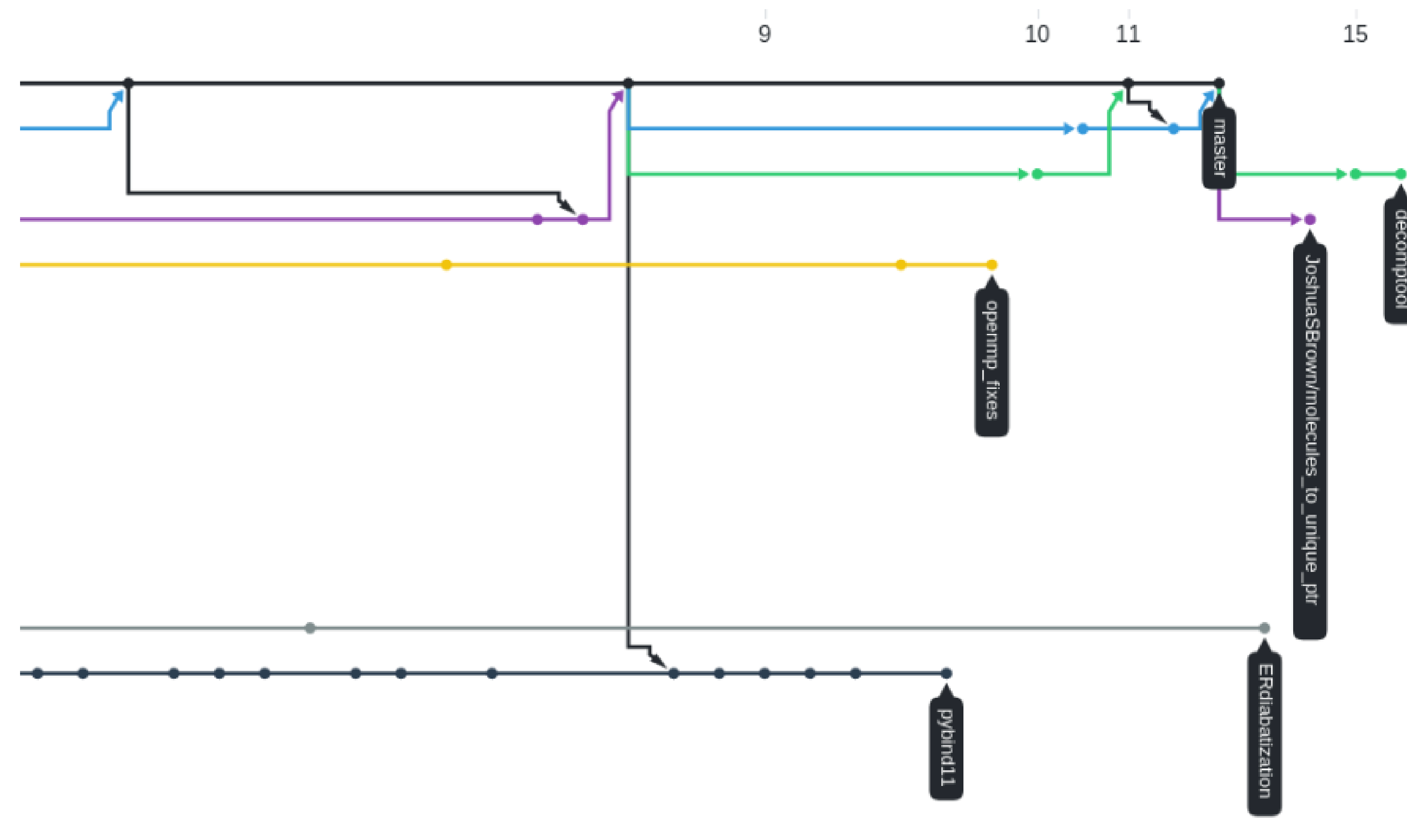
Alone



2-3 researchers

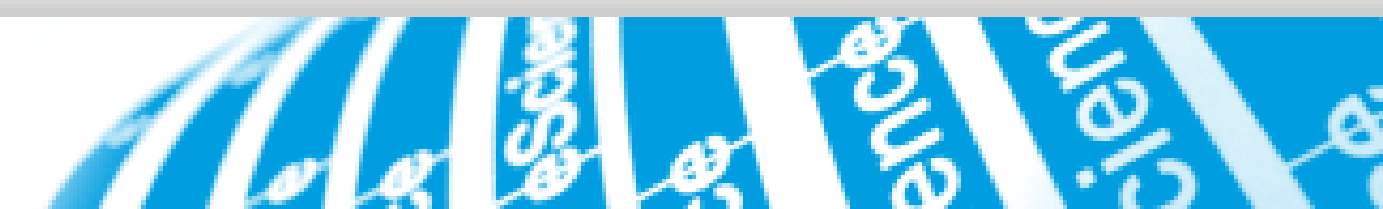


4-5 devs + releases



## Code Review

- Consistent design and implementation
- Minimizing your mistakes and their impact
- Improving code performance
- Sharing new techniques



# How long should this code last?

Longer than a week -> Use version control + Gitlab

Longer than 3 months -> Write tests

Longer than half a year -> Write documentation

Longer than half a year -> Automated tests

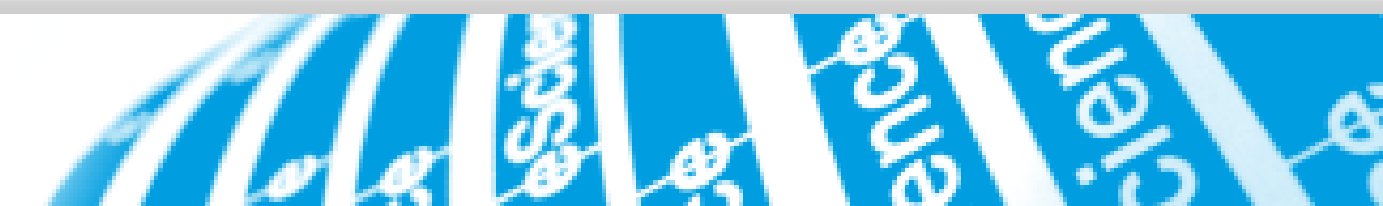
# How may people use it?

1 -> just push to master

2+ -> use branches and merge to master

2+ (+ students) -> Code Review

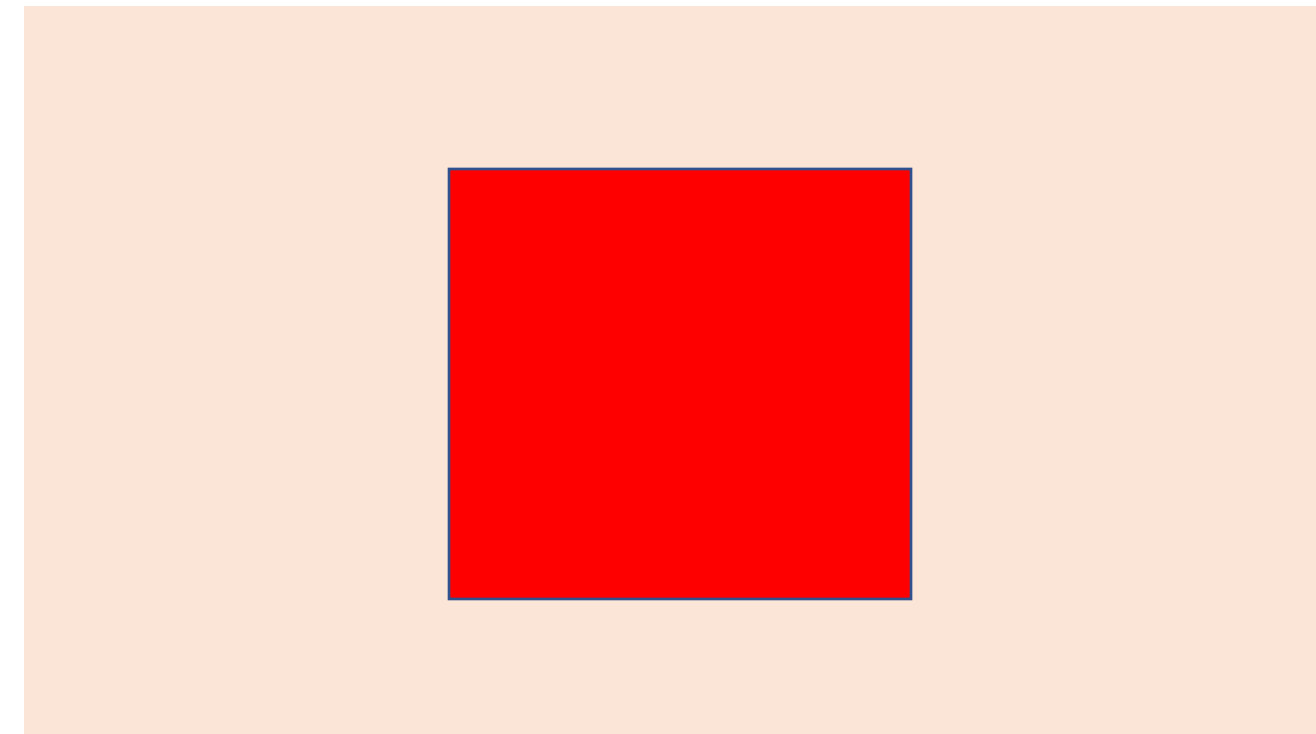
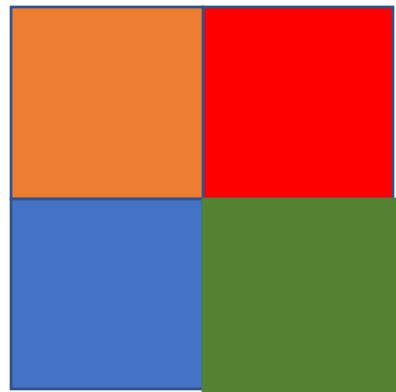
2+ (+outside users) -> Release Branch + everything else



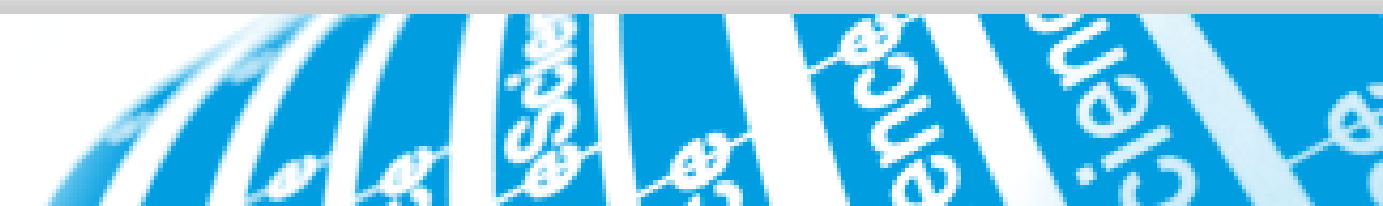
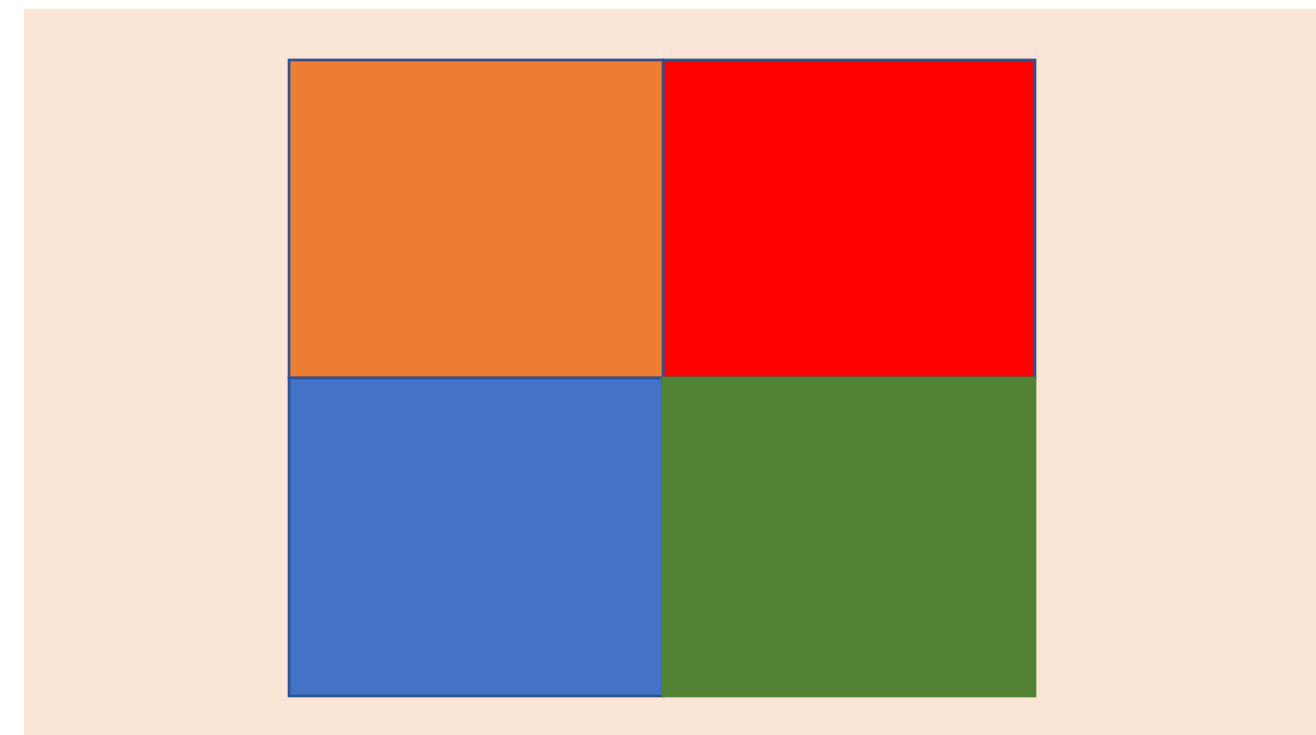
# Testing

Write small programs to run parts of our code and verify the output

Unit tests



Integration tests





# Testing





# Why test?

## Tests help preserving expected functionality

- As projects grow, it becomes easier to break things without noticing immediately
- Testing helps **detecting new errors early**
- Testing is essential for research software because we care about reproducibility of scientific results and because derivative research and programs depend on research software

## Tests help users of your code

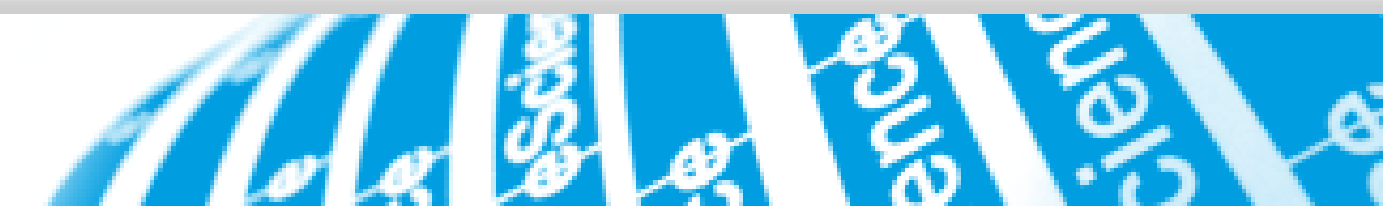
- Make it easier for others to verify whether the code has been correctly installed
- Users of your code publish papers based on results produced by your code
- Your peers need to be able to reproduce your (to be) published computational results

## Tests help other developers

- Tests make it easier to **refactor the code** (rewrite code while keeping functionality)
- Documentation which is up to date by definition
- Easier for external developers to contribute to the project without breaking your code (**you may immediately see problems in your code but others may not**)

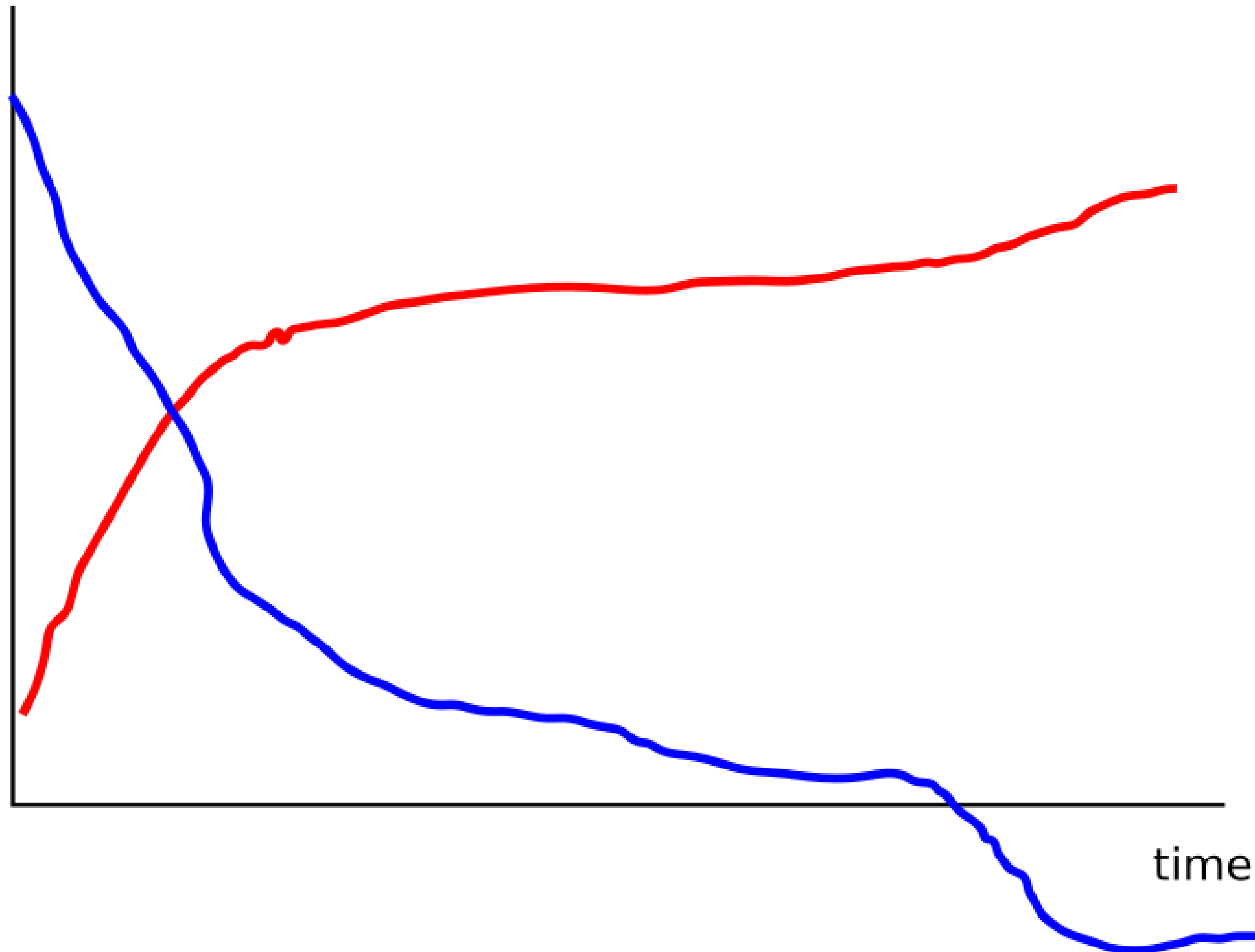
## Tests help managing complexity

**You write the test anyway!!  
and then throw it away**



# Why not test?

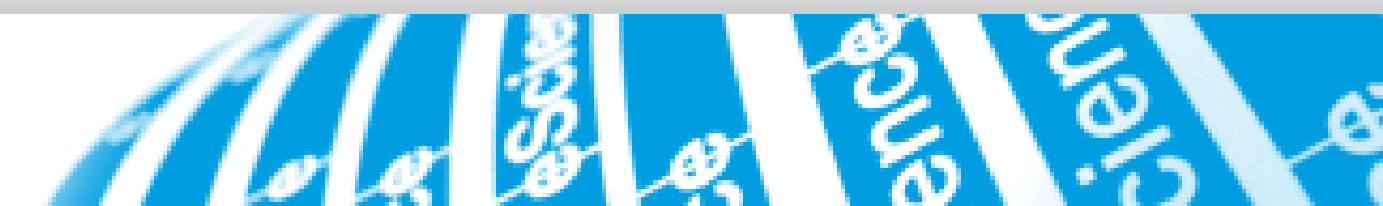
development speed



We are human

Code Review -> easier to tell  
someone else to write a test

Metrics like Codecov ->  
Stepping on the scale each  
morning





# Let's stay in touch

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