Introduction to version control with Git

Day 2: Branching, Merging and collaboration workflows

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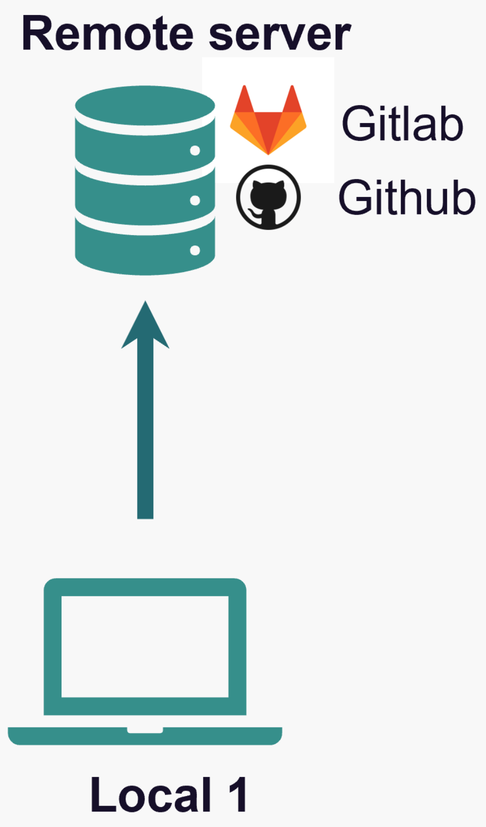
Before we start

Did everyone accept a collaboration invitation?

Recap

Basic Git workflow:

1. **Initialize** a Git repository
2. **Work** on the project
3. **Stage** and **commit** changes to the local repository
4. **Push** to the remote repository



Recap

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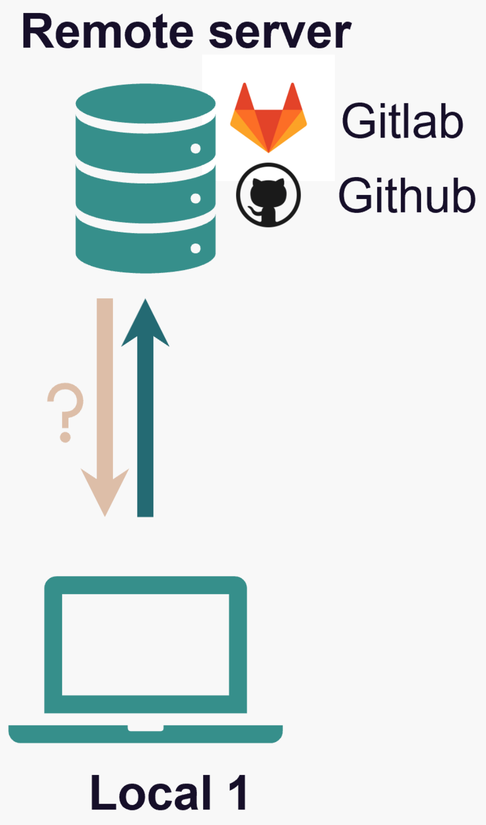
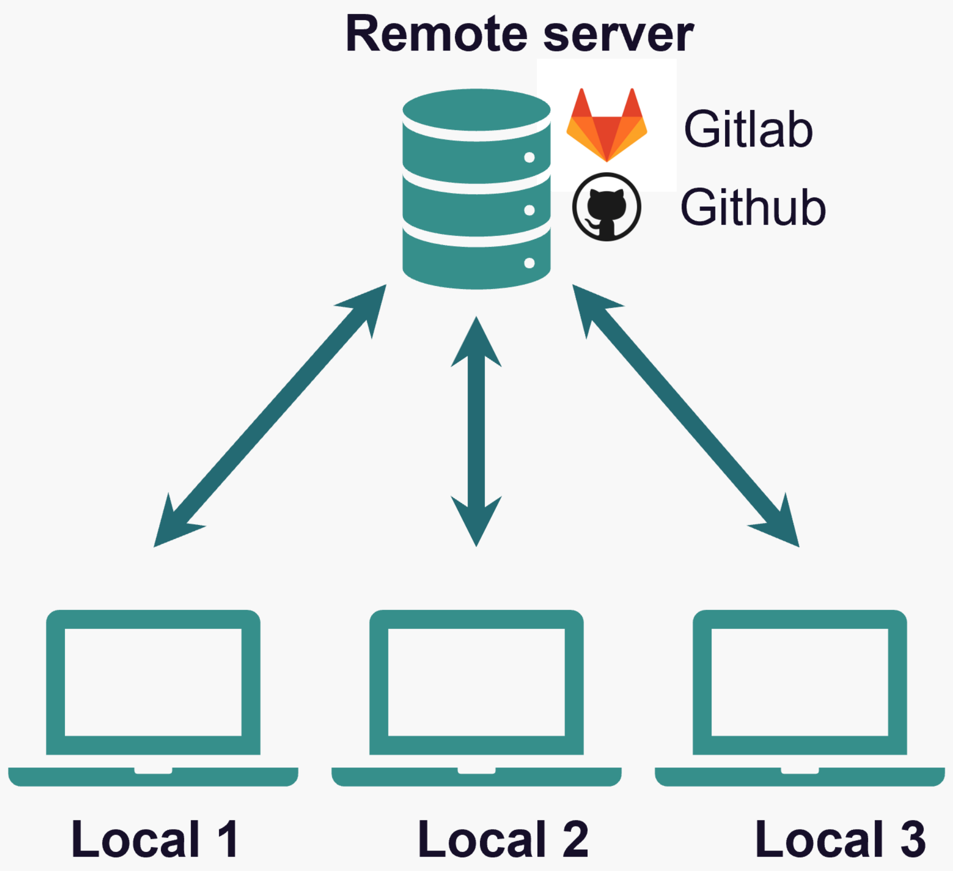


Recap

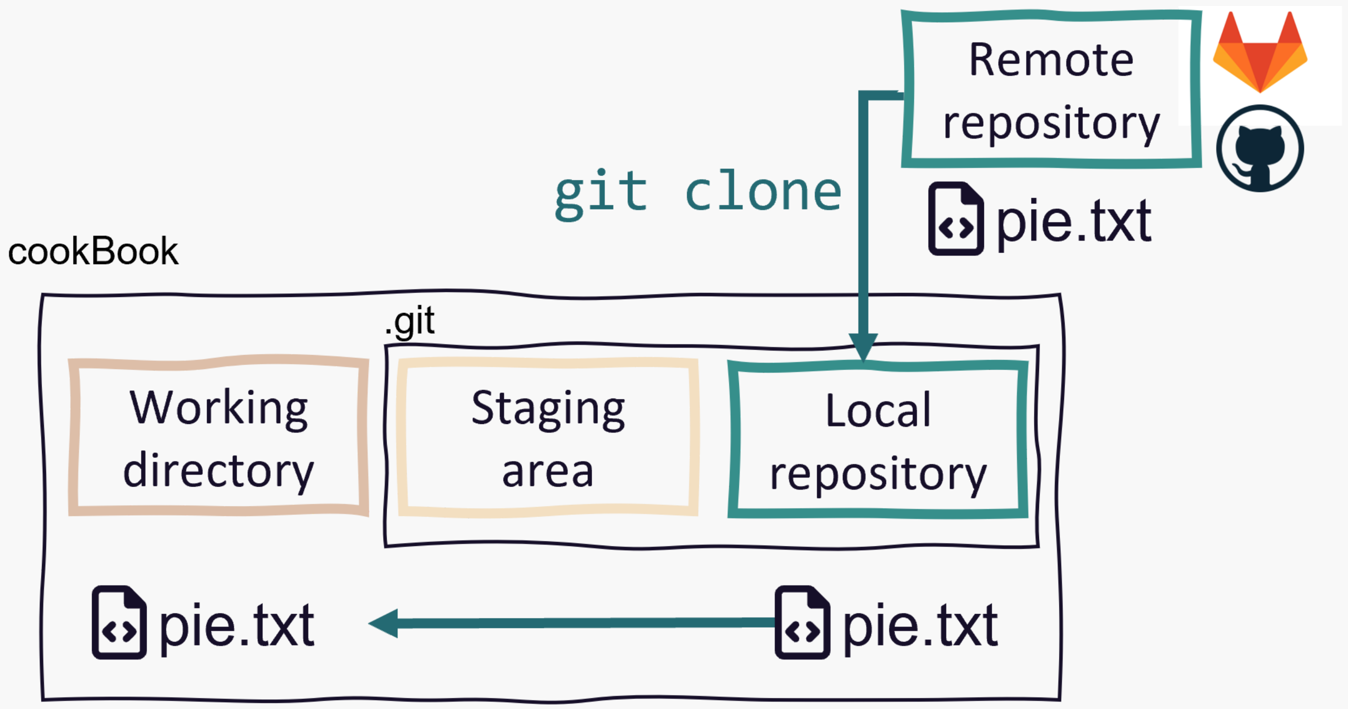
Git is a **distributed version control system**

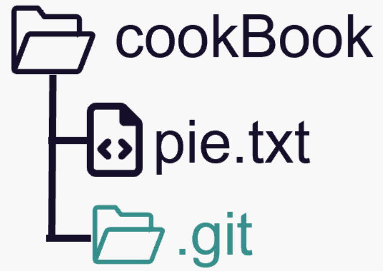


- Idea: many *local* repositories synced via one *remote* repo
- Collaborate with
  - yourself on different machines
  - your colleagues and friends
  - strangers on open source projects

Get a repo from a remote

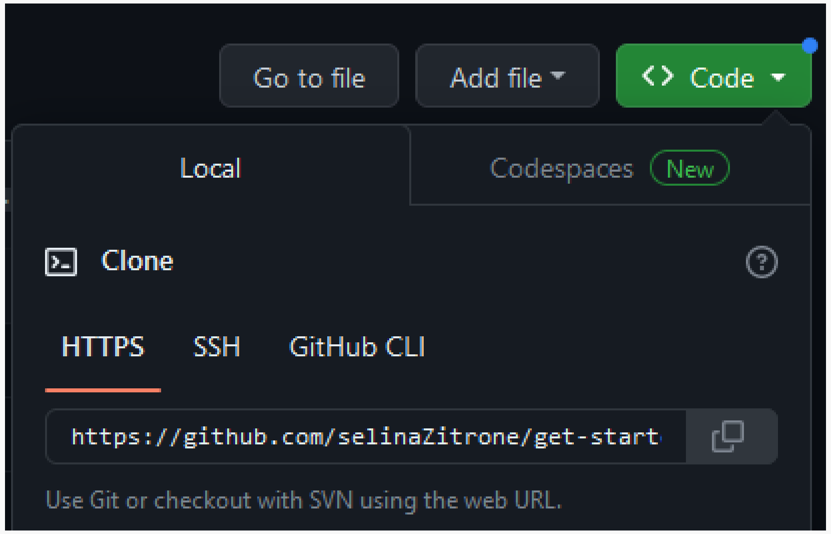
- In Git language, this is called **cloning**
  - Get a **full copy** of the remote repo





Get a repo from a remote

- To clone a repo, you need to know the repo's URL



```
https://github.com/selinaZitrone/get-start
```

Use Git or checkout with SVN using the web URL.

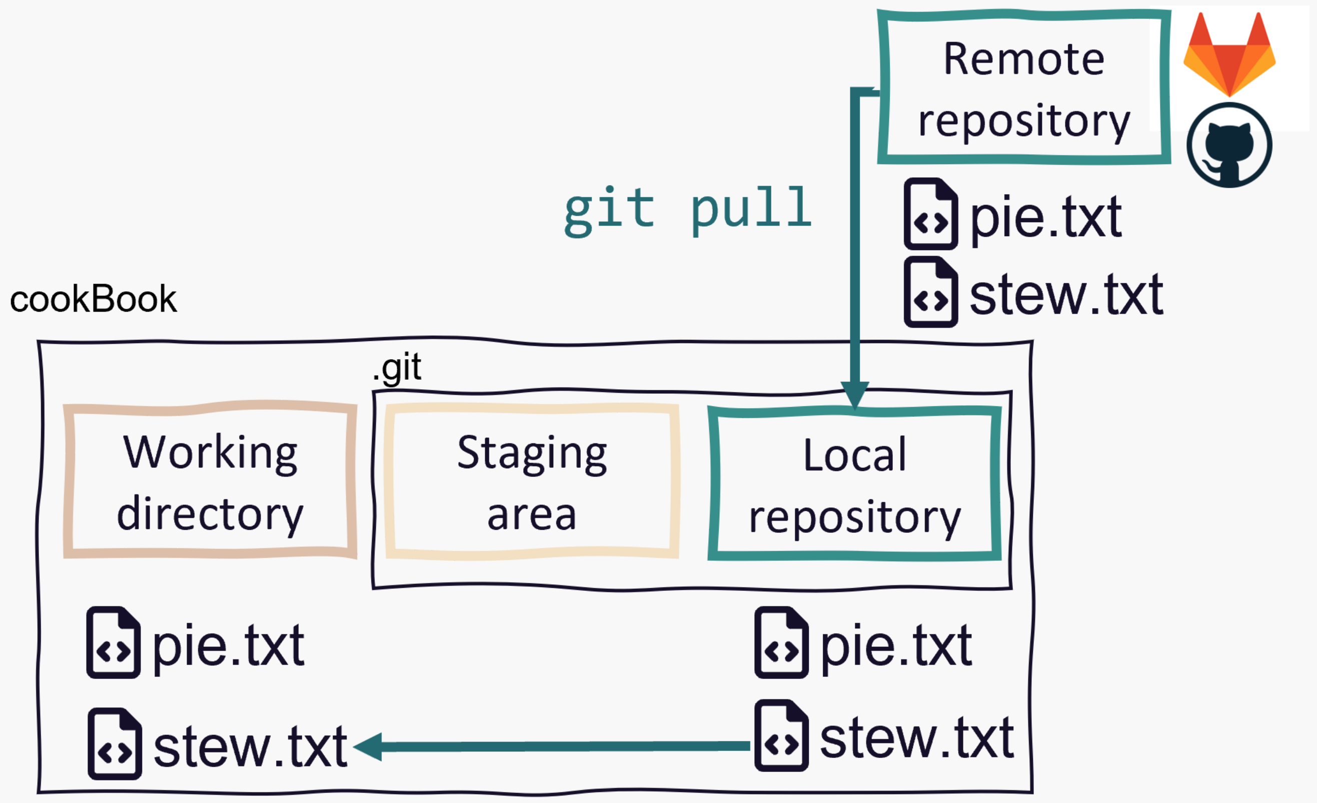
- You can clone all public repositories
  - You can only push if you are authorized
- You can clone private repositories if you are a collaborator

Now you

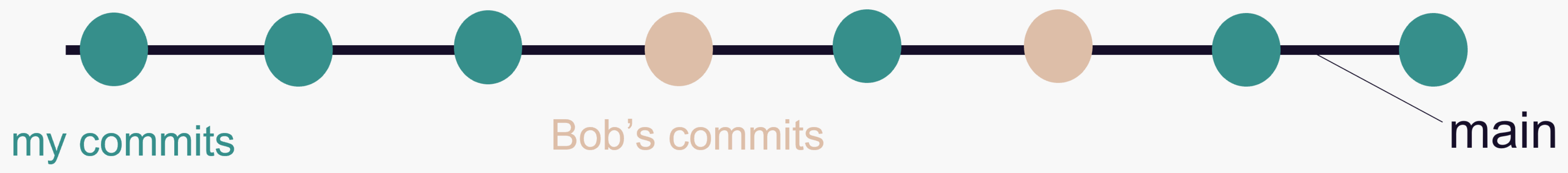
Clone your team mate's cook Book repo (**File -> Clone repository**)
It should be in the list of your repositories if you accepted the invitation.

Get changes from the remote

- Local changes, publish to remote: `git push`
- Remote changes, pull to local: `git pull`

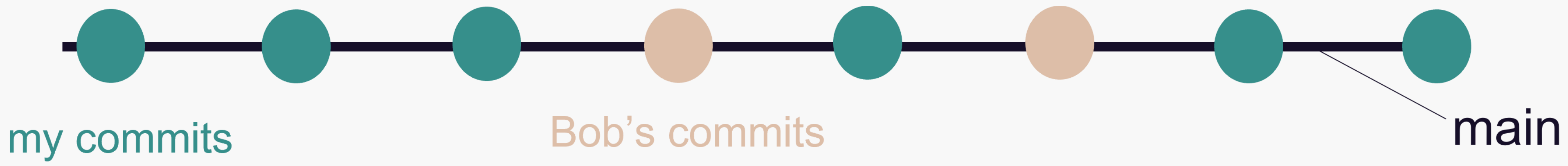


A simple collaboration workflow



- One remote repo on Github, multiple local repos
- Idea: Everyone works on the same branch
  - **Pull before** you start **working**
  - **Push after** you finished **working**

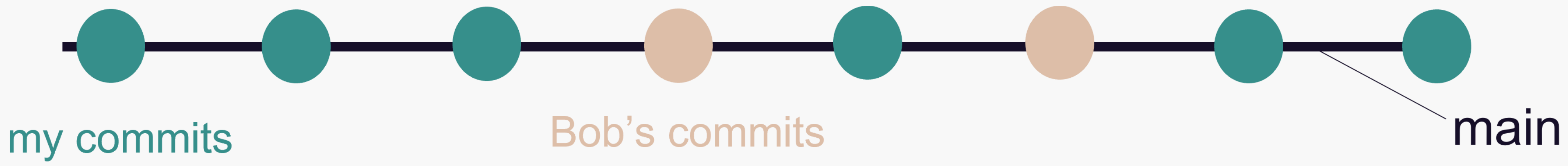
A simple collaboration workflow



This works well if

- Repo is not updated often
- You don’t work on the same files simultaneously
- No need to discuss changes before they are integrated
- You collaborate with yourself

A simple collaboration workflow



This workflow starts to be problematic when

- People push often/forget to pull regularly
  - Potential conflicts on main
- You just want to experiment
  - Everything goes directly to main

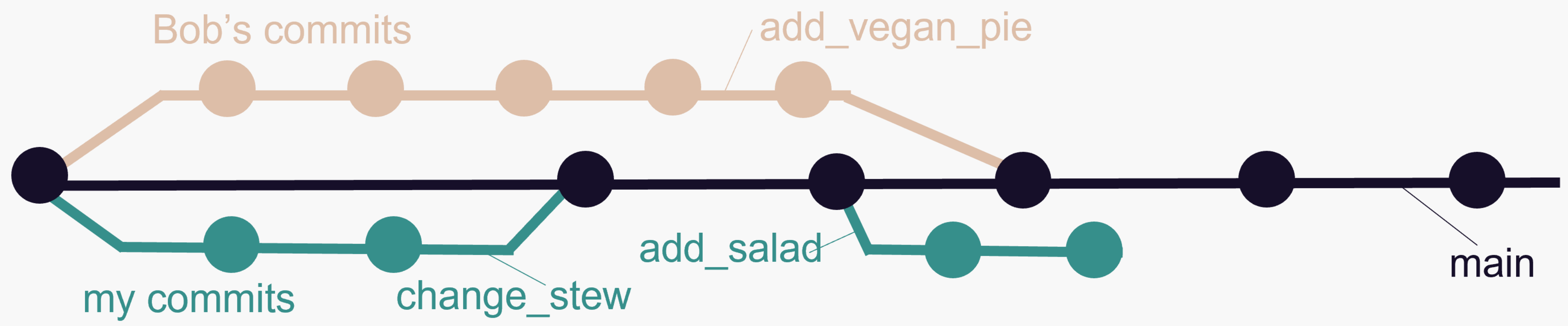
Let's give it a try

- Make sure you are in the repository of your team mate
- Open a recipe in the cook book of your team mate
  - Repository -> Show in Explorer
- Change something in there
- Commit the change and push it

Get the changes of your team mate from the remote.

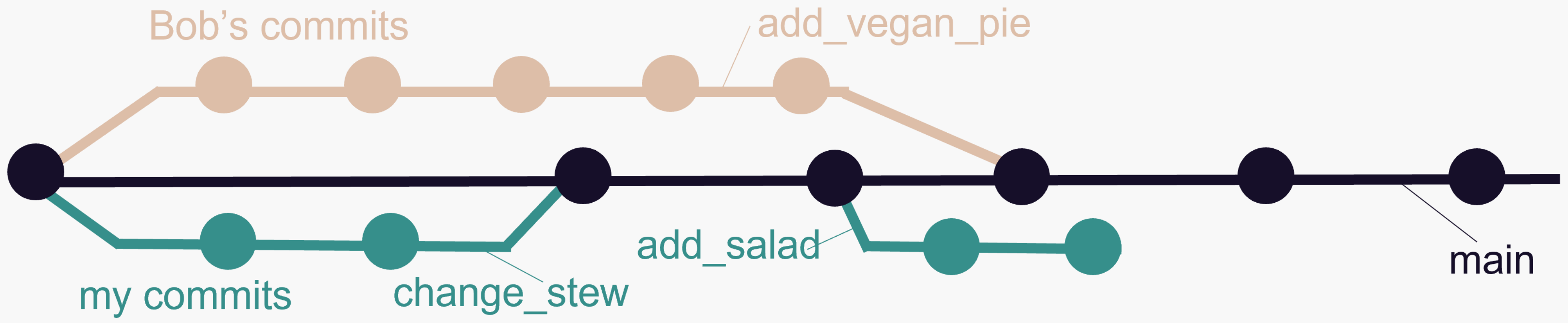
- Switch to your own cook book repository
- Pull the changes (Same button as the push button)
- Have a look at the commit history to see what changed

A branching-merging workflow



- One remote repo on Github, multiple local repos
- Idea: Everyone works on the their **separate branch**
  - **Merge** branch with the main when work is done

A branching-merging workflow

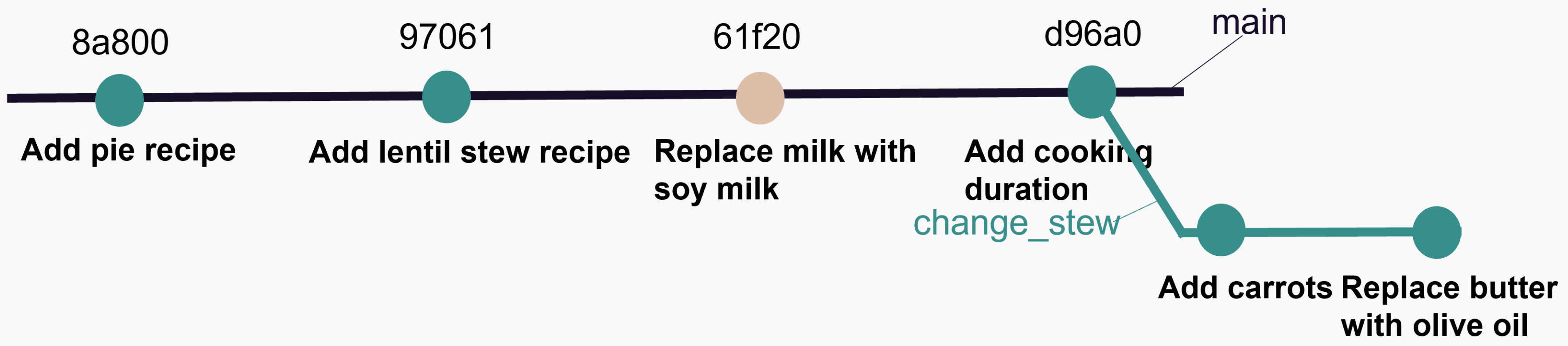


Advantages of this approach

- Guarantee that main always works
- Potential conflicts don't have to be solved on main
- You can experiment without messing up the main

Working on a separate branch

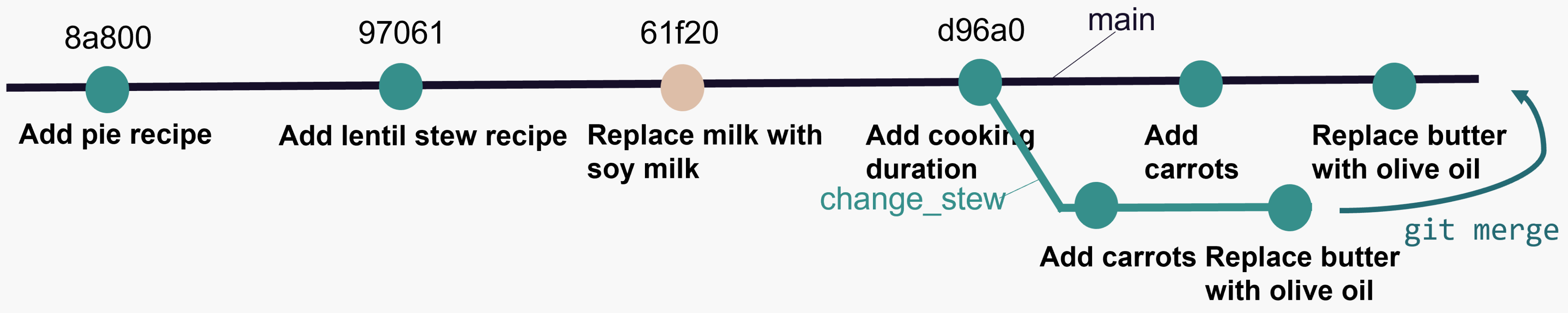
The steps to create and work on a separate branch are easy:



- Create a local branch and switch to it
- Work on the branch like you are used to
  - Make changes, **stage** and **commit**

Merging changes from a branch

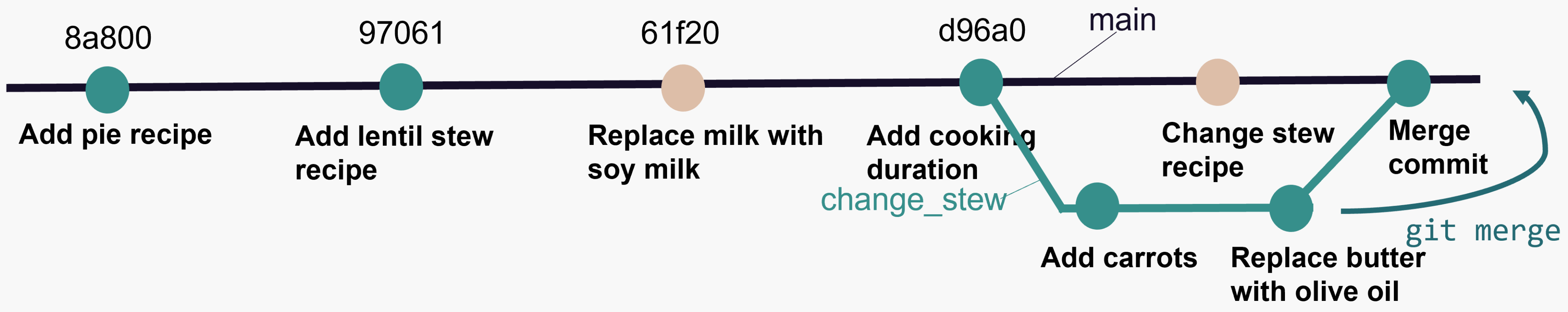
To bring changes to the main branch you need to **merge** them.



Normally: Git merge brings the commits from the branch to main

Merging changes from a branch

To bring changes to the main branch you need to **merge** them.



If there was a commit on a common file in main, a *merge commit* is introduced.

Merging changes from a branch

To bring changes to the main branch you need to **merge** them.

- Mostly merging happens without problems, but…
- … if the same line was edited on separate branches…
- … there will be a merge conflict 😱

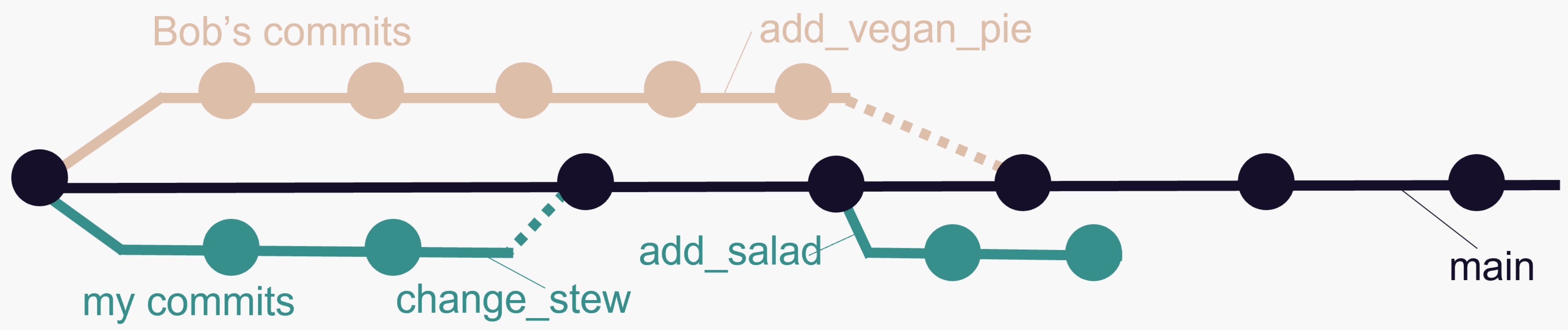
Merge conflicts need to be solved manually. You need to chose which of the conflicting versions you want to keep.

Now you

Create a branch and merge it in your team mate's cook book

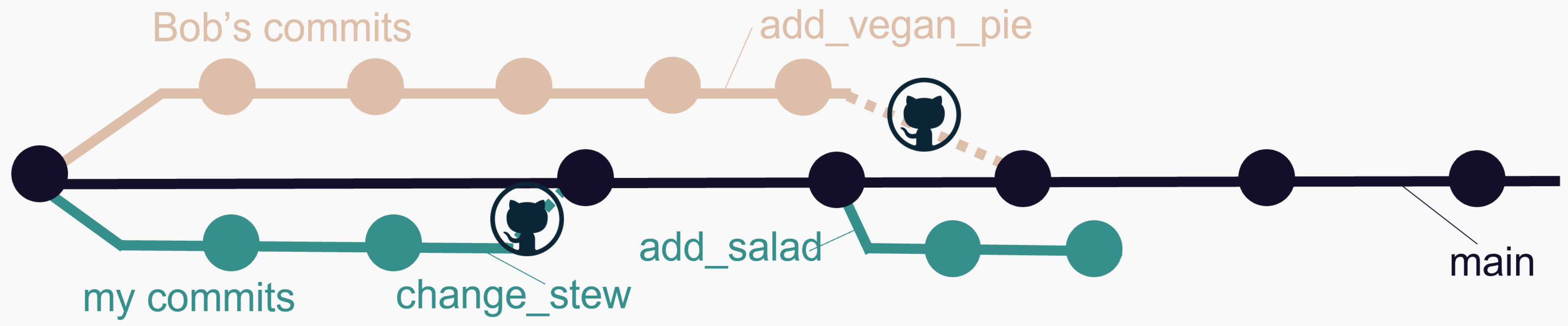
Complete task 2 "Branch and merge" (10 min)

A branching-merging workflow with Github



- One remote repo on Github, multiple local repos
- Idea: Everyone works on the their separate branch
  - ~~Merge branch with the main when work is done~~

A branching-merging workflow with Github



- One remote repo on Github, multiple local repos
- Idea: Everyone works on the their separate branch
  - ~~Merge your branch with the main when you are finished~~
  - Create a pull request on Github to ask for a merge

A branching-merging workflow with Github

A pull request is basically asking your collaborators:

> What do you think of my changes? Can we integrate them in main or do we still need to change something?

Github has nice features for pull requests:

- **Describe your changes** in detail
- Collaborators can easily **compare versions**
- Collaborators can **discuss and comment** on your changes
- …

A pull request is merged on Github when **everyone agreed on the code**.

Now you

Create a pull request on your partners repo

Complete task 3 “Pull requests” (10 min)

Thanks for your attention

Questions?

Next week

- Monday 2.30 - 3.30 on Webex (link via email)
- Until then: work with Git on your own (~ 1 - 2 h)
  - Pick something you find most interesting/useful to you
- Collect questions/problems/discoveries
- More Git topics

Some ideas

- **Start working** with Git on one of **your research projects**
- **Publish** one of your projects on Github including a nice README
- **Practice collaboration** by contributing to my cook book project
  - Accept the invitation I'll send you later and work with branches and pull requests
  - I will answer your pull requests and request some changes :)
- **Check out the How-To guides** if you want to
  - Recap GH Desktop
  - Are interested in the terminal
  - Want to learn about Git + R
- If you find a mistake on my websites
  - **Edit the page** on Github or **report an issue**
- …