E5 Programming Course

Version control with git

Slides inspired by PeP et al. Toolbox Workshop

Version Control

- Version → Current state of a Project
- Project → Current state + History

Version Control

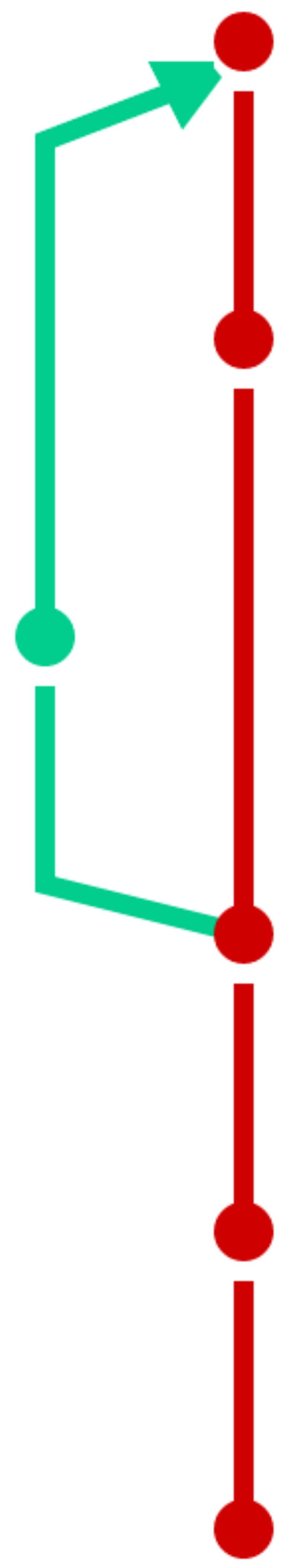
Repository		What does he mean?
• Version → Current state of a Project	⟶	`/home/kevin/Bachelorarbeit`
• Project → Current state + History	⟶	Current directory + Yesterday’s state, All the work you’ve done, did some Science

Version Control

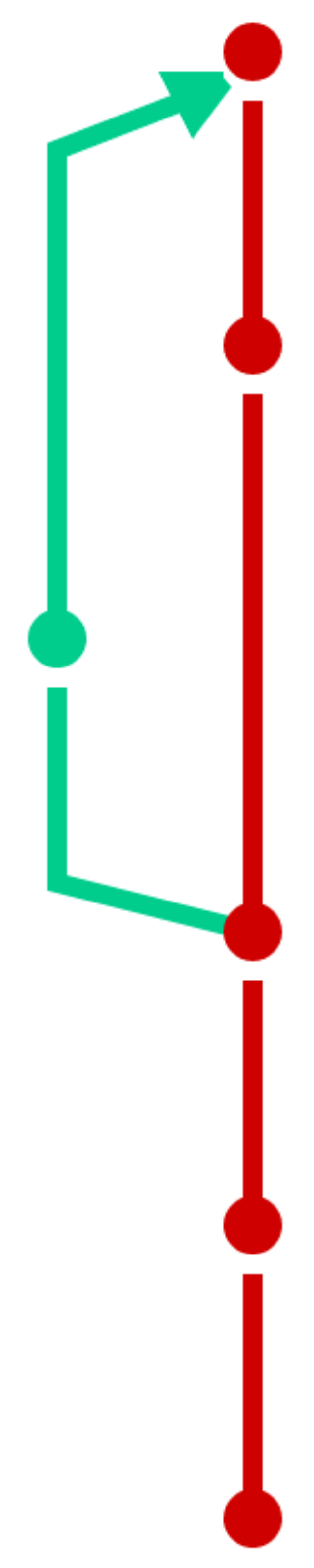
- Version → Current state of a Project
- Project → Current state + History
- Backup
- Easily view differences between versions
- Essential for scientific work – on your own or in a team

The Idea

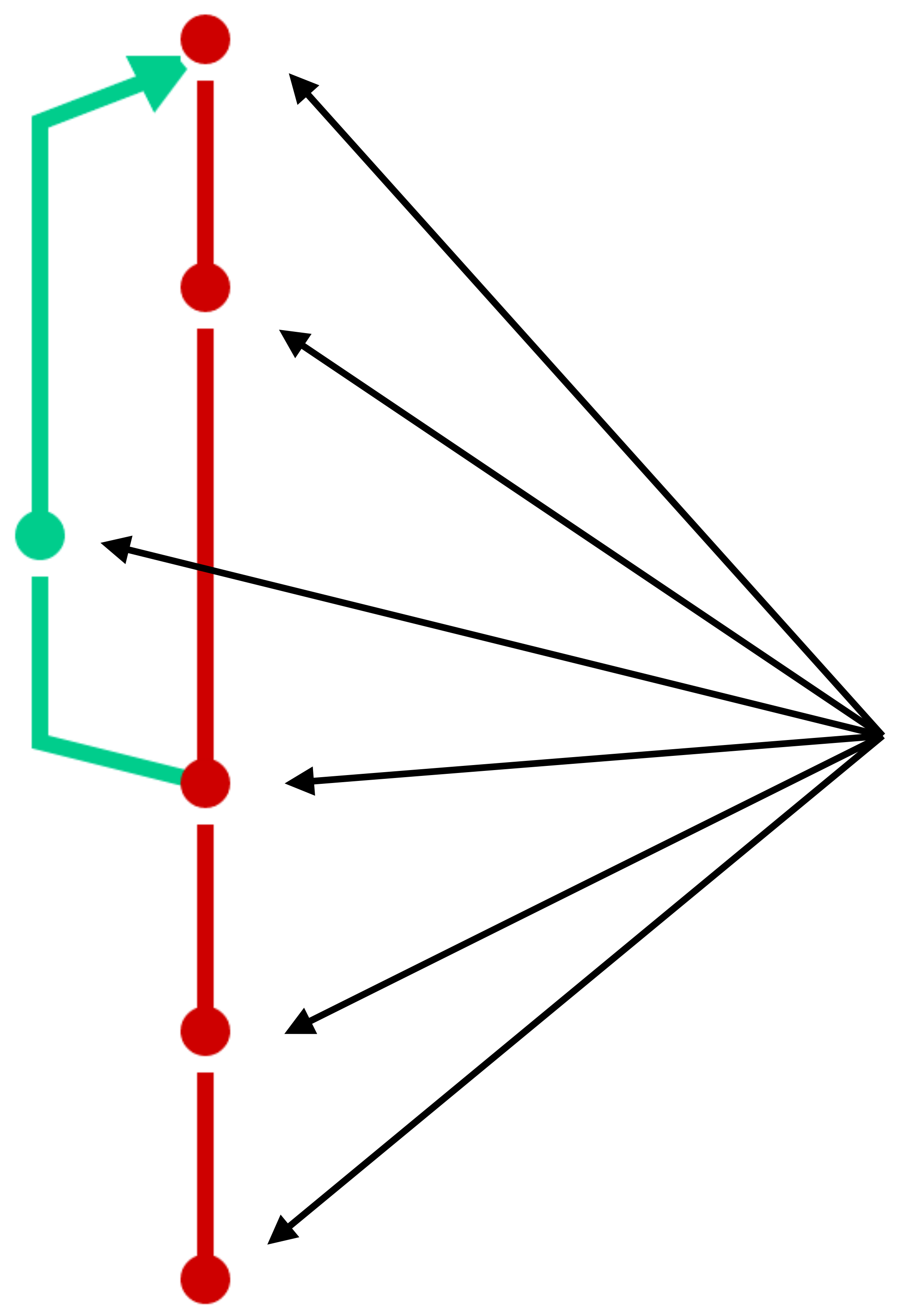
- Files “don’t know anything about git"
- git stores ALL versions of all tracked files efficiently
- Internal database and configuration in `.git/`-directory of the project folder
    - Backup means storing a copy of the `.git/` directory somewhere else (another computer/server)



The Idea



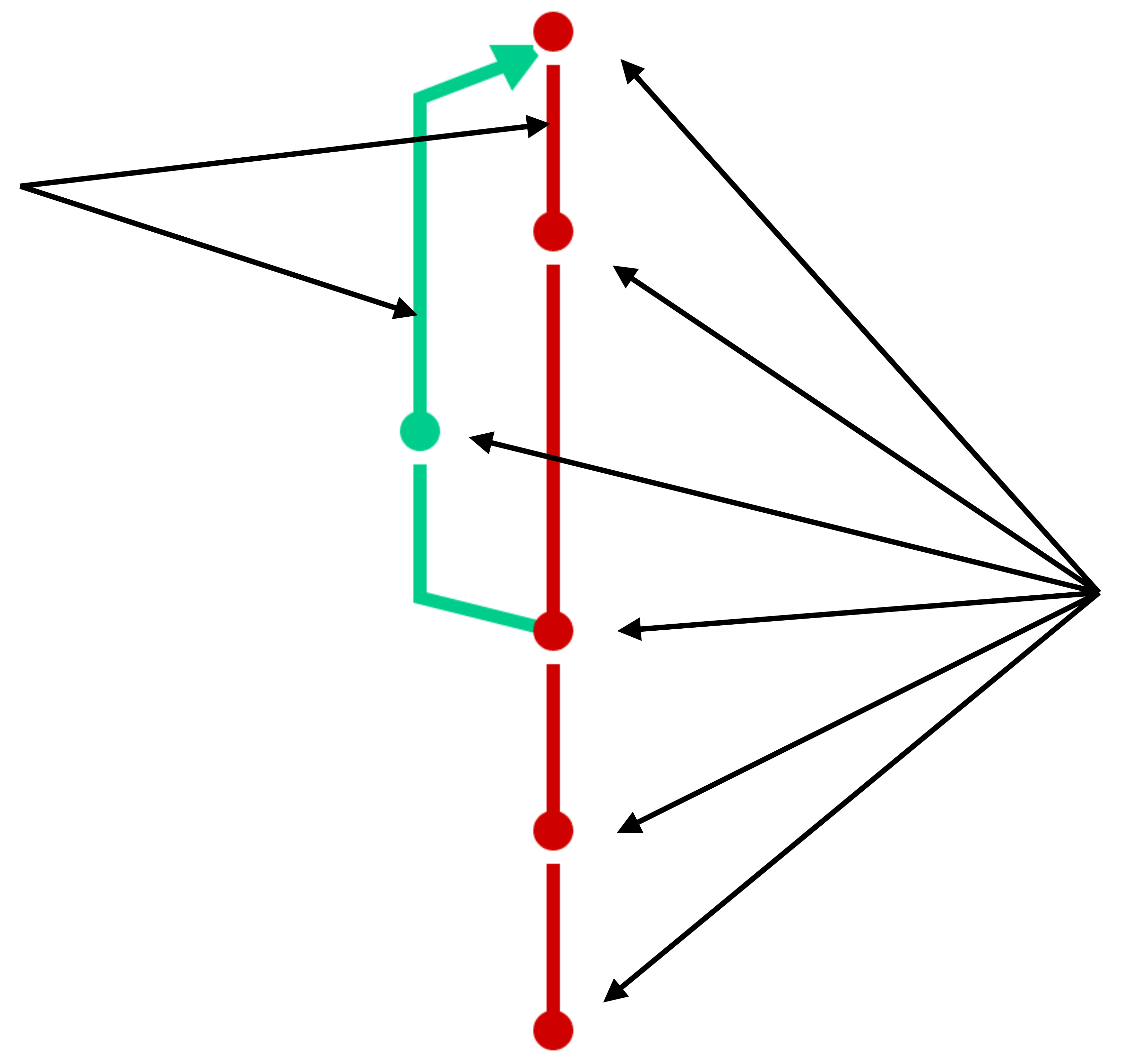
The Idea



commit (version)

Stores all changes from a previous version of the repository, including a description of the changes.

The Idea



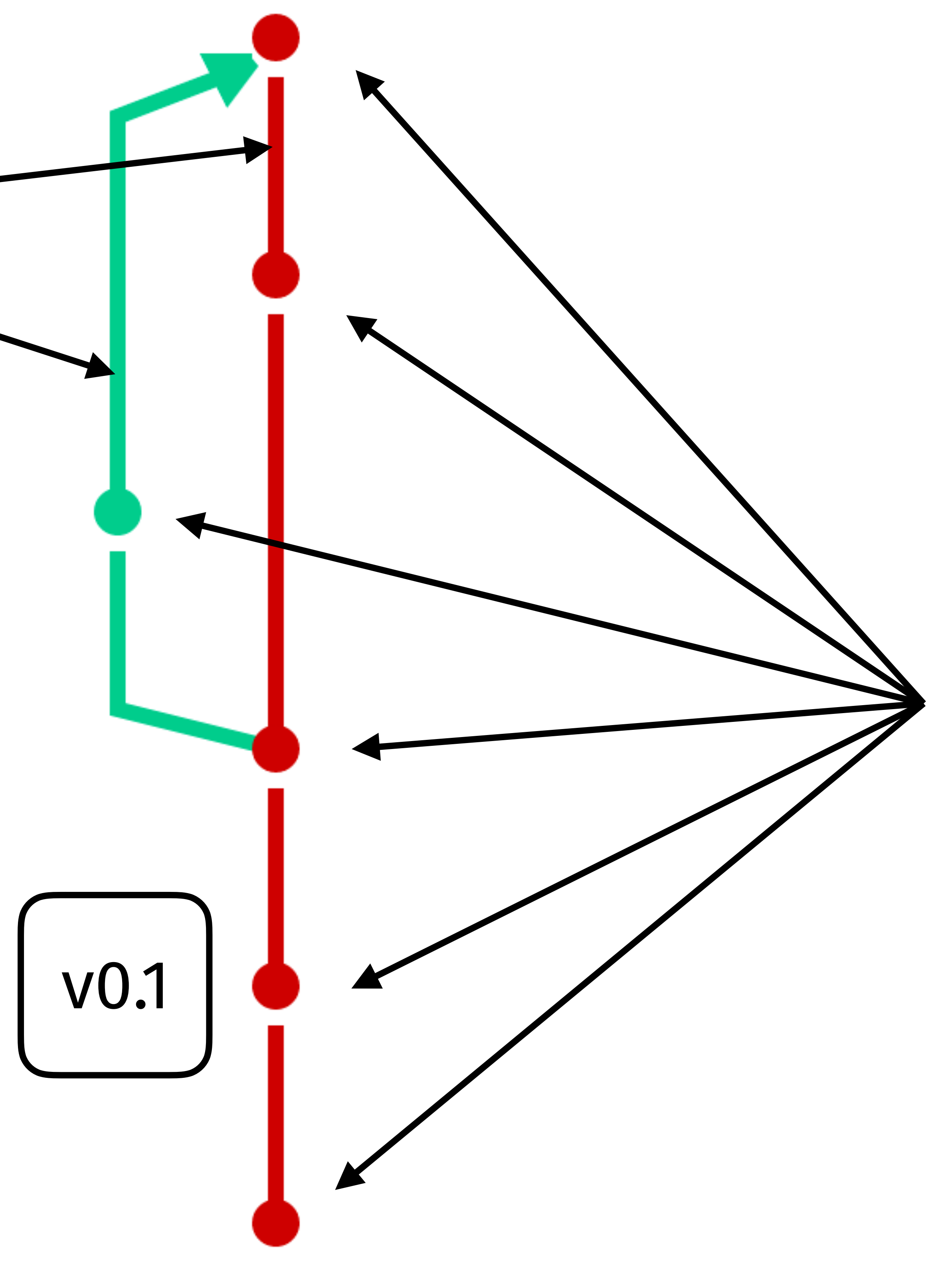
Branch

Name/Label for a commit and it’s “branch”

commit (version)

Stores all changes from a previous version of the repository, including a description of the changes.

The Idea

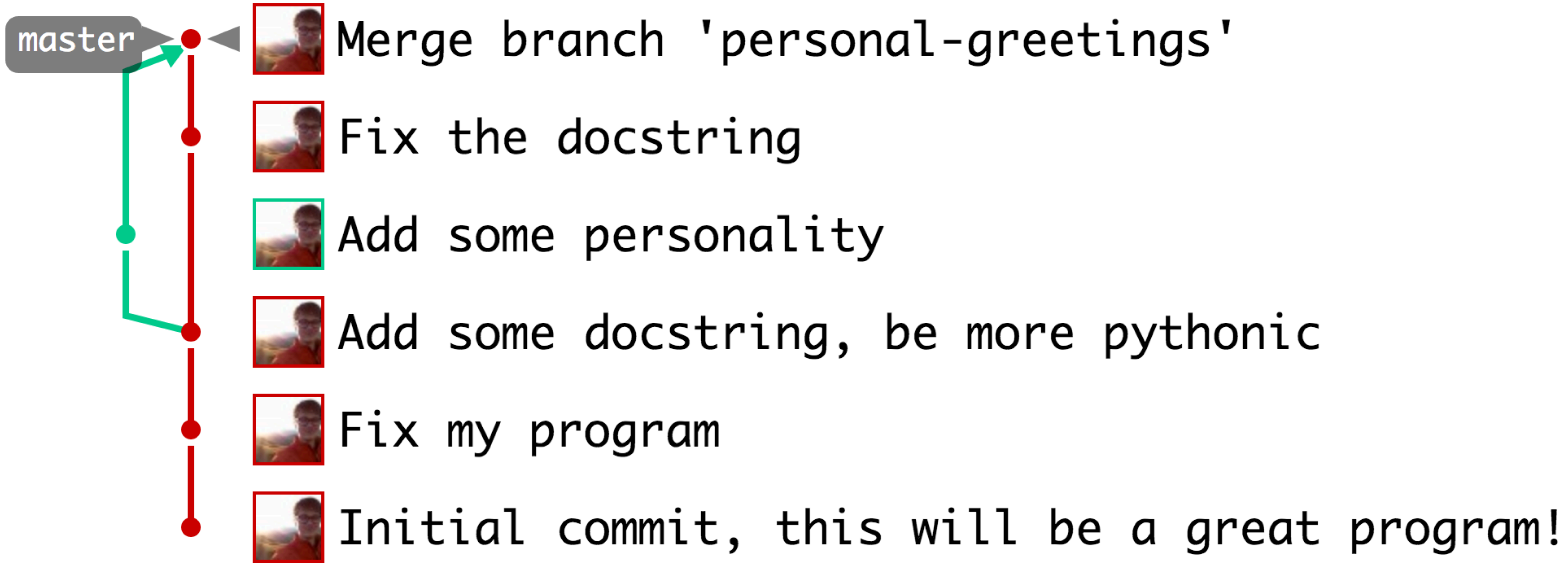


Branch
Name/Label for a commit and it's "branch"

Tag
Unique Name/Label for a single commit

commit (version)
Stores all changes from a previous version of the repository, including a description of the changes.

In Practice



Merge branch 'personal-greetings'
Fix the docstring
Add some personality
Add some docstring, be more pythonic
Fix my program
Initial commit, this will be a great program!

In Practice

git add

Mark files (or parts of them) for a new commit

Working Directory

`/home/kevin/Bachelorarbeit`

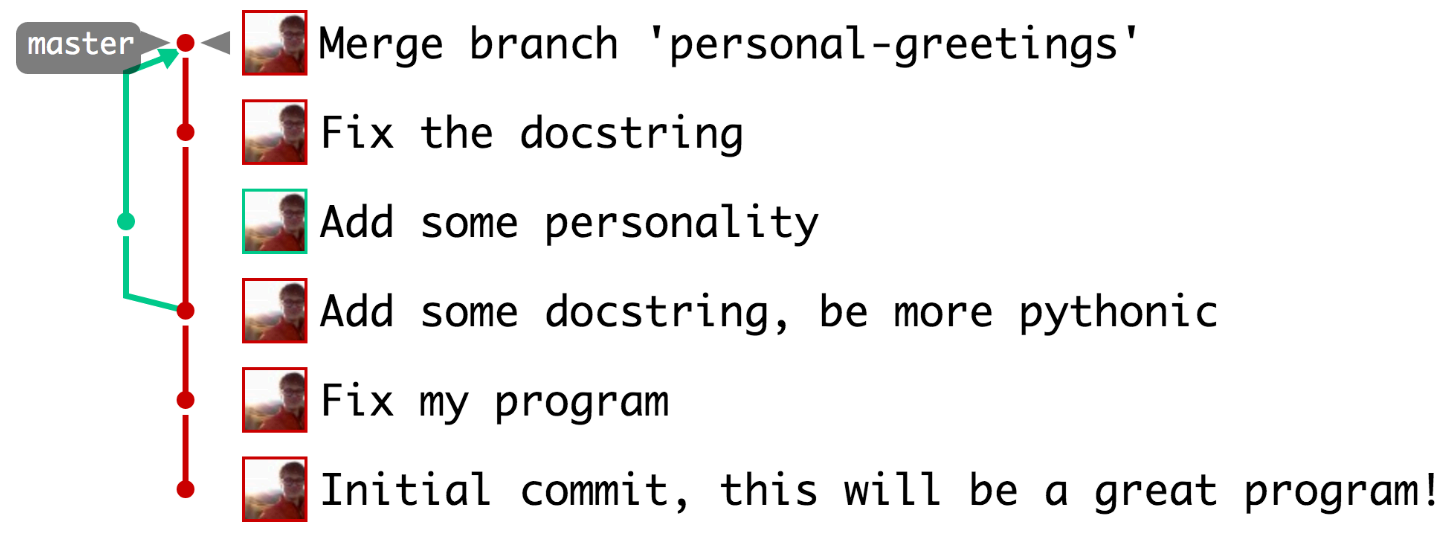
Staging

Prepare a new commit

git commit

Move commit from staging to history and permanently store it in `.git/`

History



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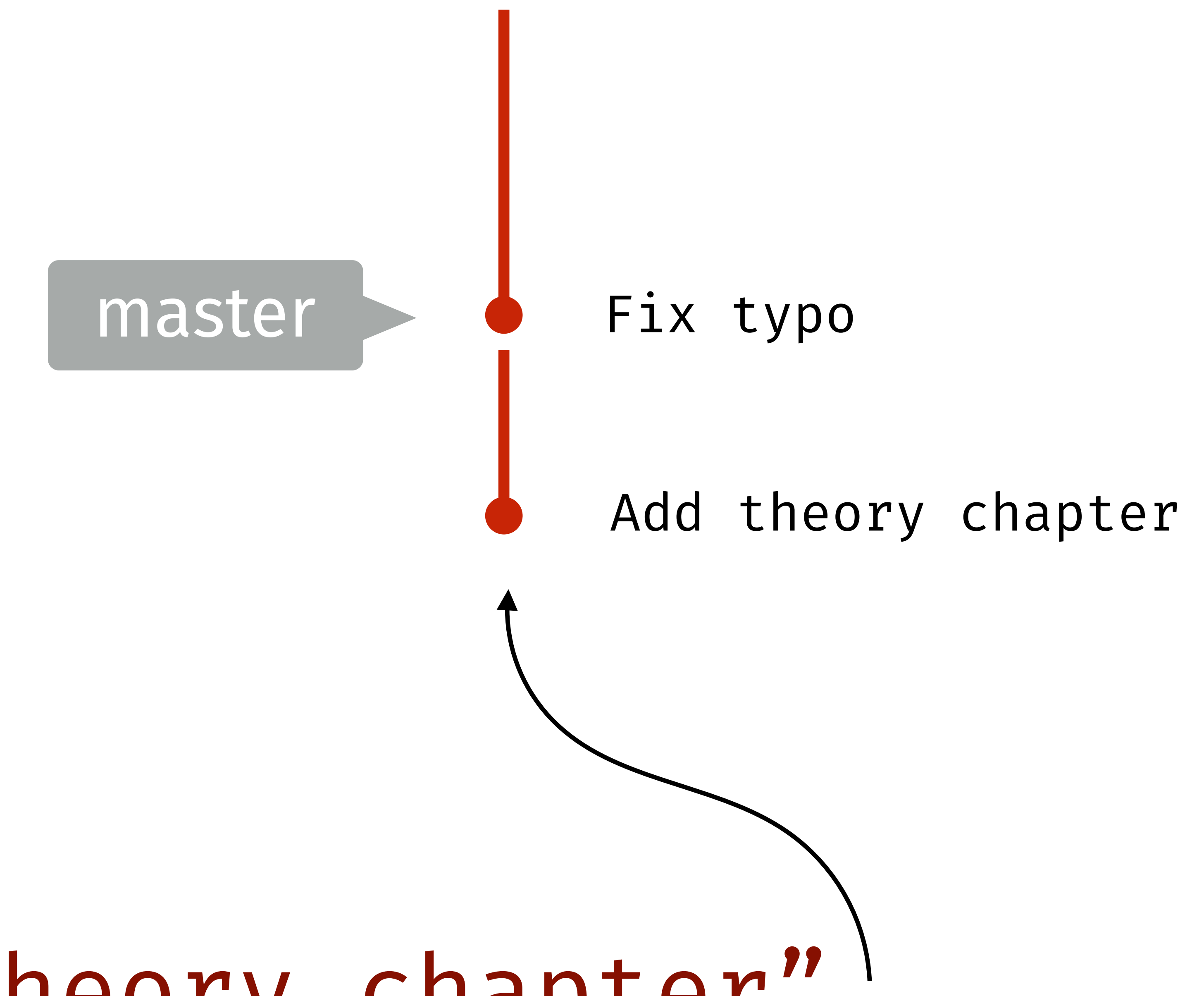
In Practice: Branches

In Practice: Branches

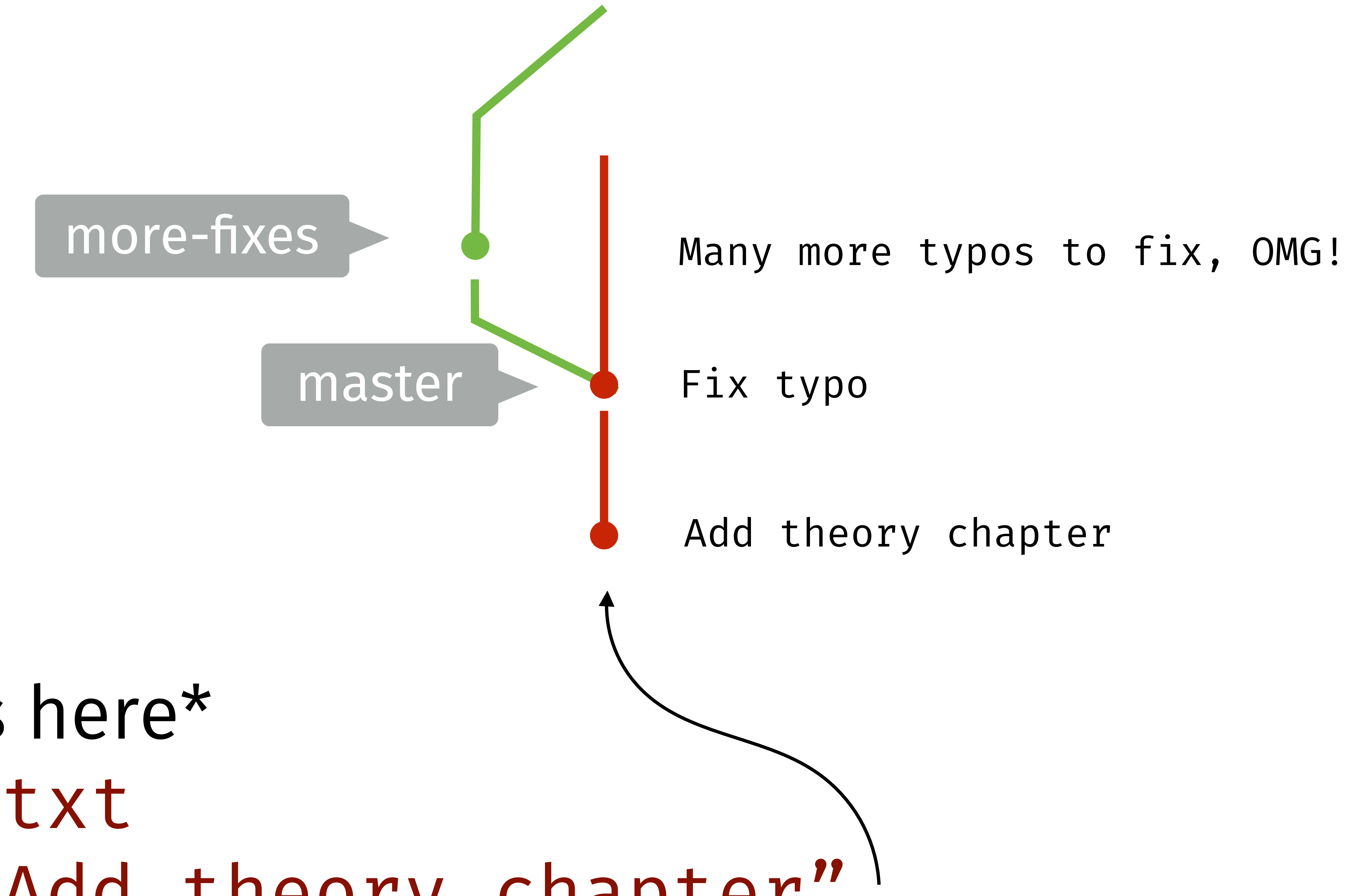


Working hard, *physics here*

```
$ git add theory.txt
$ git commit -m “Add theory chapter”
```

In Practice: Branches

```
$ git branch more-fixes
$ git checkout more-fixes
```



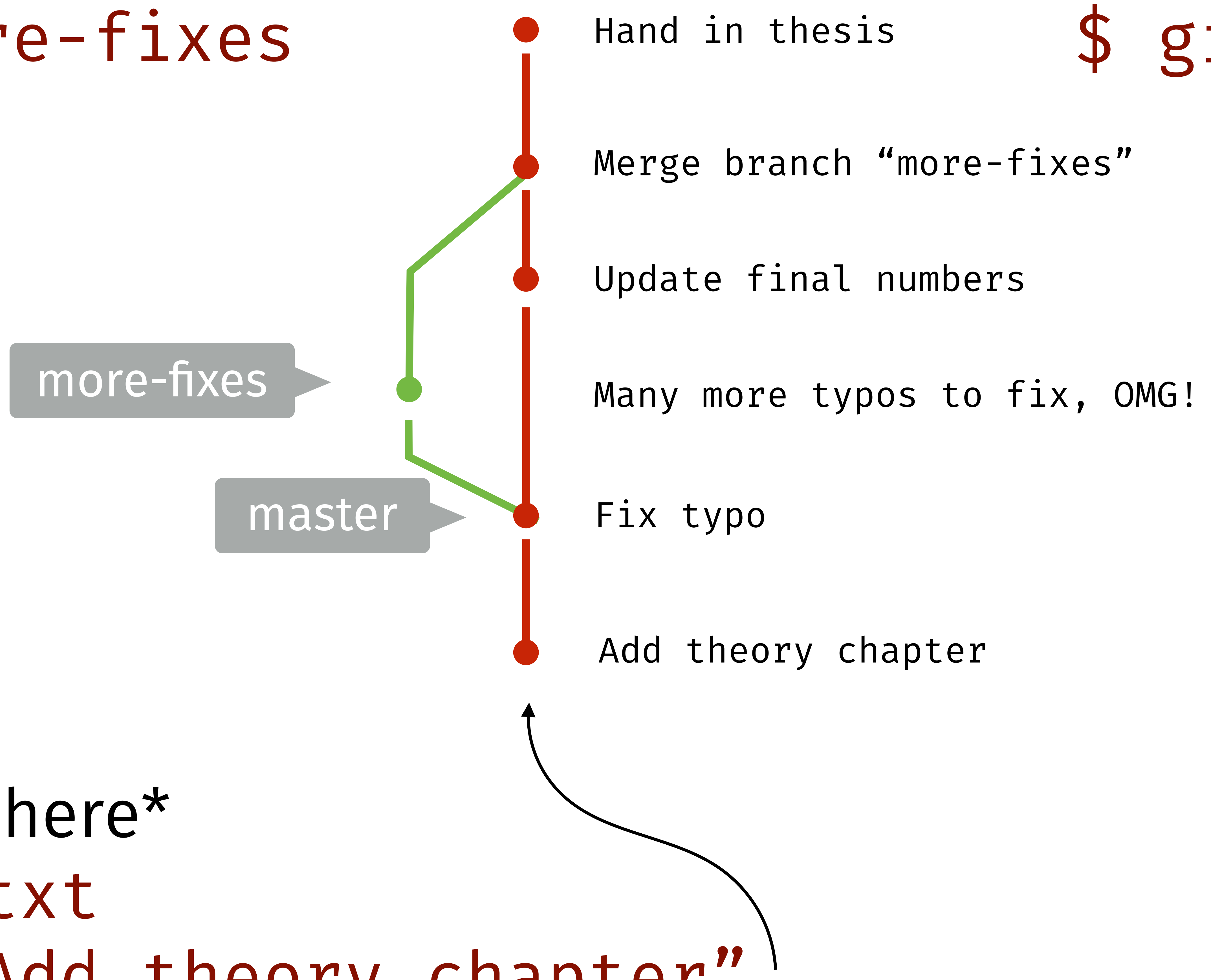
Working hard, *physics here*

```
$ git add theory.txt
$ git commit -m “Add theory chapter”
```

In Practice: Branches

```
$ git branch more-fixes
$ git checkout more-fixes
```

```
$ git checkout master
$ git merge more-fixes
```



Working hard, *physics here*

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$ git add theory.txt
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See also toolbox.pep-dortmund.org/files/archive/2019/git.pdf.

Demo

Learn Git Branching

E5 git Infrastructure

- Login at git.e5.physik.tu-dortmund.de
- GitLab-Instance in the E5-Cloud (it's in our basement 🤓)
  - git server → copy of our local `.git/` directory
  - Comes with a nice web interface for code review, collaborative coding, issue tracking, making code comments, continuous integration, …

E5 git Infrastructure

- If you have no ssh-key yet (there should be one):
  - `ssh-keygen -b 4096`
  - `cat ~/.ssh/id_rsa.pub | pbcopy/xsel -b`
- Add your public key via the web interface (copy & paste to git.e5.../profile/keys)
- git authenticates you via ssh with your new public key

git Workflow

- GitLab organizes repositories as projects in Group- and Usernamespaces

    Namespace Projectname/Repo

    - e.g. /kevin.heinicke/GitIntroRepo

- Create new projects via the web interface

- Connect the project with your local directory (follow the instructions)
  e.g. `git clone yourProject.git`

Siehe auch toolbox.pep-dortmund.org/files/archive/2016/git.pdf.

git Workflow

- Initially run `git clone RepoURL.git` (`cd ./RepoURL/`)
- `git pull`
- Arbeit... `git add`
- `git commit`
- `git push`

See also toolbox.pep-dortmund.org/files/archive/2019/git.pdf.

Demo

Solving Merge Conflicts aka.
Collaboration