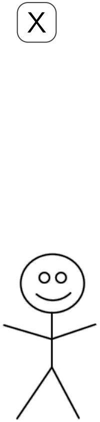
Introduction to Git

10 September, 2020

THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.
COOL. HOW DO WE USE IT?
NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.

`http://www.xkcd.com`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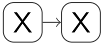
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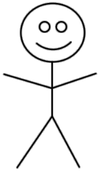

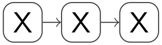
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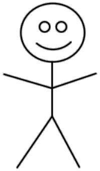

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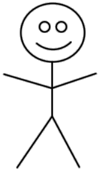

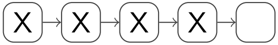
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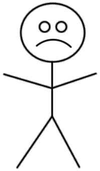

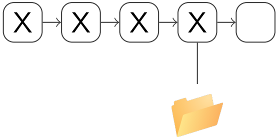
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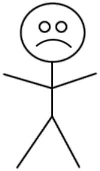

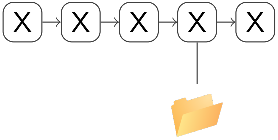
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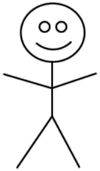

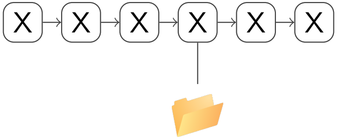
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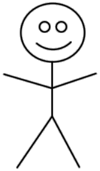

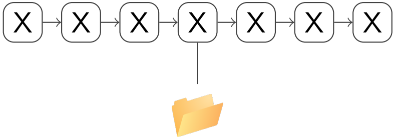
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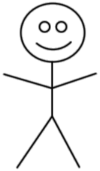

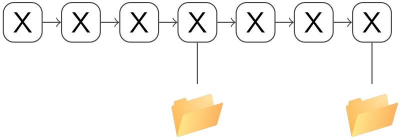
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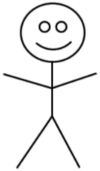

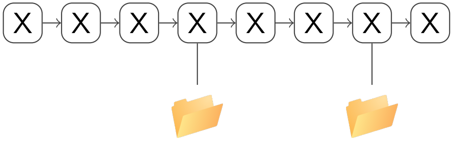
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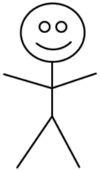

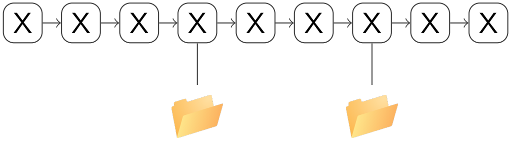
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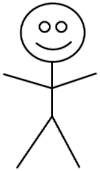

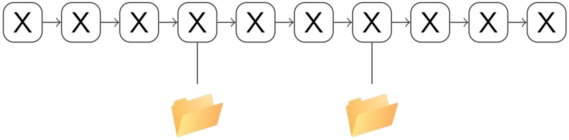
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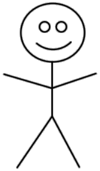

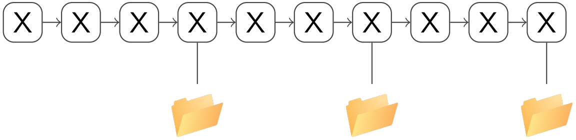
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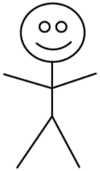

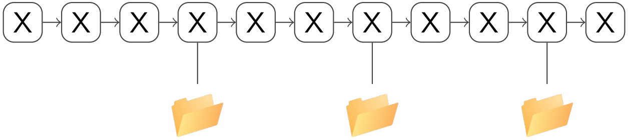
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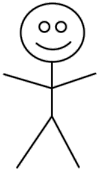

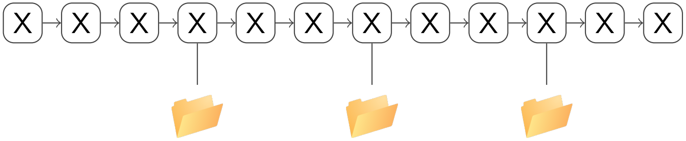
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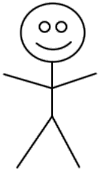

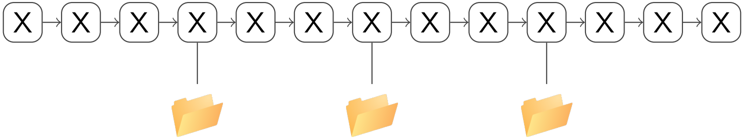
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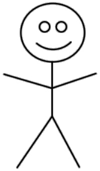

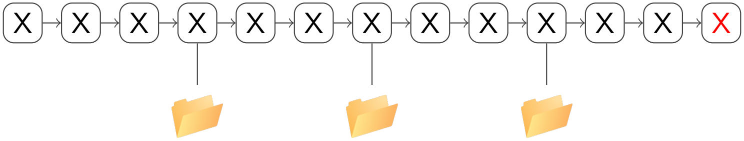
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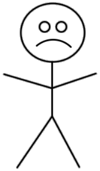

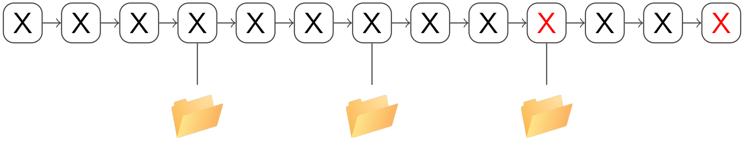
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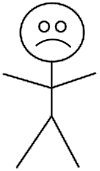

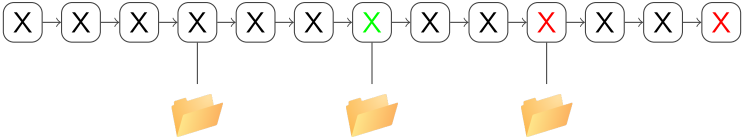
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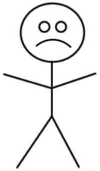

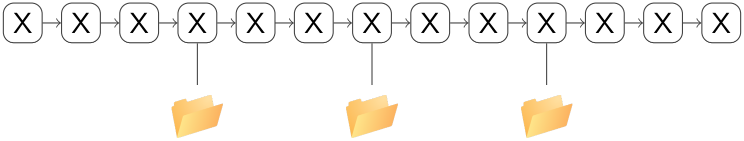
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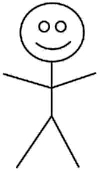

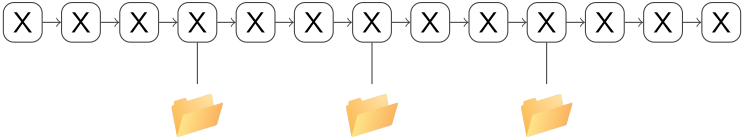
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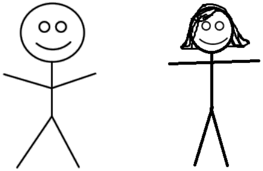
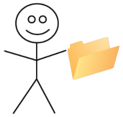
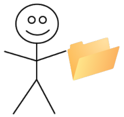


Git helps you to:

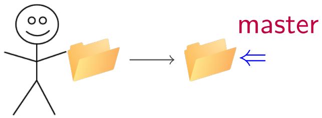
- continuously keep backups of your work;
- restore the entire state of your project to a previous version;
- undo specific changes to some files – or even part of files – without affecting others;
- easily share your progress with other people;
- synchronise your work across multiple devices;
- experiment with a new feature without affecting existing work;
- maintain multiple versions of a product;
- and more!



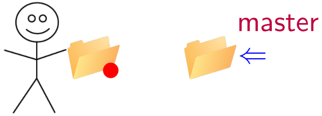
Actions:



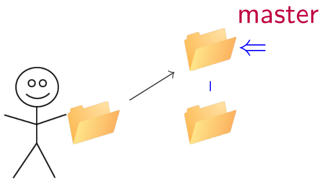
Actions: figure out which files should be on version control



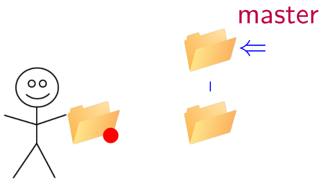
Actions: `git add *.txt *.java images/ ; git commit`



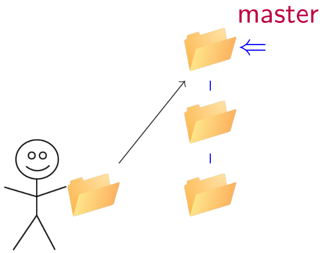
Actions: replace all occurrences of “magenta” by “pink”



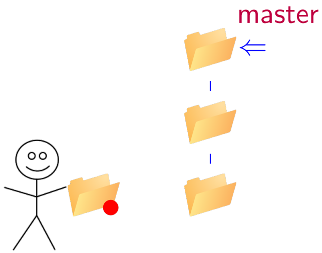
Actions: `git commit -a`



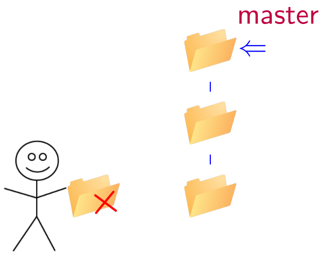
Actions: add a new source file and change some others



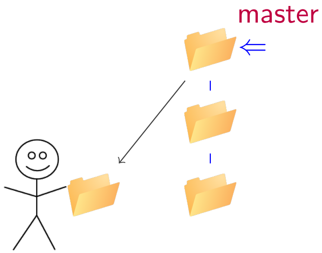
Actions: `git` <u>`add`</u> `newfile.java ; git` <u>`commit`</u>



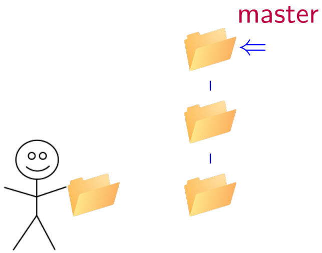
Actions: start working on a new feature



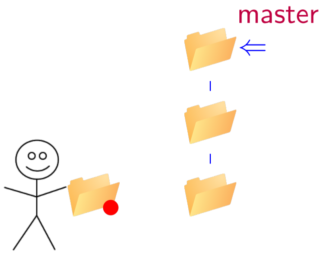
Actions: realise it was a bad idea



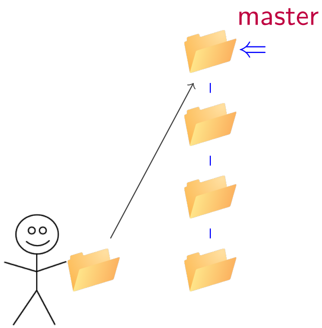
Actions: `git reset --hard`



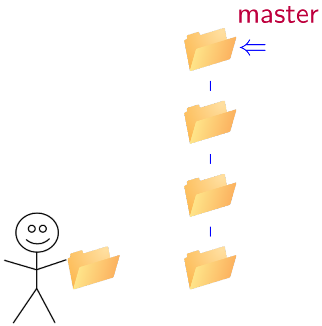
Actions:



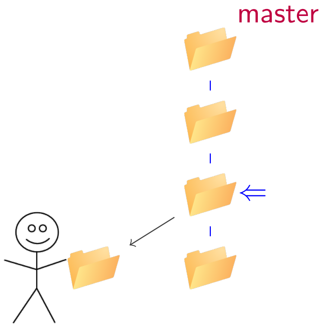
Actions: update documentation



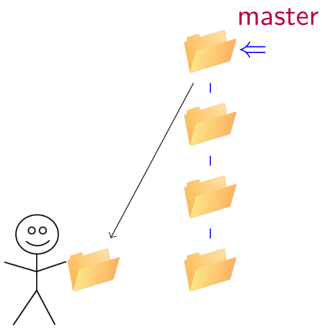
Actions: `git commit -a`



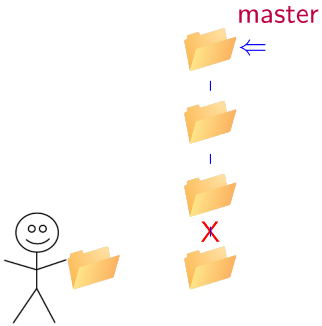
Actions: decide you want to see an earlier version



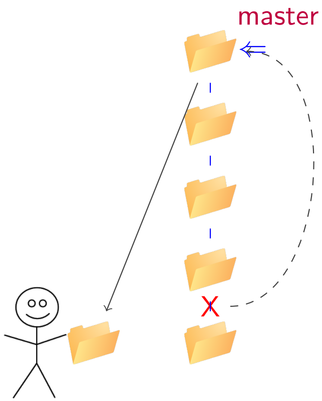
Actions: `git` <u>`checkout`</u> `de337dc`



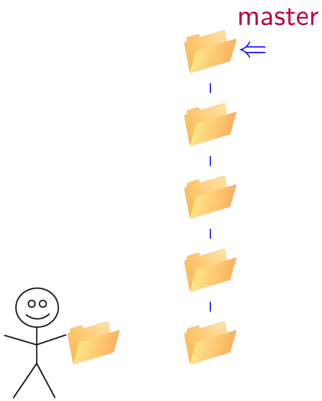
Actions: `git checkout master`



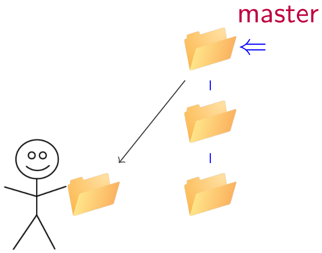
Actions: realise that the colour change was a bad idea



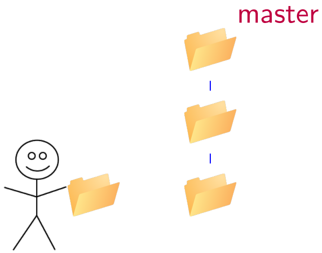
Actions: `git` <u>`revert`</u> `de337dc`



Actions: realise that you were drunk during the last two commits



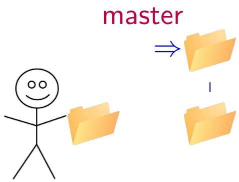
Actions: `git reset 252137e --hard` (be very careful!)



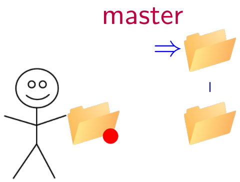
Actions:

You can also:

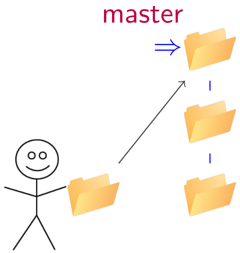
- view a graphic description of your commits (like given here)
- "stage" changes gradually
- view files in earlier versions (`git show a62c16e:file1.txt`)
- recover only a single file (`git checkout a62c163 -- file1.txt`)
- view differences between a current and prior version of a file
- stage changes gradually



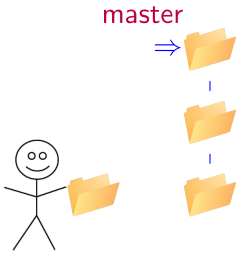
Actions:



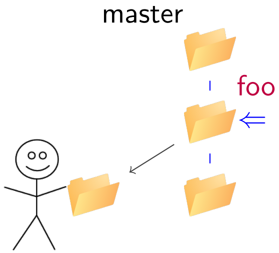
Actions: start work on the network



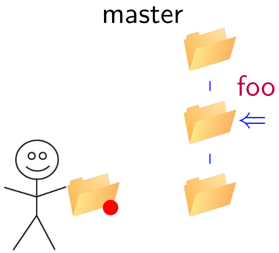
Actions: `git commit -a`



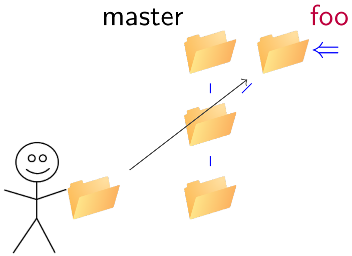
Actions: decide to work on a high-priority database change



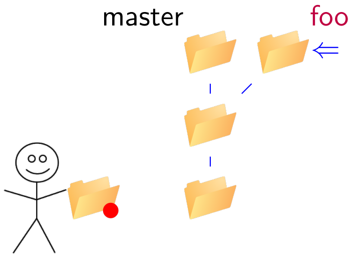
Actions: `git checkout -b foo de337dc`



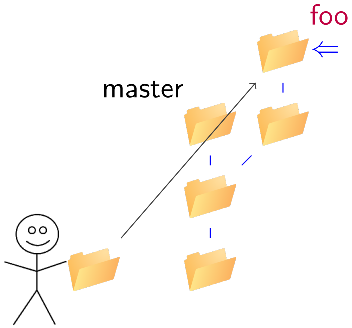
Actions: make some changes to the database



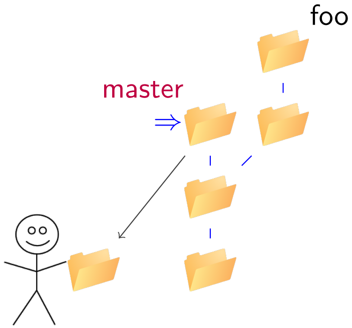
Actions: `git` <u>`commit`</u> `-a`



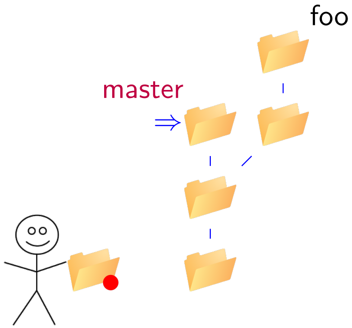
Actions: complete changes to the database



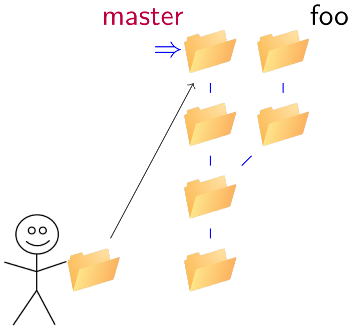
Actions: `git` <u>`commit`</u> `-a`



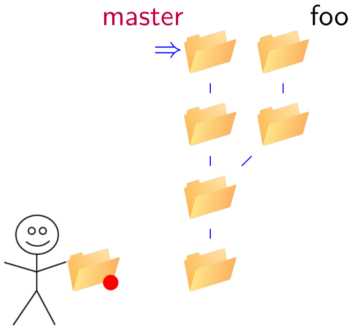
Actions: `git checkout master`



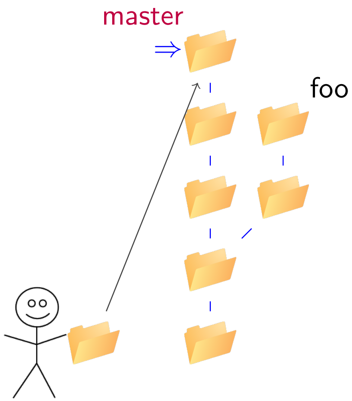
Actions: improve network negotiation



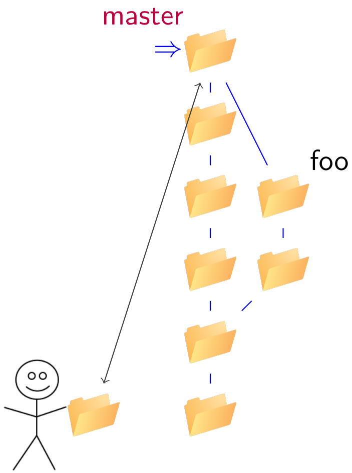
Actions: `git commit -a`



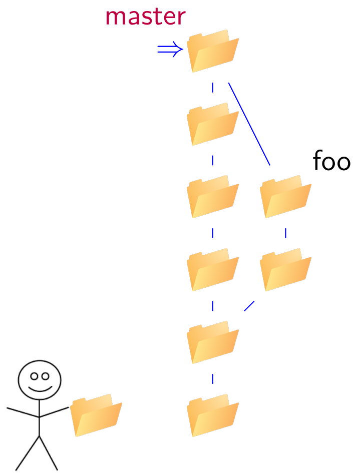
Actions: fix last of the network bugs



Actions: `git commit -a`

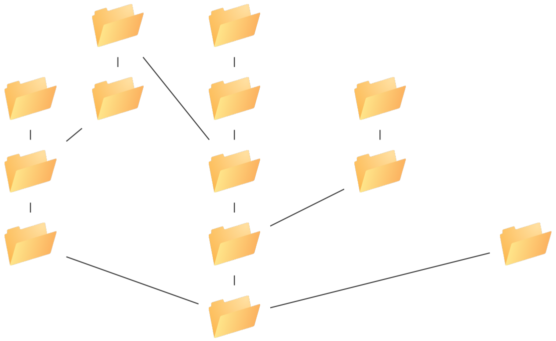


Actions: `git merge foo`



Actions:

Git branches should be seen as a directed acyclic graph!



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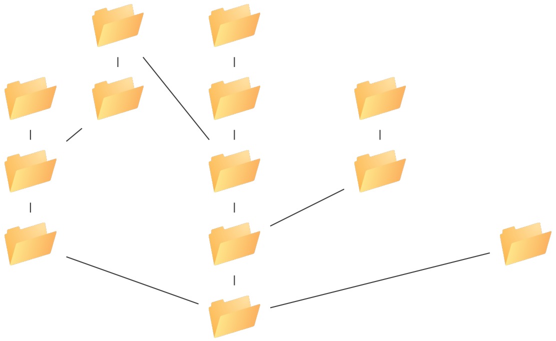

- every vertex has a unique label

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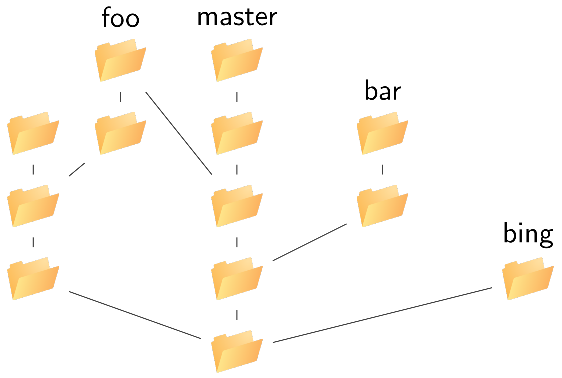

- every vertex has a unique label
- some vertices are also labeled with a branch name

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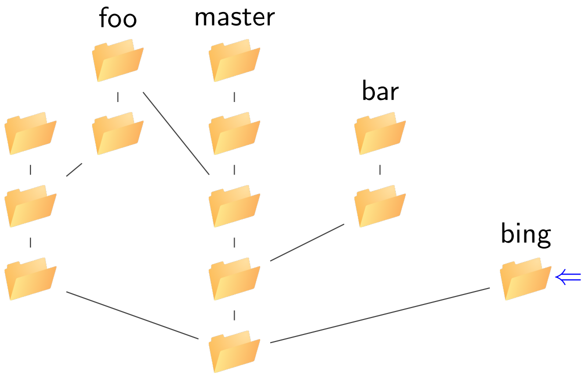

- every vertex has a unique label
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- exactly one vertex is active, this is the `HEAD`

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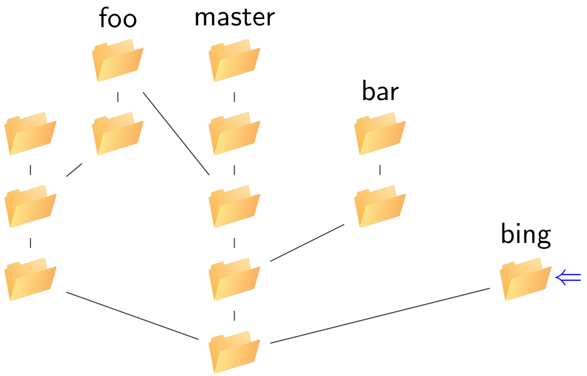

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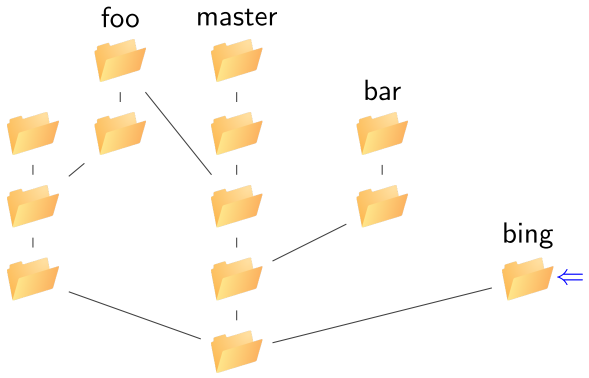

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- commit and merge add a vertex and advance the branch

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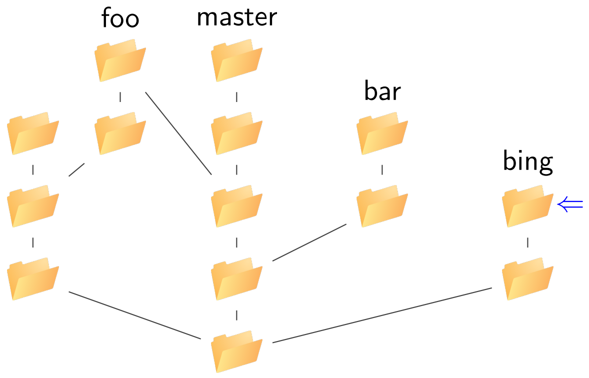

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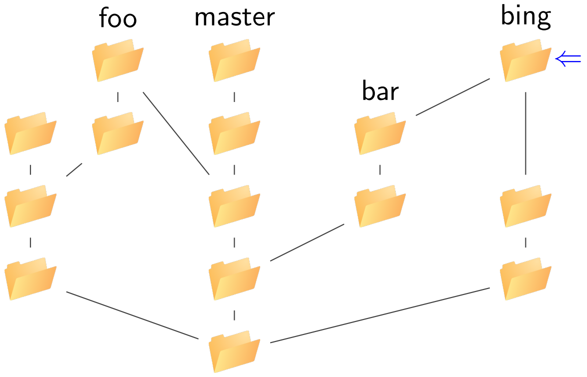

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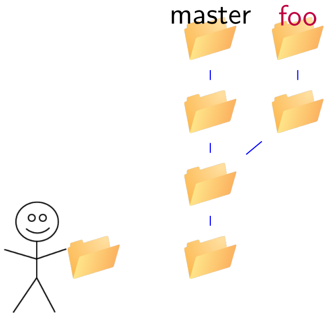
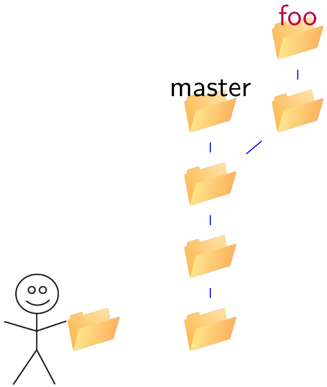
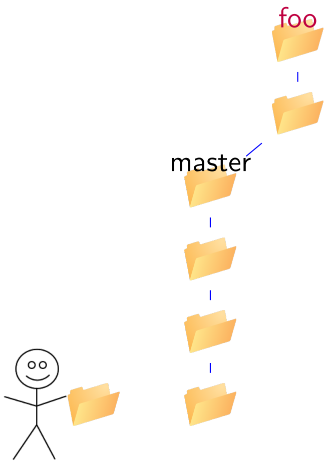
Git rebase



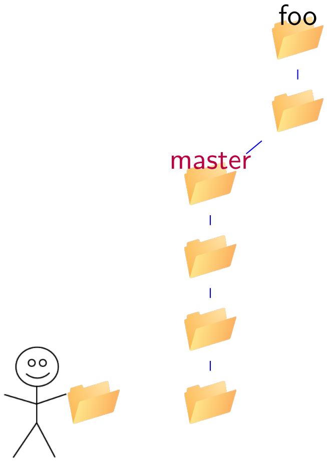
Git rebase



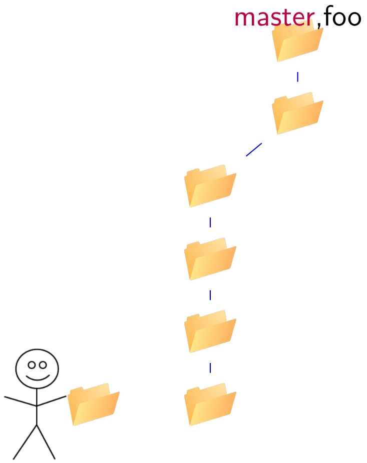
Git rebase



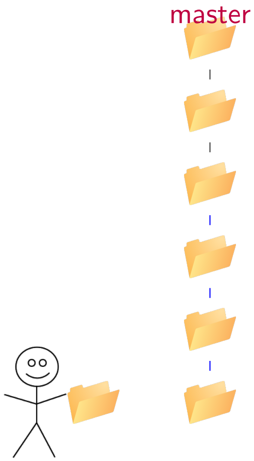
Git rebase



Git rebase



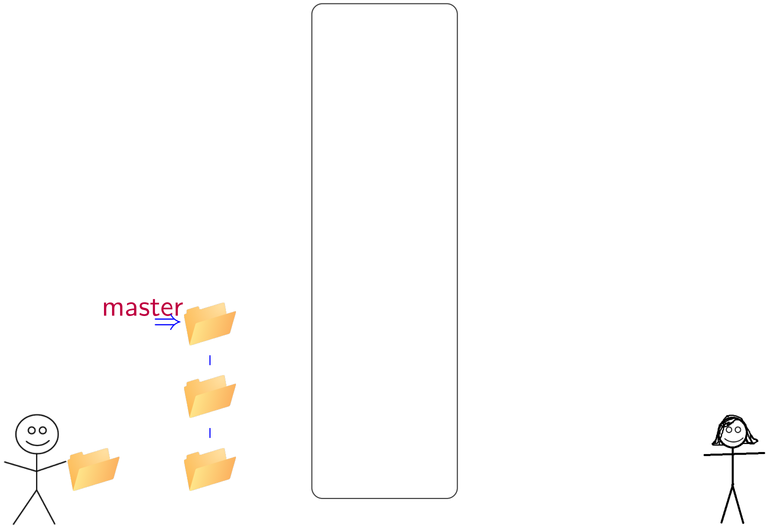
Git rebase



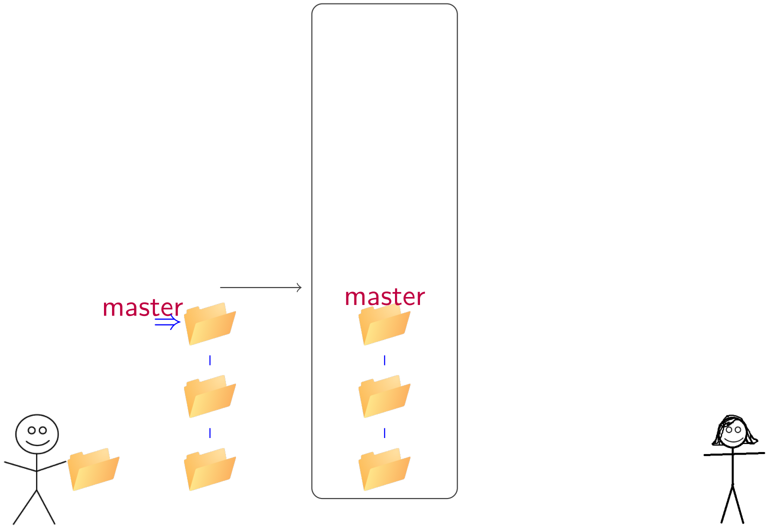
You can also. . .

- push branches onto the server (`git push -u origin <branchname>`)
- view which branches you have, which is active (HEAD), etc.
- keep a branch up-to-date with another without merging (`git rebase master`)
- delete whole branches (`git branch -d <branchname>`)
- change branch names; make another branch master (but be careful!)

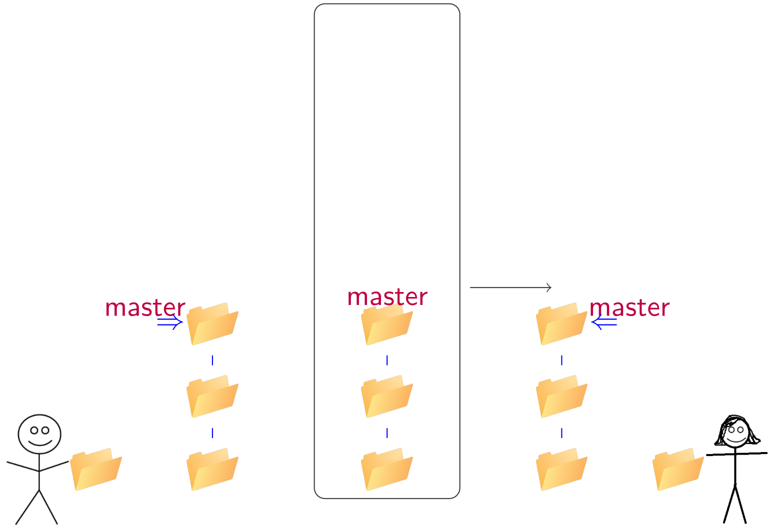
Actions:



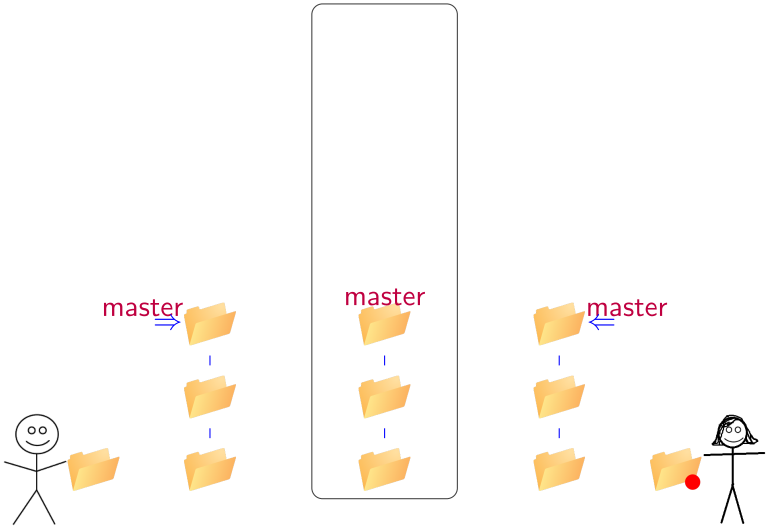
Actions:



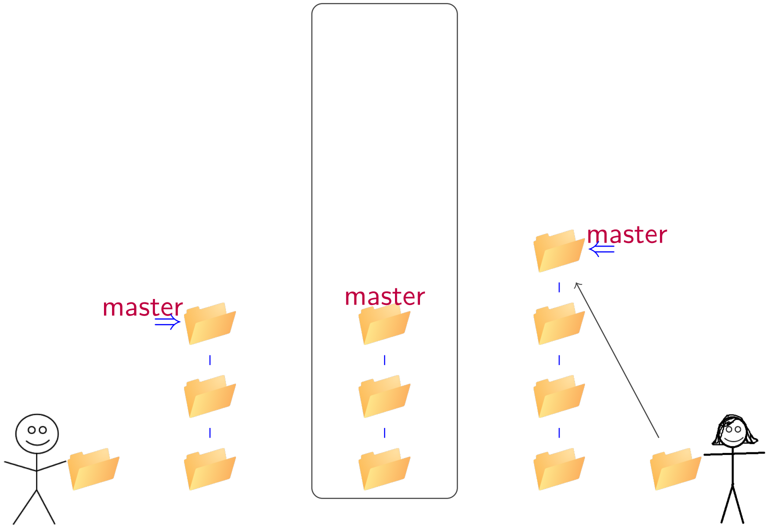
Actions: `git push`



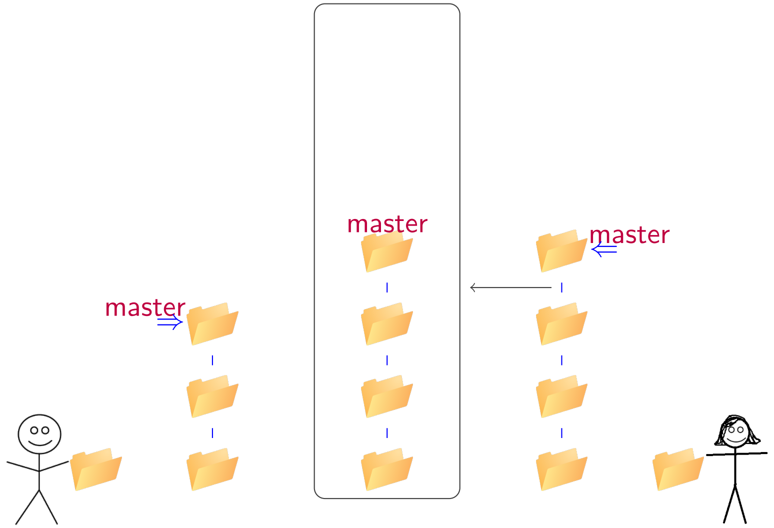
Actions: `git` `pull`



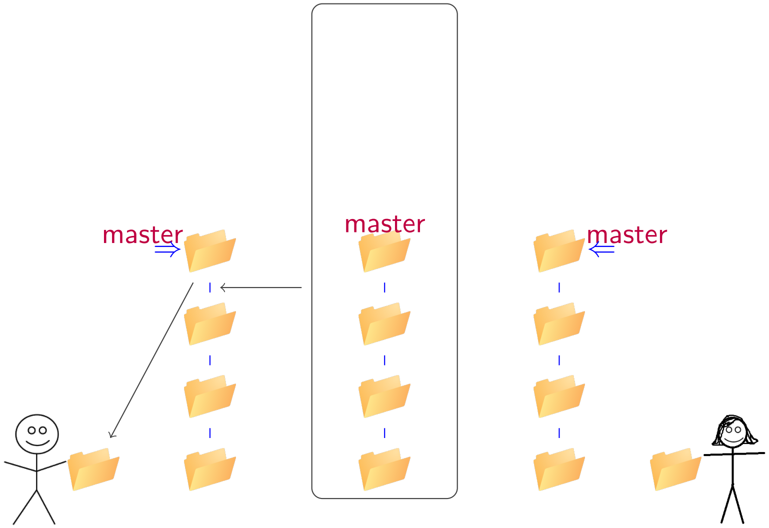
Actions: Martha updates the database handlers.



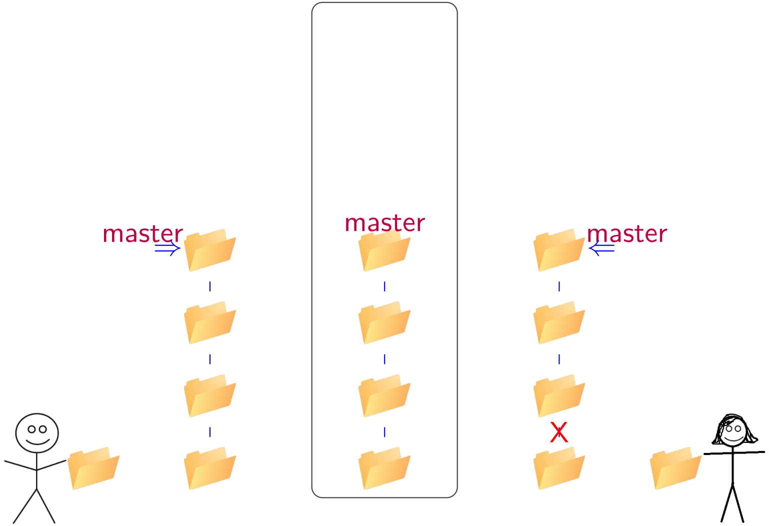
Actions: `git commit -a`



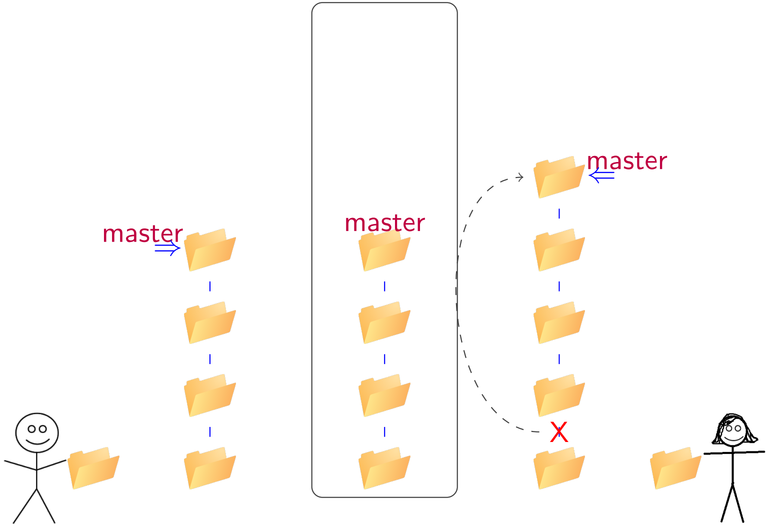
Actions: `git` `push`



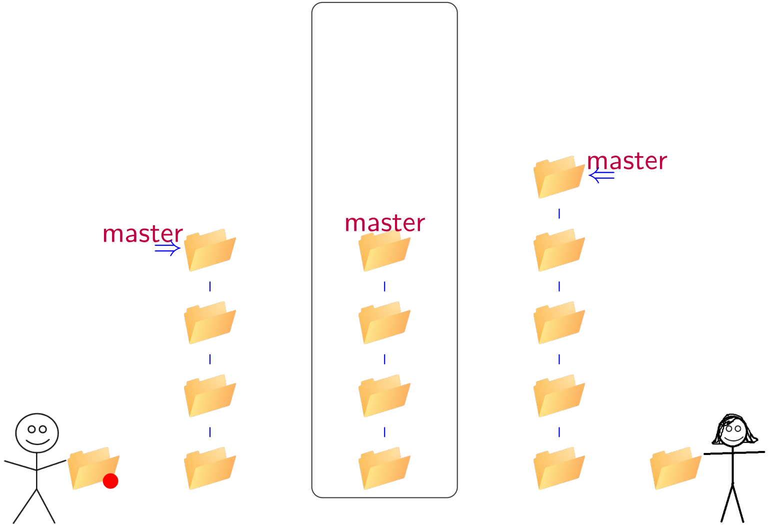
Actions: `git pull`



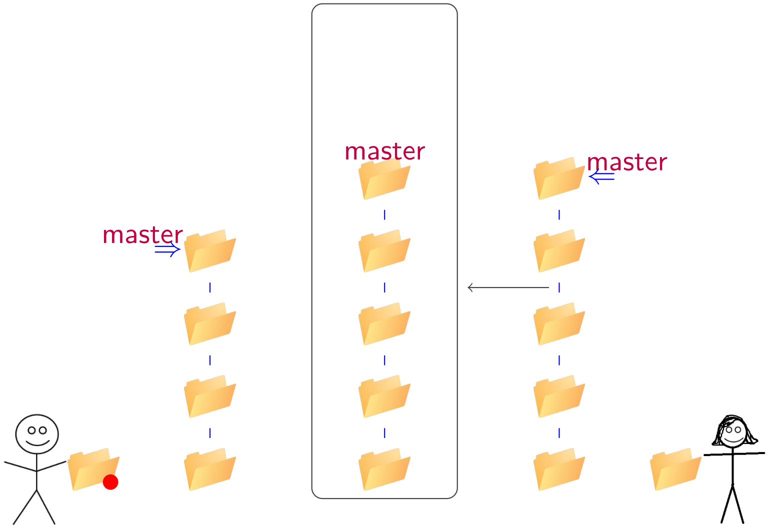
Actions: Martha decides that the colour change was a bad idea.



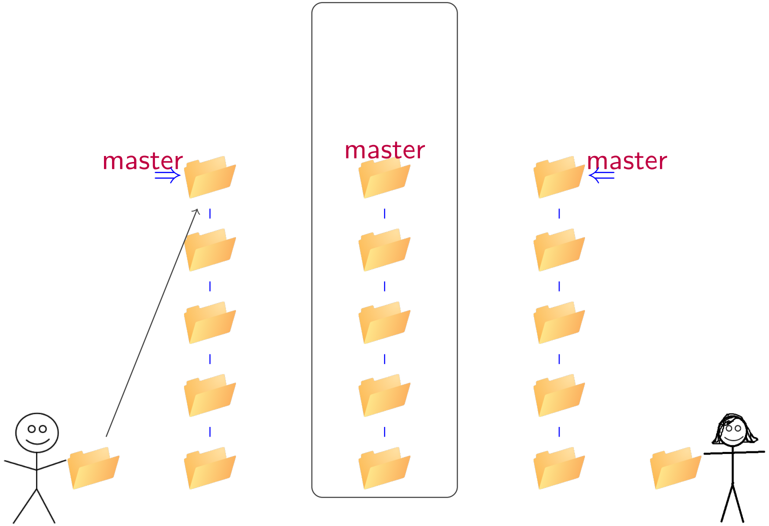
Actions: `git revert de337dc`



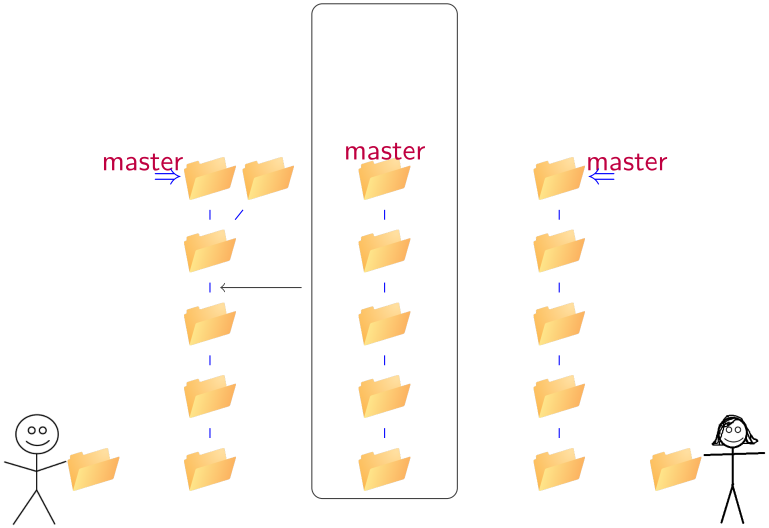
Actions: Harry changes the visualisation module.



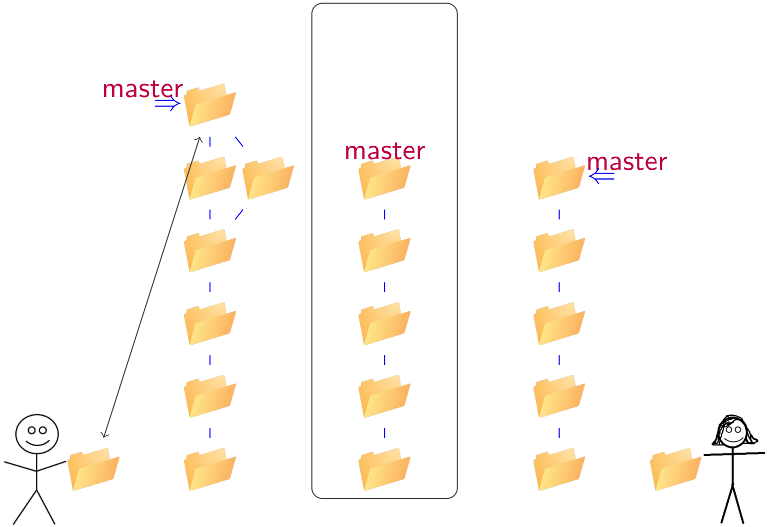
Actions: `git push`



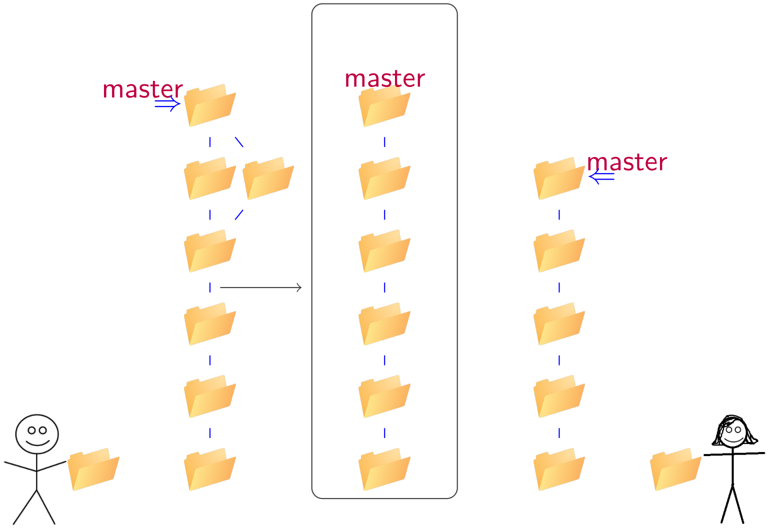
Actions: `git commit -a`



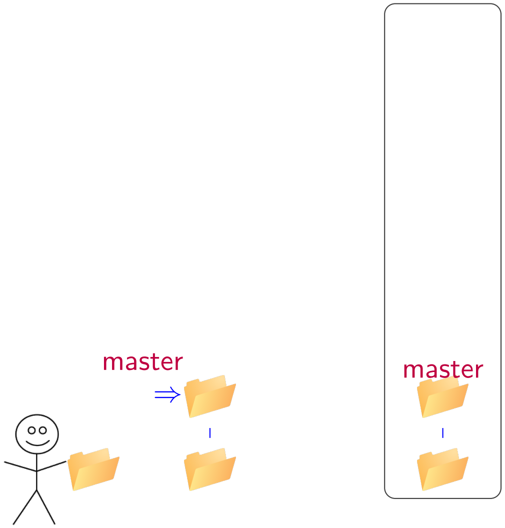
Actions: `git pull`



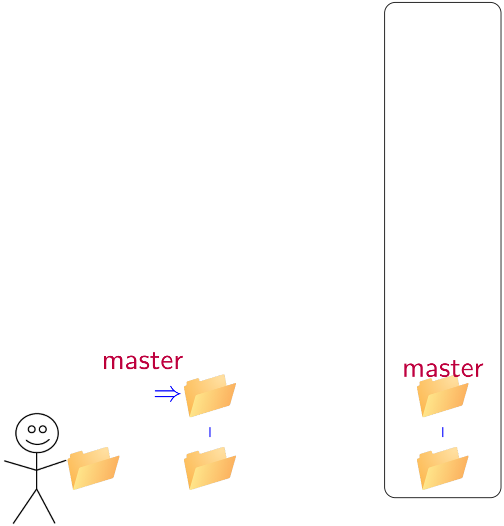
Actions: Harry handles the merge conflicts (if necessary).



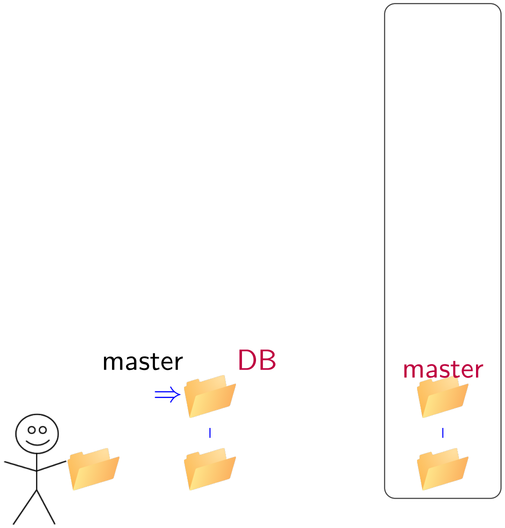
Actions: `git push`



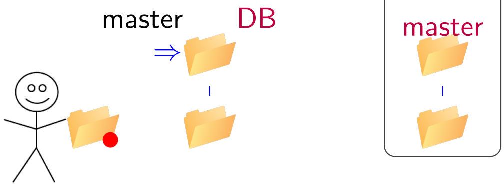
Actions:



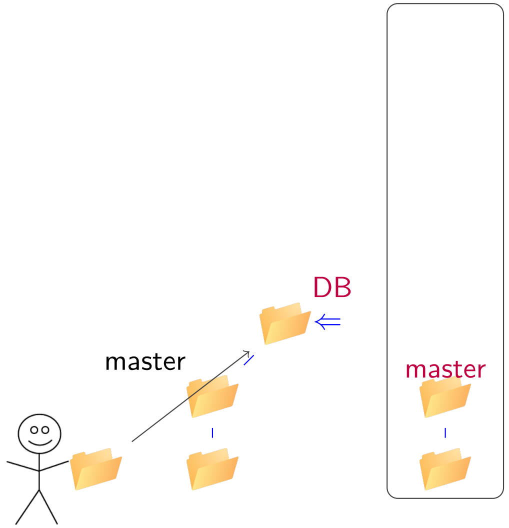
Actions: Harry decides to start working on a new feature.



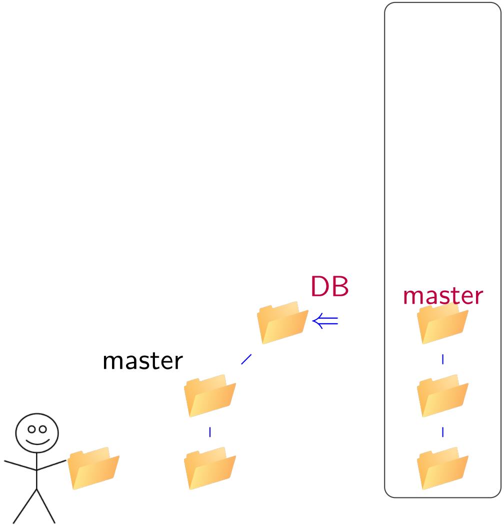
Actions: `git branch DB`



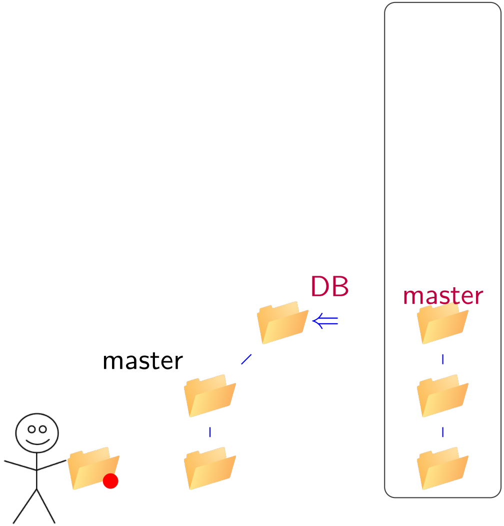
Actions: Harry changes the table structure



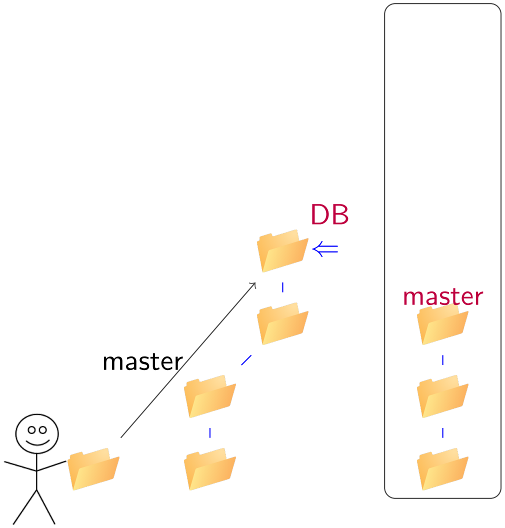
Actions: `git commit -a`



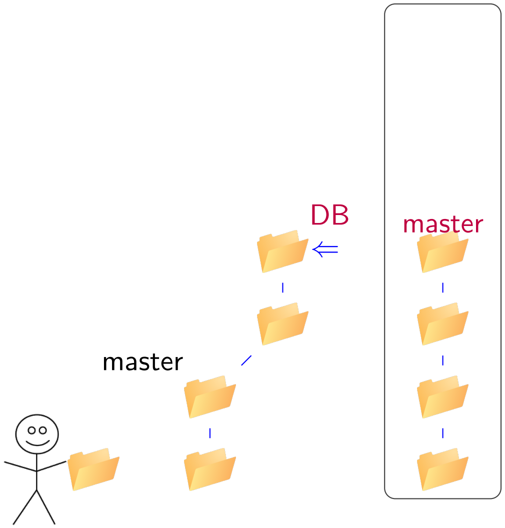
Actions: Collaborators make their own changes to the project.



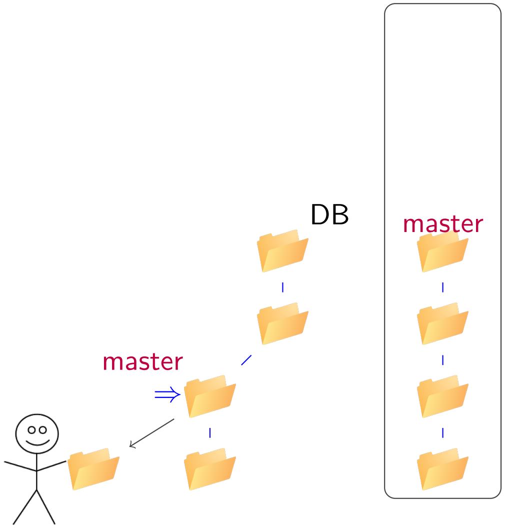
Actions: Harry moves database interactions to a separate class



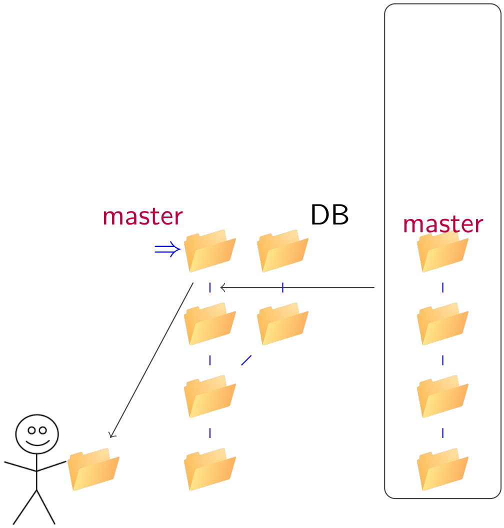
Actions: `git add DBManager.java ; git commit -a`



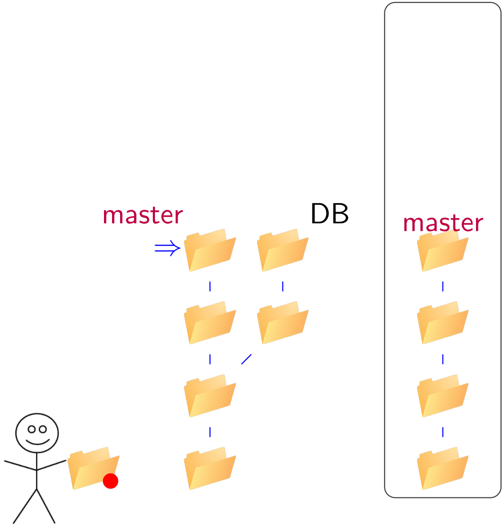
Actions: Collaborators make more changes and ask Harry to look.



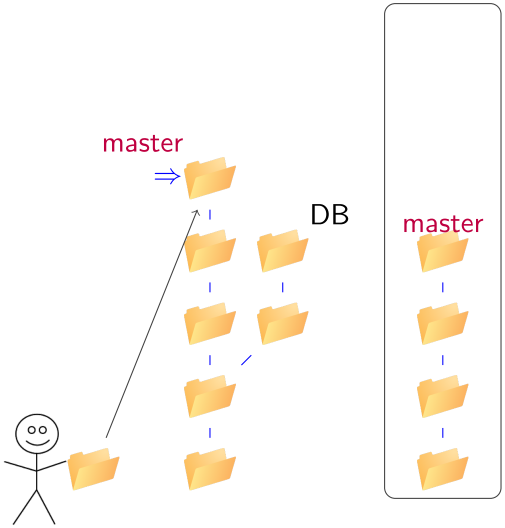
Actions: `git checkout master`



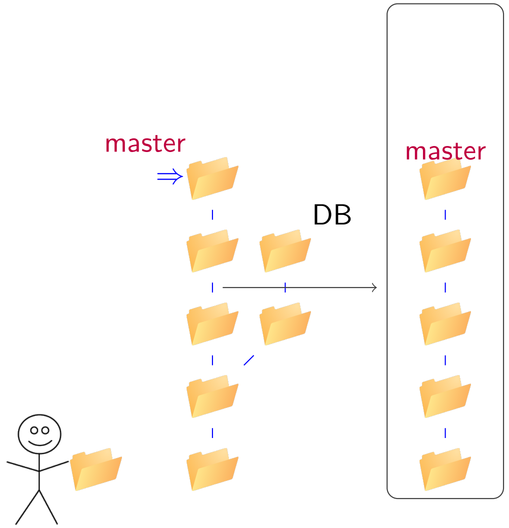
Actions: `git pull`



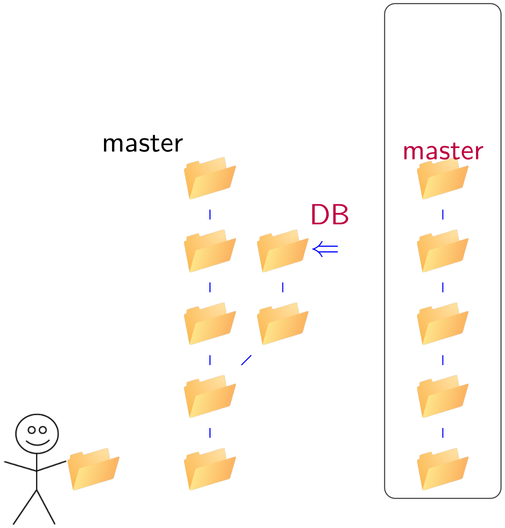
Actions: Harry makes a minor update.



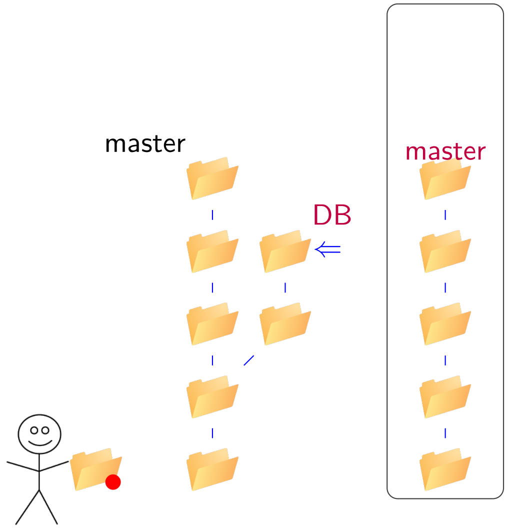
Actions: `git commit -a`



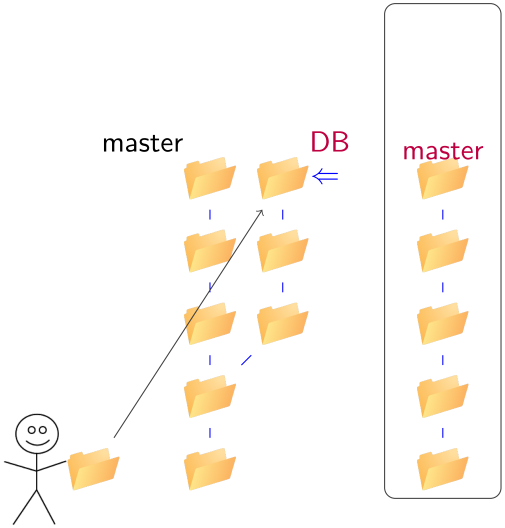
Actions: `git push`



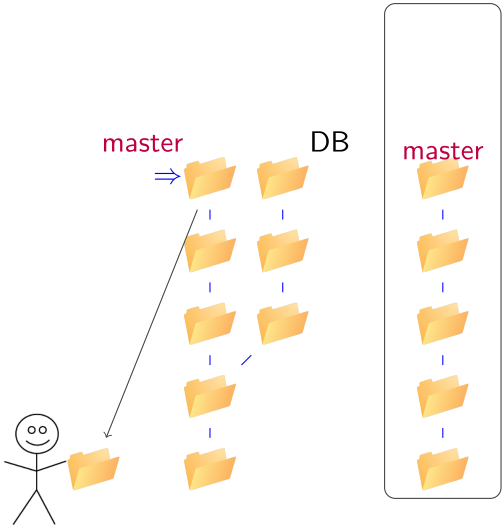
Actions: `git checkout DB`



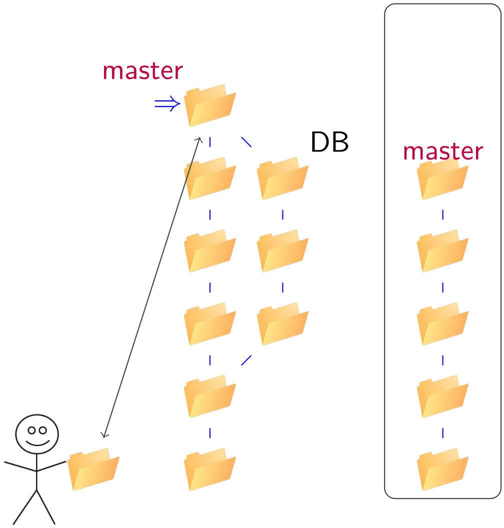
Actions: Harry completes changes to the database.



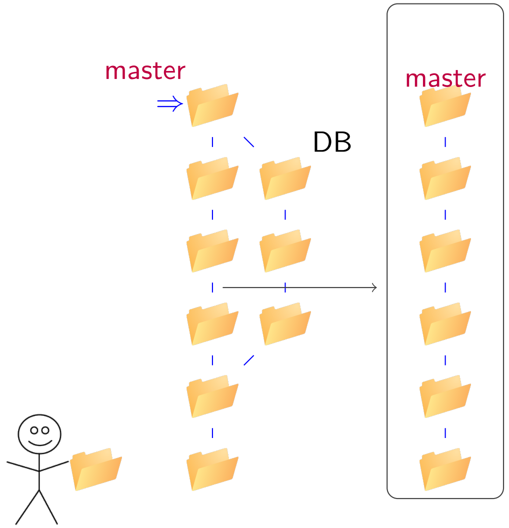
Actions: `git commit -a`



Actions: `git checkout master`



Actions: `git` `merge` `DB`

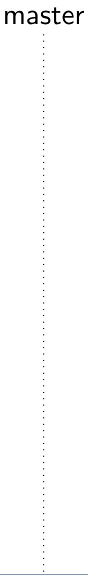


Actions: `git` `push`

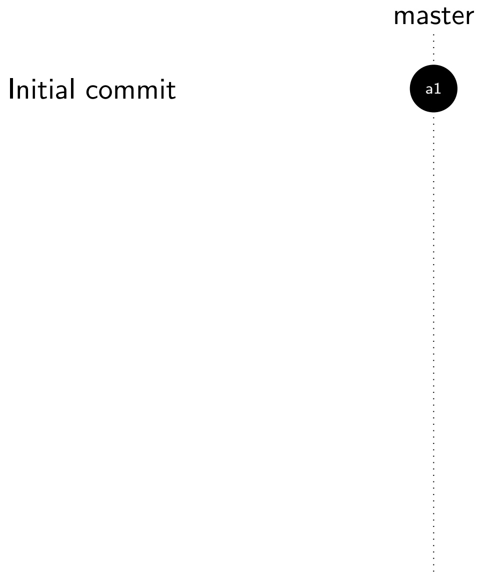
Try it out!!

- make a local git repository (possibly: one of those you played with before)
- create an empty repository on github
- push your repository to the server
- make branches and push those to the server, too
- delete branches on the server
- (fork and) clone someone else's repository
- generate and resolve merge conflicts
- any remaining questions. . . try it yourself :)

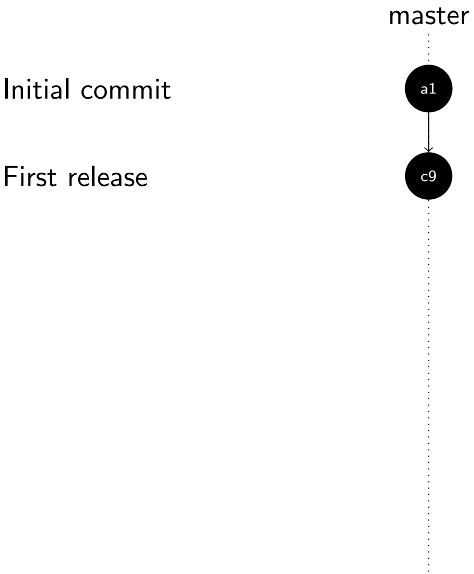
Bad workflow



Bad workflow



Bad workflow

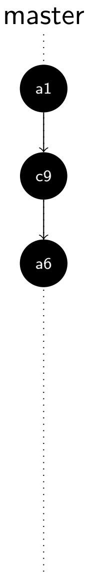


Bad workflow

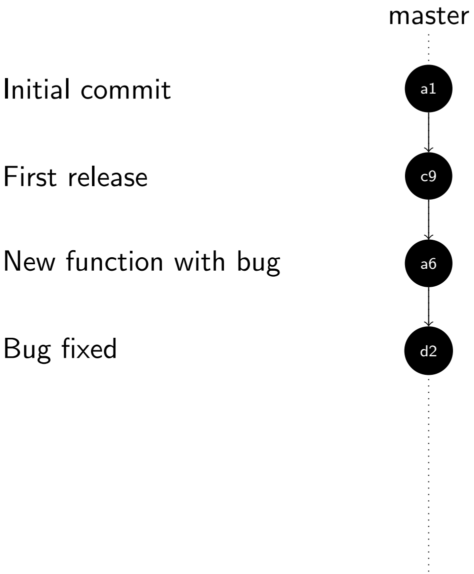
Initial commit

First release

New function with bug



Bad workflow



Bad workflow

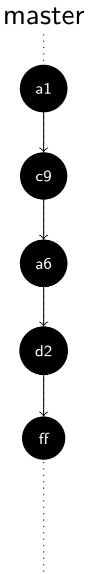
Initial commit

First release

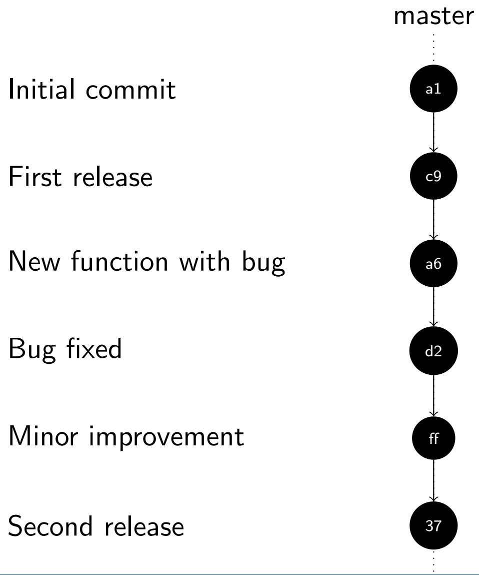
New function with bug

Bug fixed

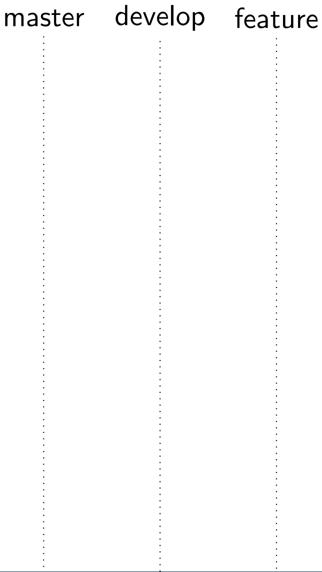
Minor improvement



Bad workflow

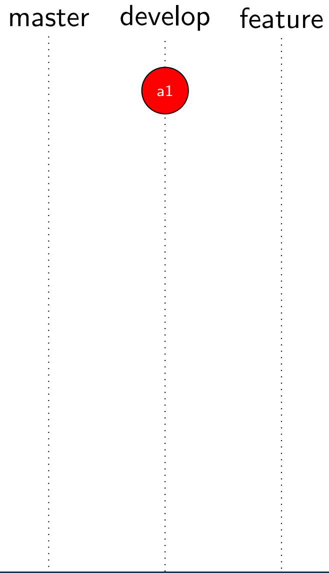


Good workflow



Good workflow

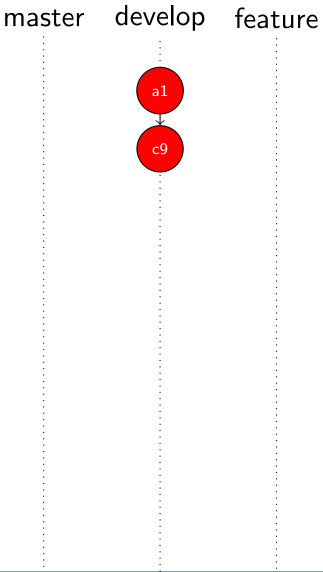
Initial commit



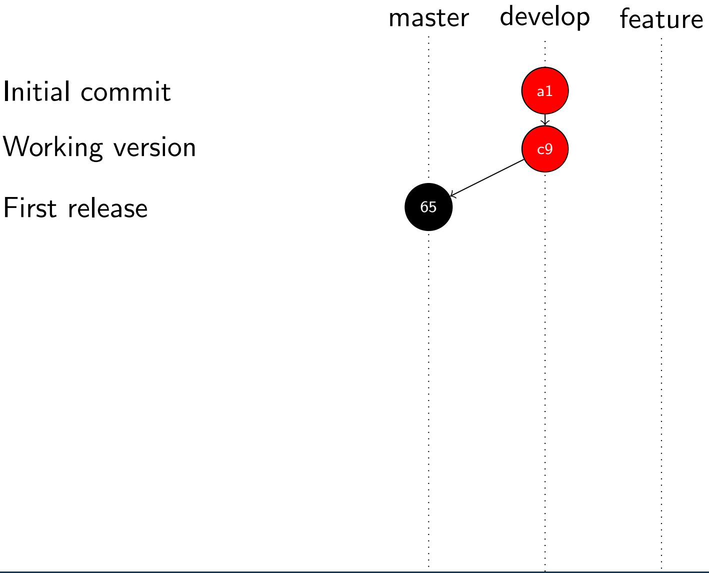
Good workflow

Initial commit

Working version



Good workflow



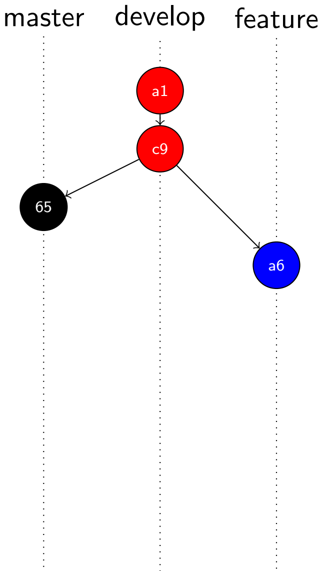
Good workflow

Initial commit

Working version

First release

New function with bug



Good workflow

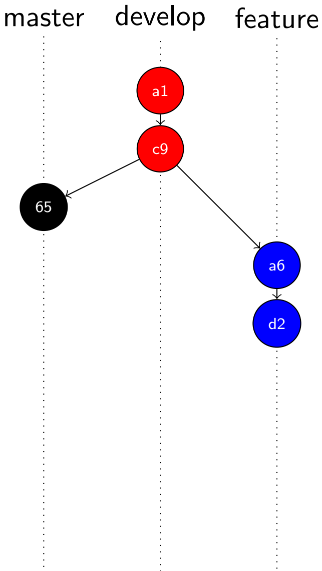
Initial commit

Working version

First release

New function with bug

Bug fixed



Good workflow

Initial commit

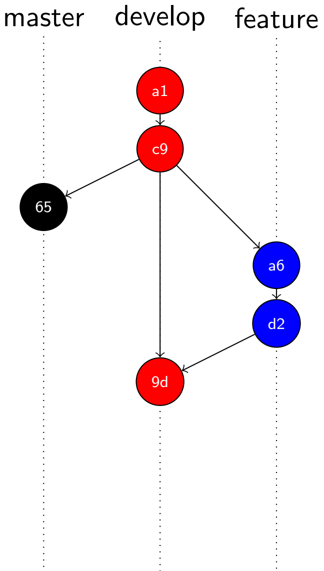
Working version

First release

New function with bug

Bug fixed

Update working version



Good workflow

Initial commit

Working version

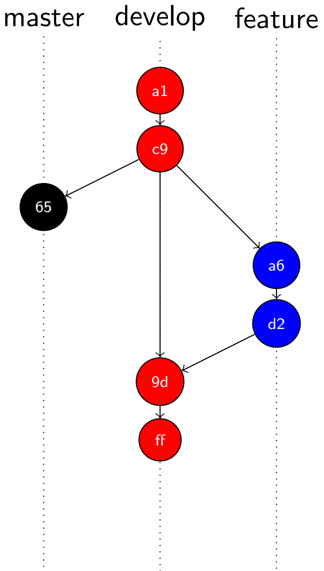
First release

New function with bug

Bug fixed

Update working version

Minor improvement



Good workflow

Initial commit

Working version

First release

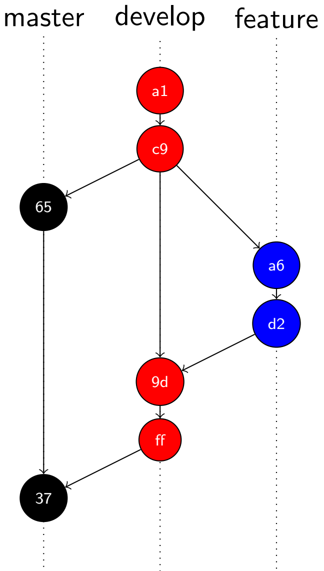
New function with bug

Bug fixed

Update working version

Minor improvement

Second release



General advice

- do not mess with remote history!
- use a development branch next to a release branch
- use a separate branch feature/pick-the-name for each feature
- all files in `.gitignore` will be ignored (e.g., `*.sw?` for swap files and `*~` for editor backup files)
- keep an eye on the repository structure through `git gui` (or an alias)
- cheat sheet: available on Brightspace :)