Principles of Software Construction: Objects, Design, and Concurrency

Git workflows
(and maybe concurrency primitives)

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Administrivia

- HW 5a presentations in Recitation in front of your classmates
  - Goal: illustrate how you achieve reuse in a domain
  - Describe domain, examples of plugins, decisions regarding generality vs specificity, overall project structure (e.g., how are plugins loaded), plugin interfaces
  - Similar to design review sessions
- Compete for “best framework”?

Administrivia (2)

- Commit messages are (one of) your primary means of communication with the rest of the team.
  - This will become more obvious in HW5.

HW4b; Oops forgot to save. (Also bus is here)

Woke up and dreamt of some bugs. They were there.

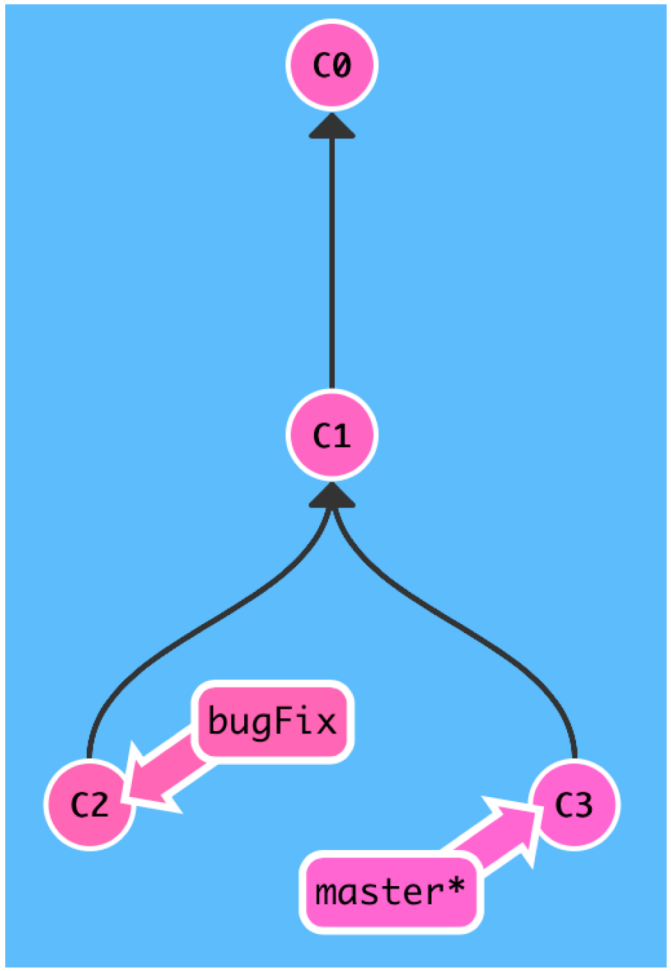
HW 4b update (...kill me)

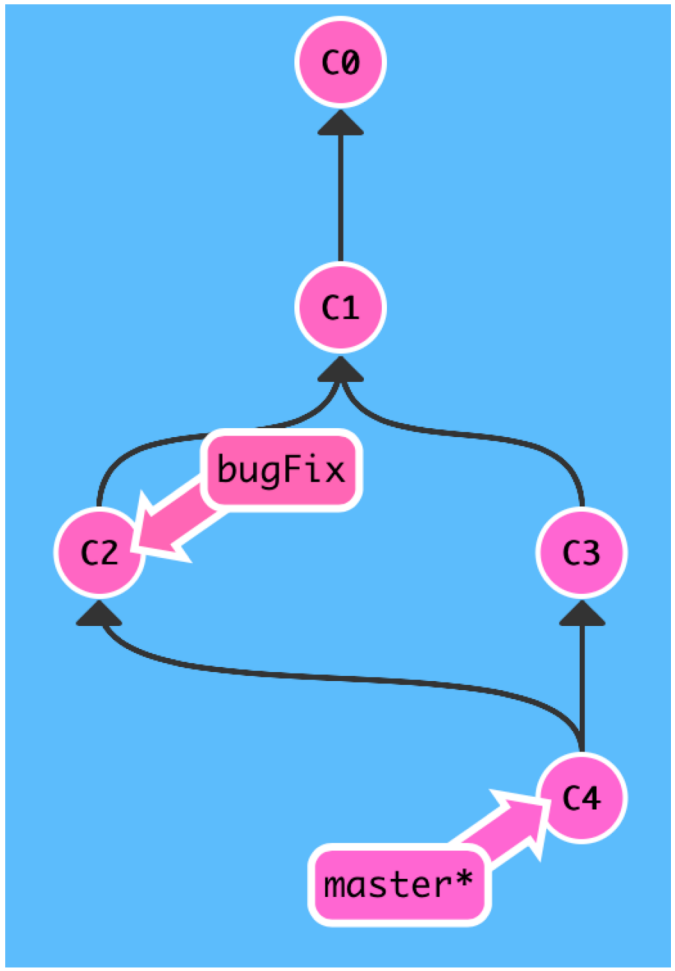
dropped my laptop, then I banged it on a table. Was reminded of impor...

Last week Tuesday

Three ways to move work around between branches

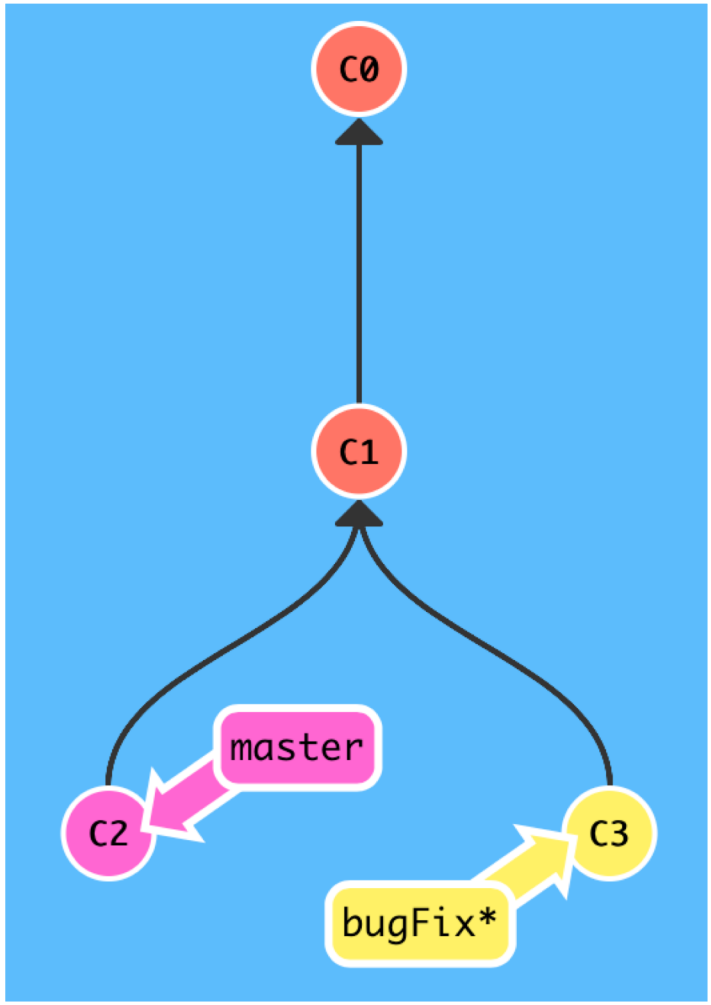
1) `git merge bugFix` (into `master`)

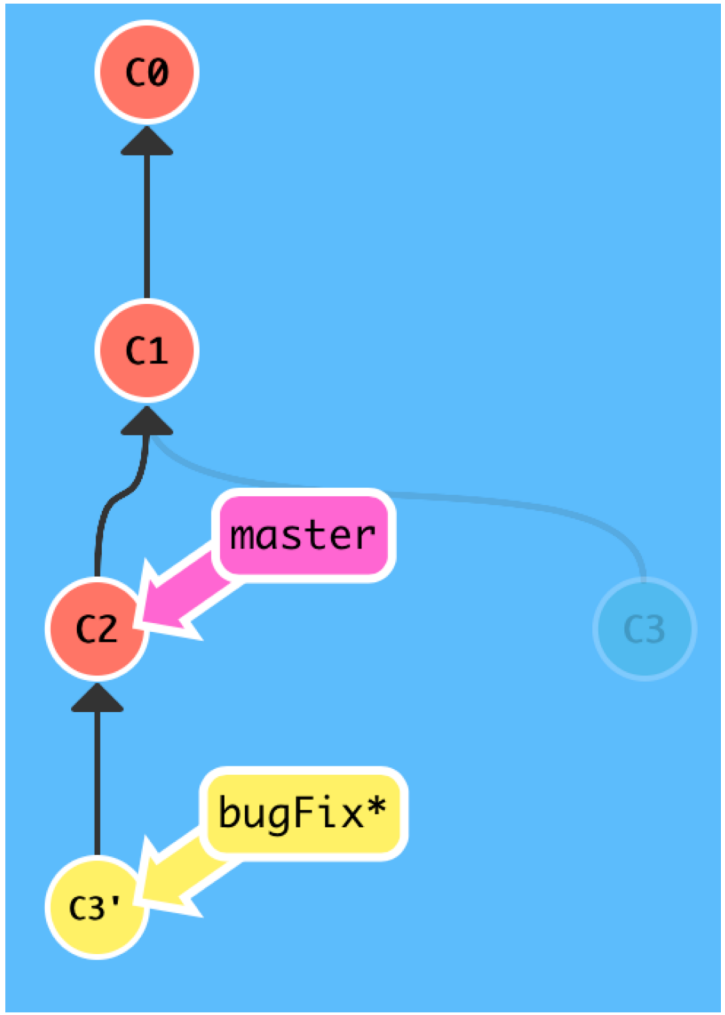




Move work from bugFix directly onto master

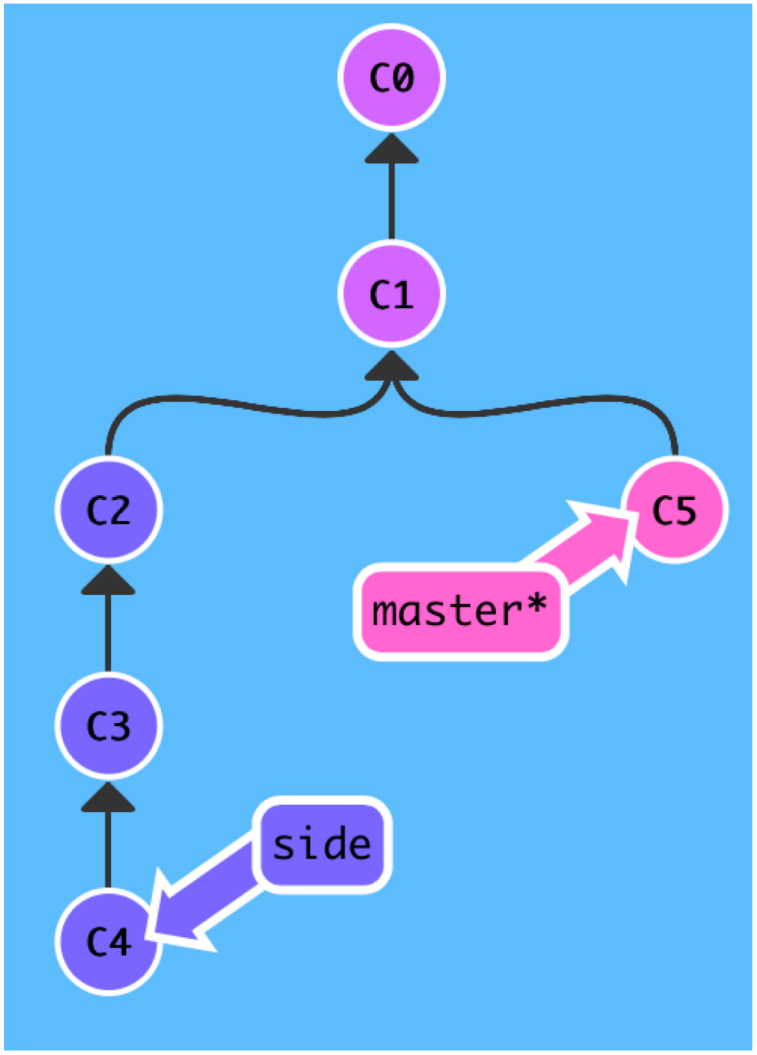
```
2) git rebase master
```

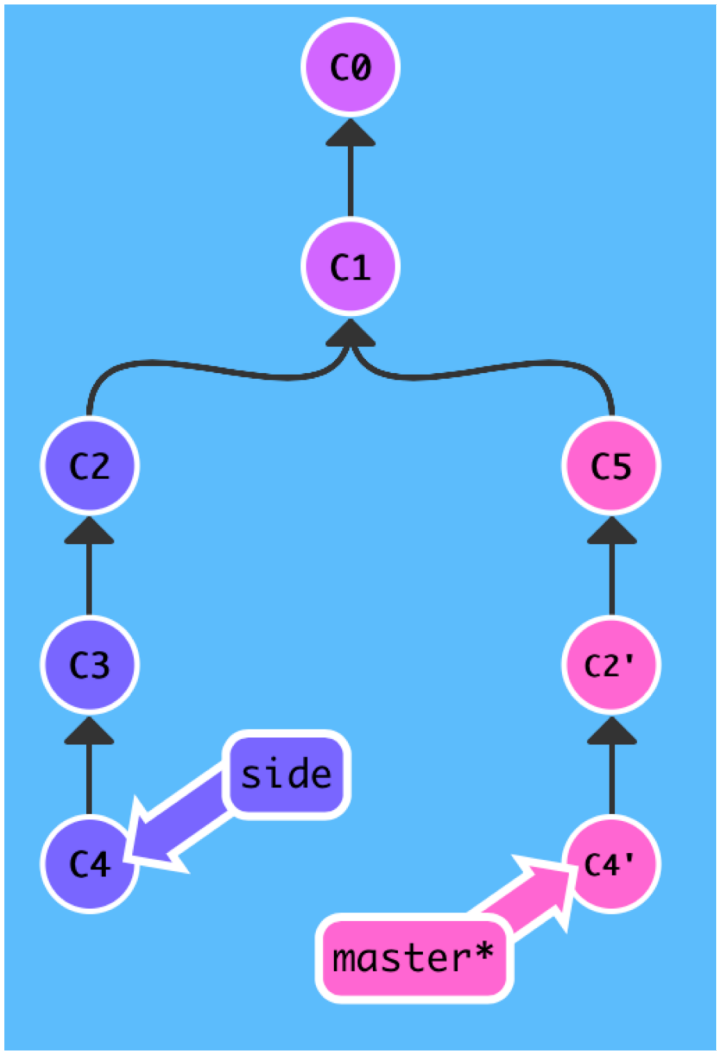




Copy a series of commits below current location

```
3) git cherry-pick C2 C4
```

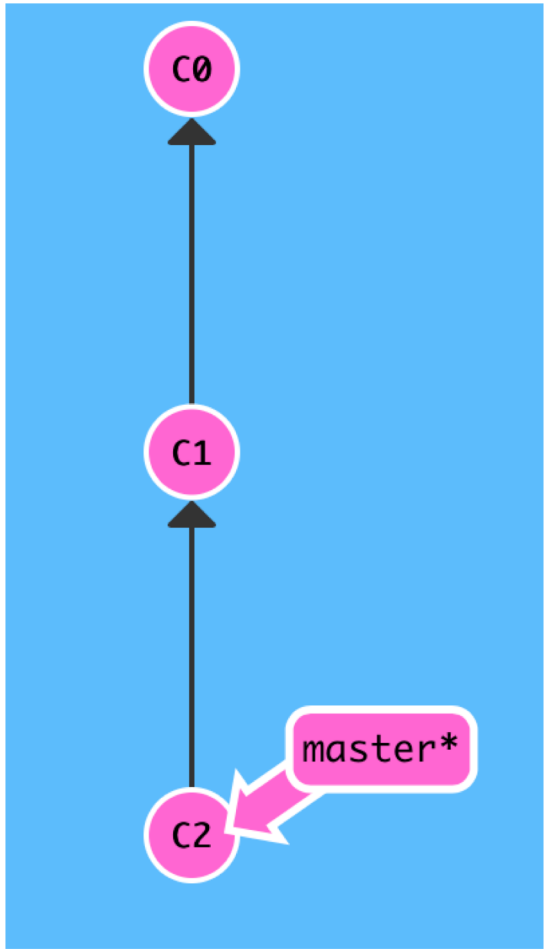


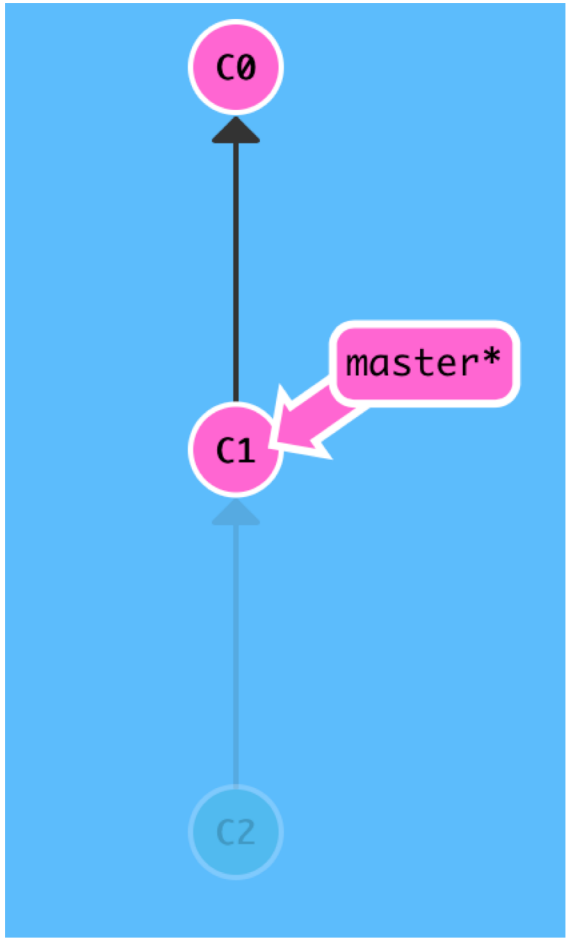


Ways to undo work (1)

```
git reset HEAD~1
```

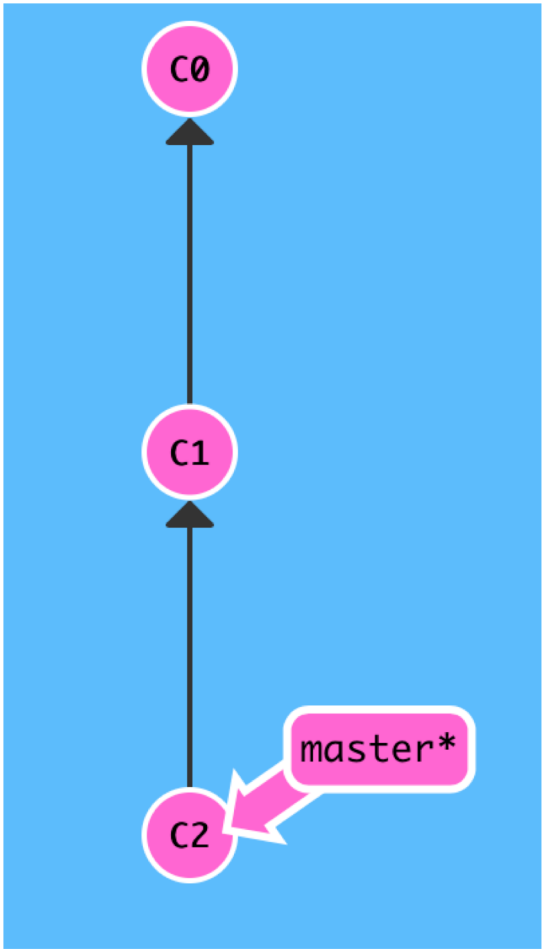
HEAD is the symbolic name for the currently checked out commit



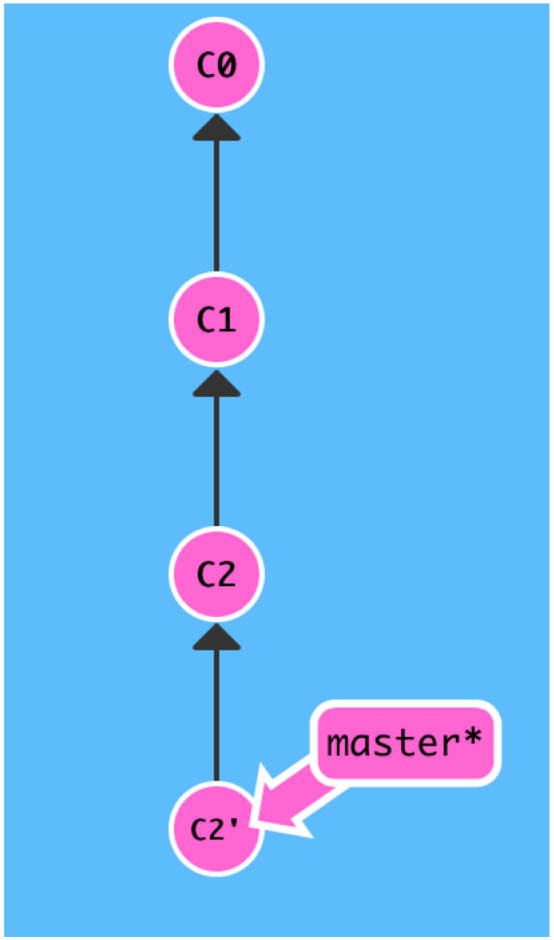


Ways to undo work (2)

```
git revert HEAD
```



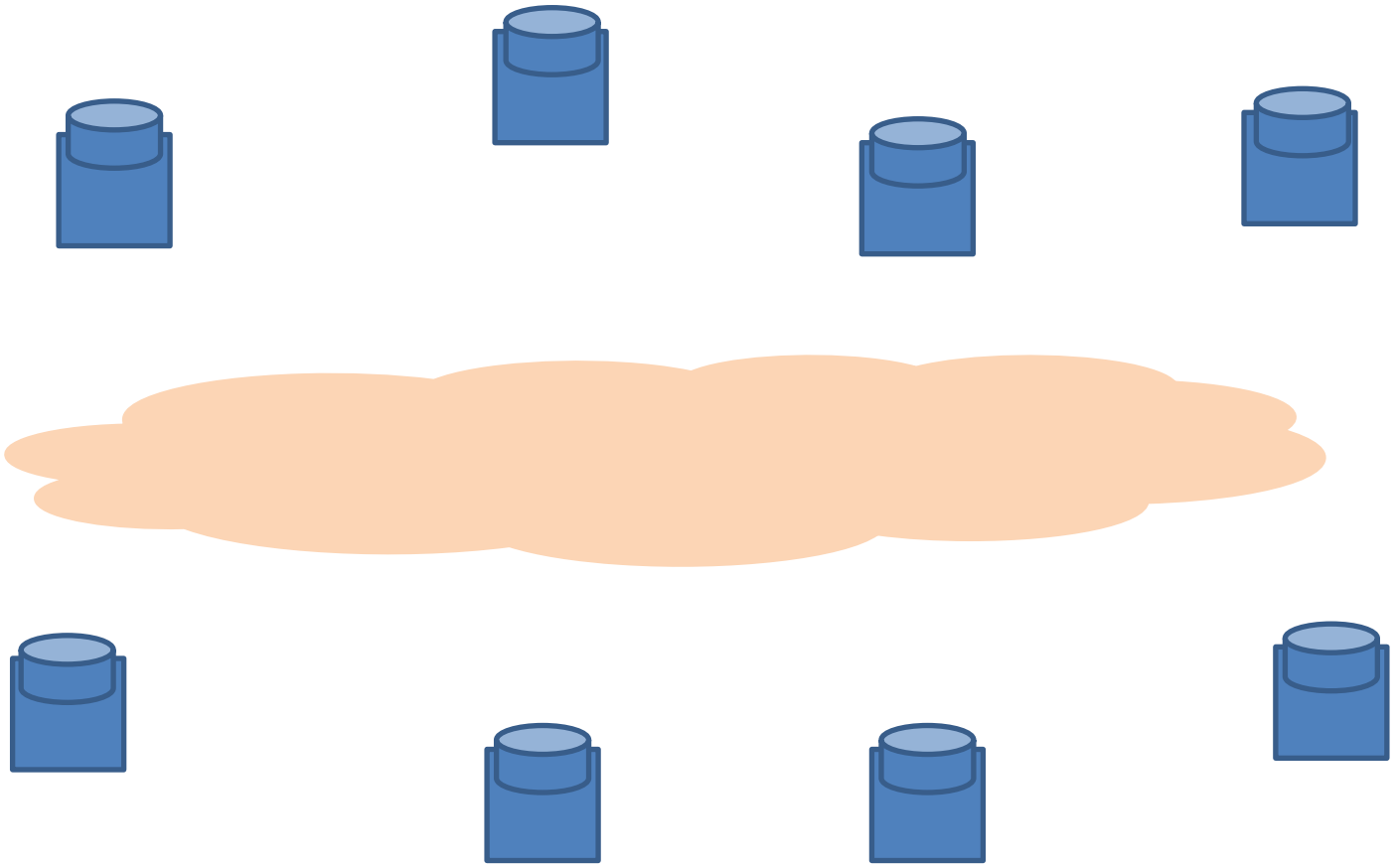
git reset does not work for remote branches



SYNCING LOCAL <--> REMOTE

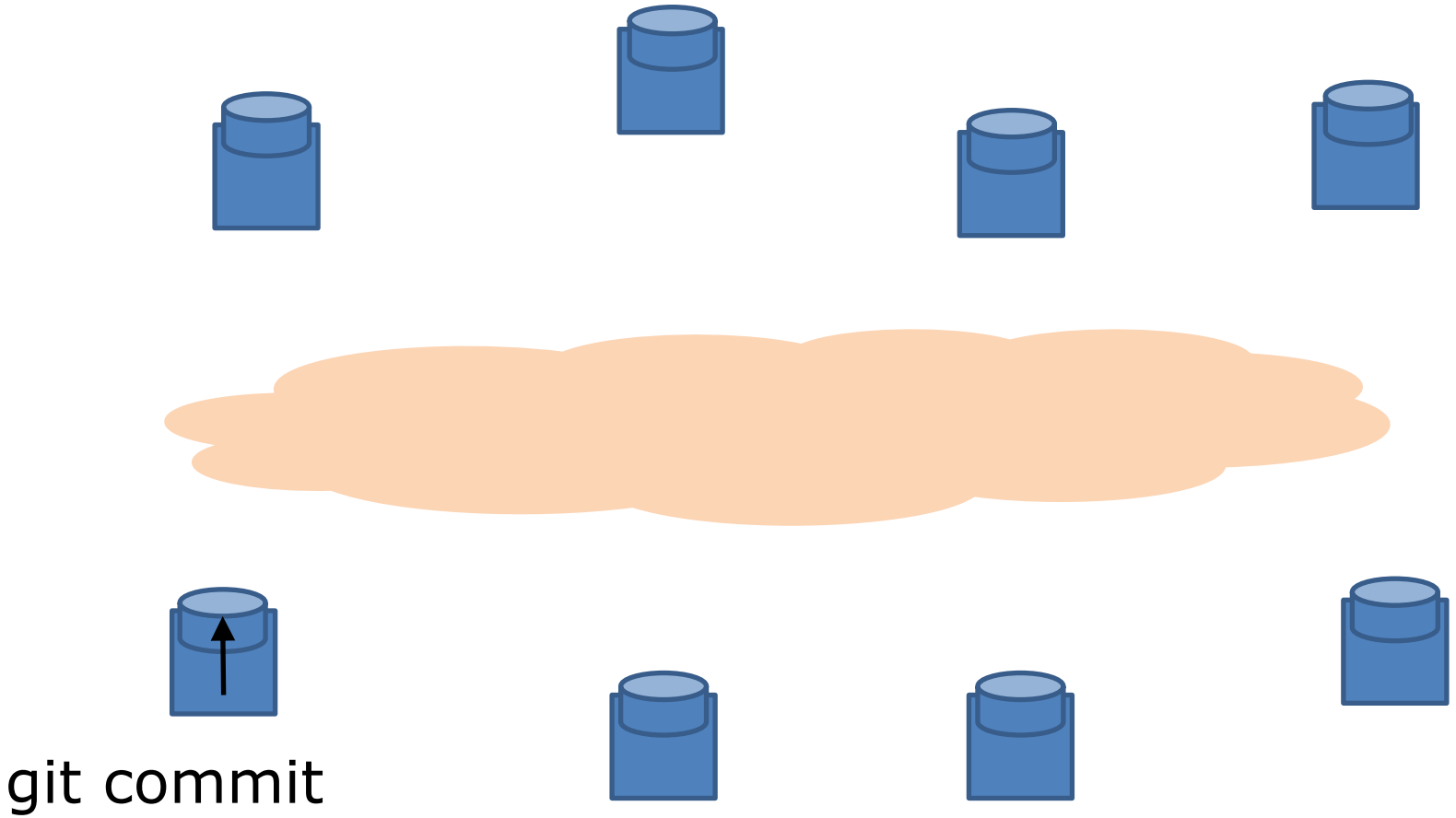
Git

Every computer is a server and version control happens locally.



Git

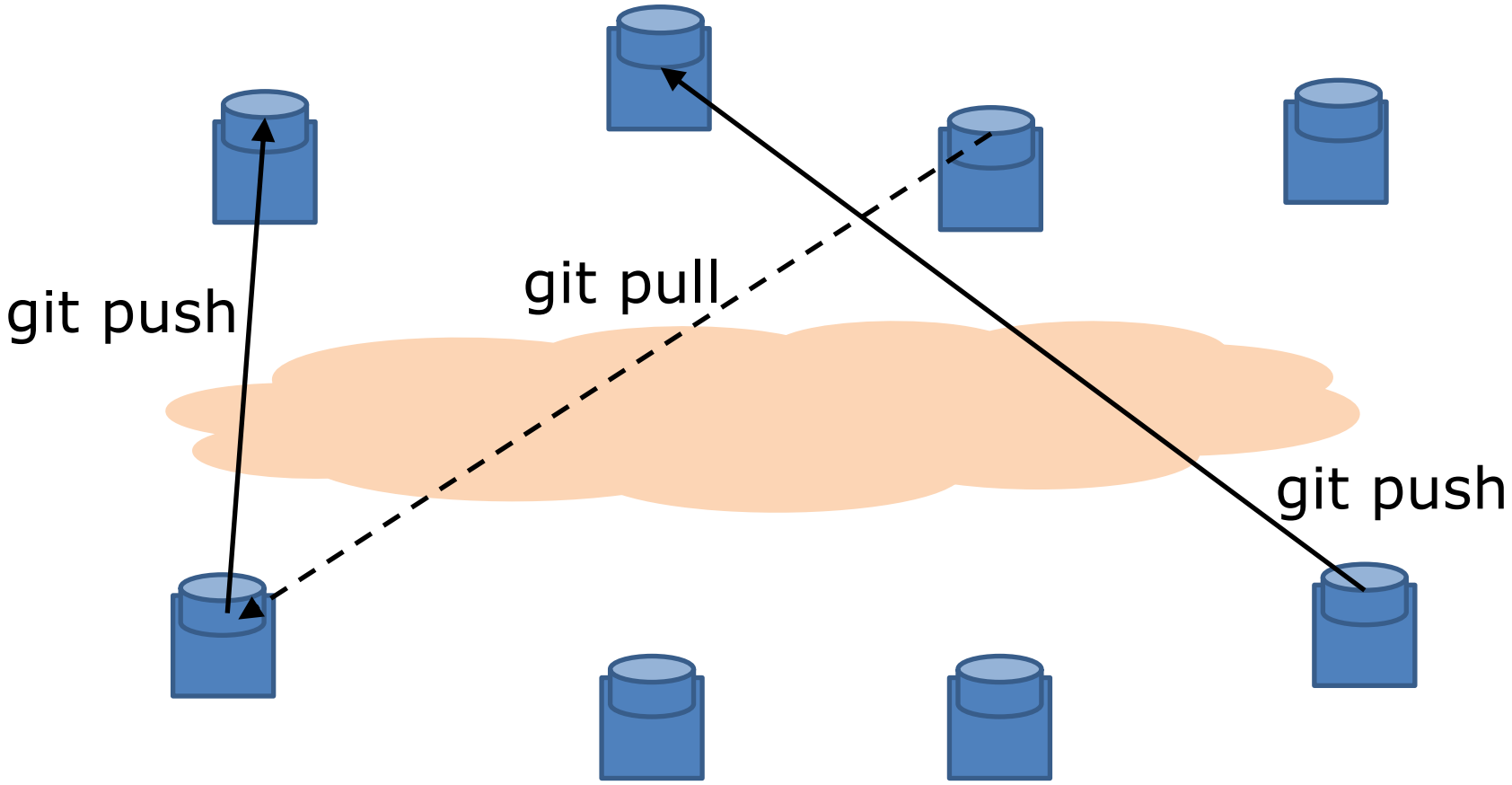
How do you share code with collaborators if commits are *local*?



git commit

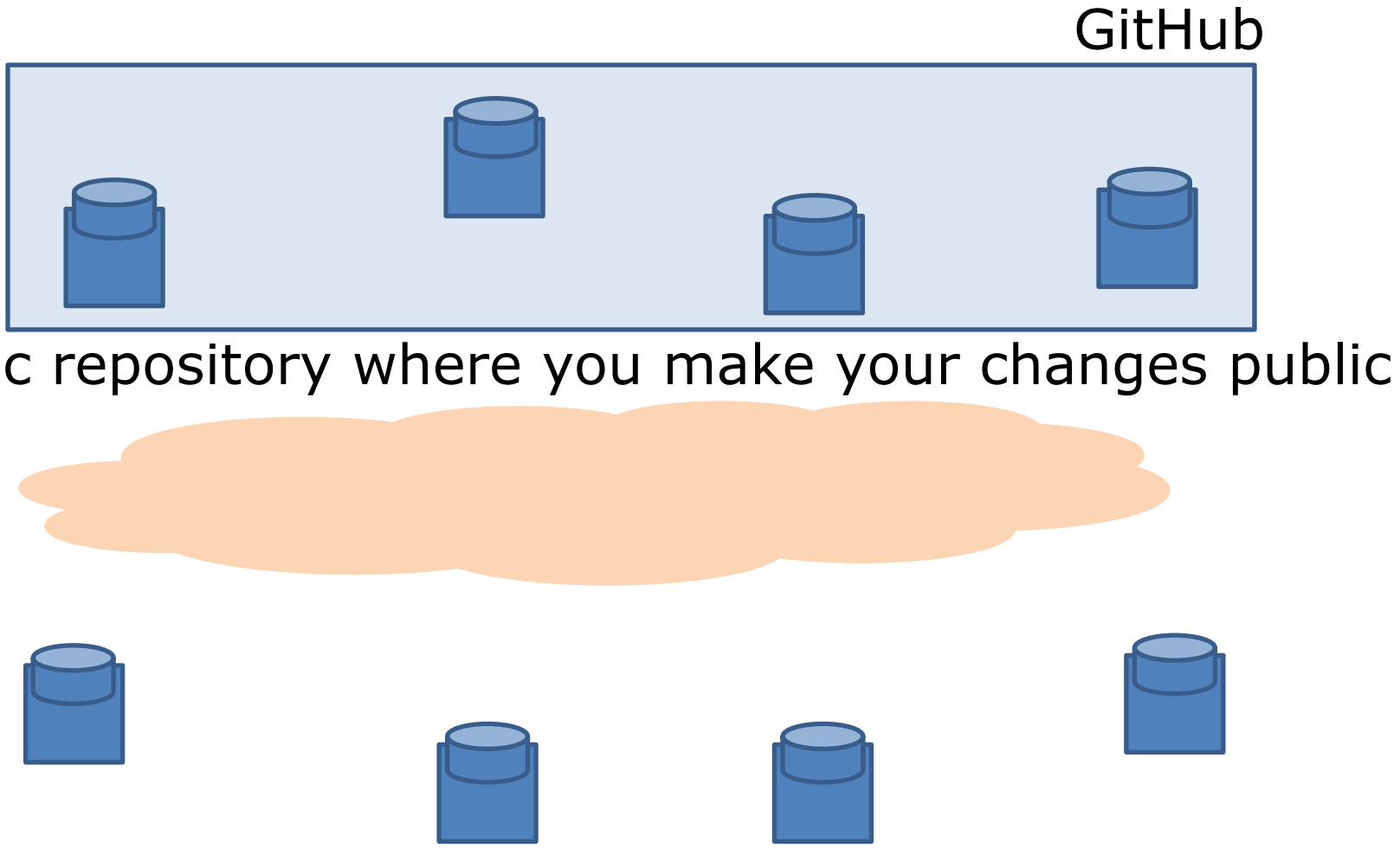
Git

You *push* your commits into their repositories / They *pull* your commits into their repositories

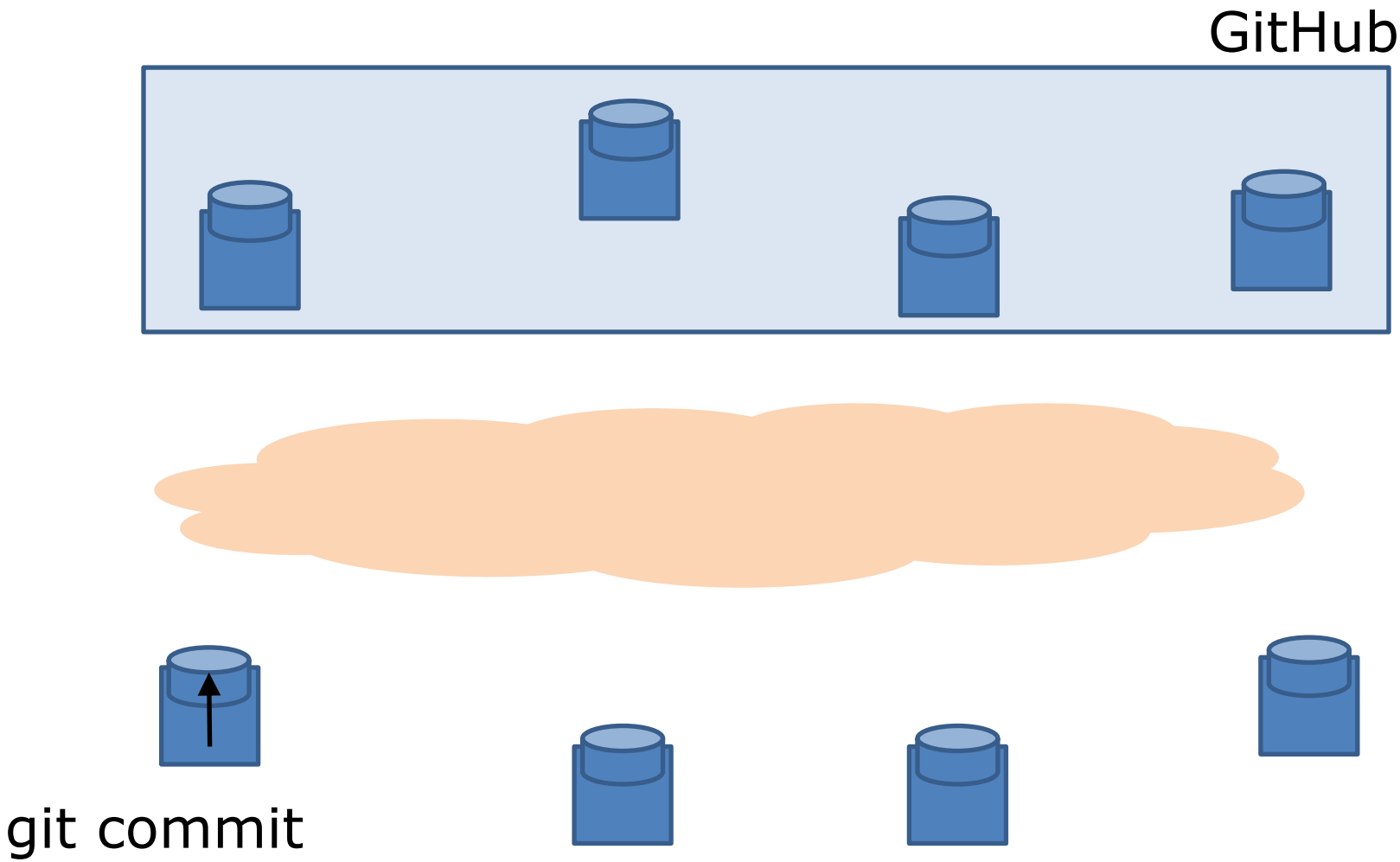


… But requires host names / IP addresses

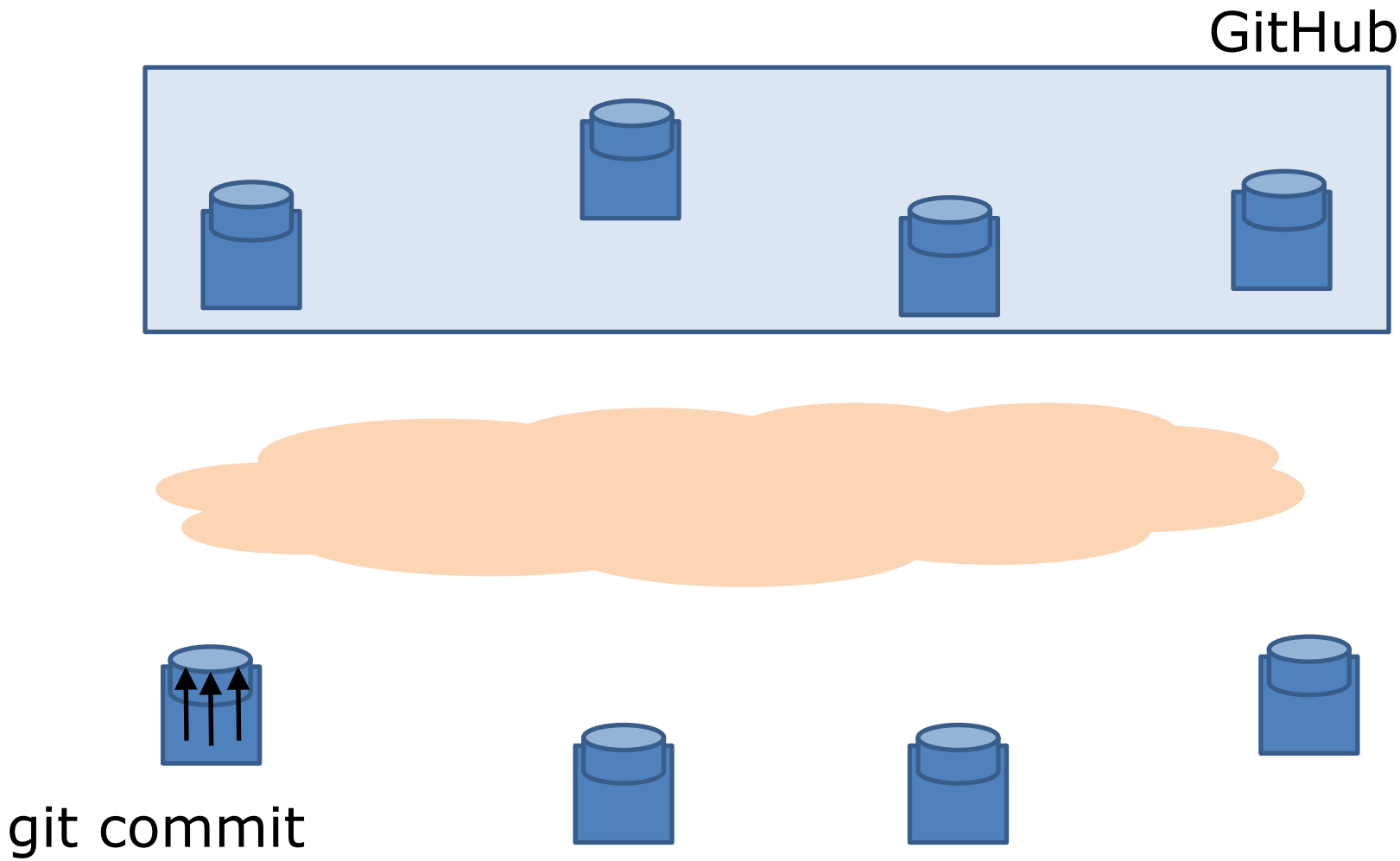
GitHub typical workflow



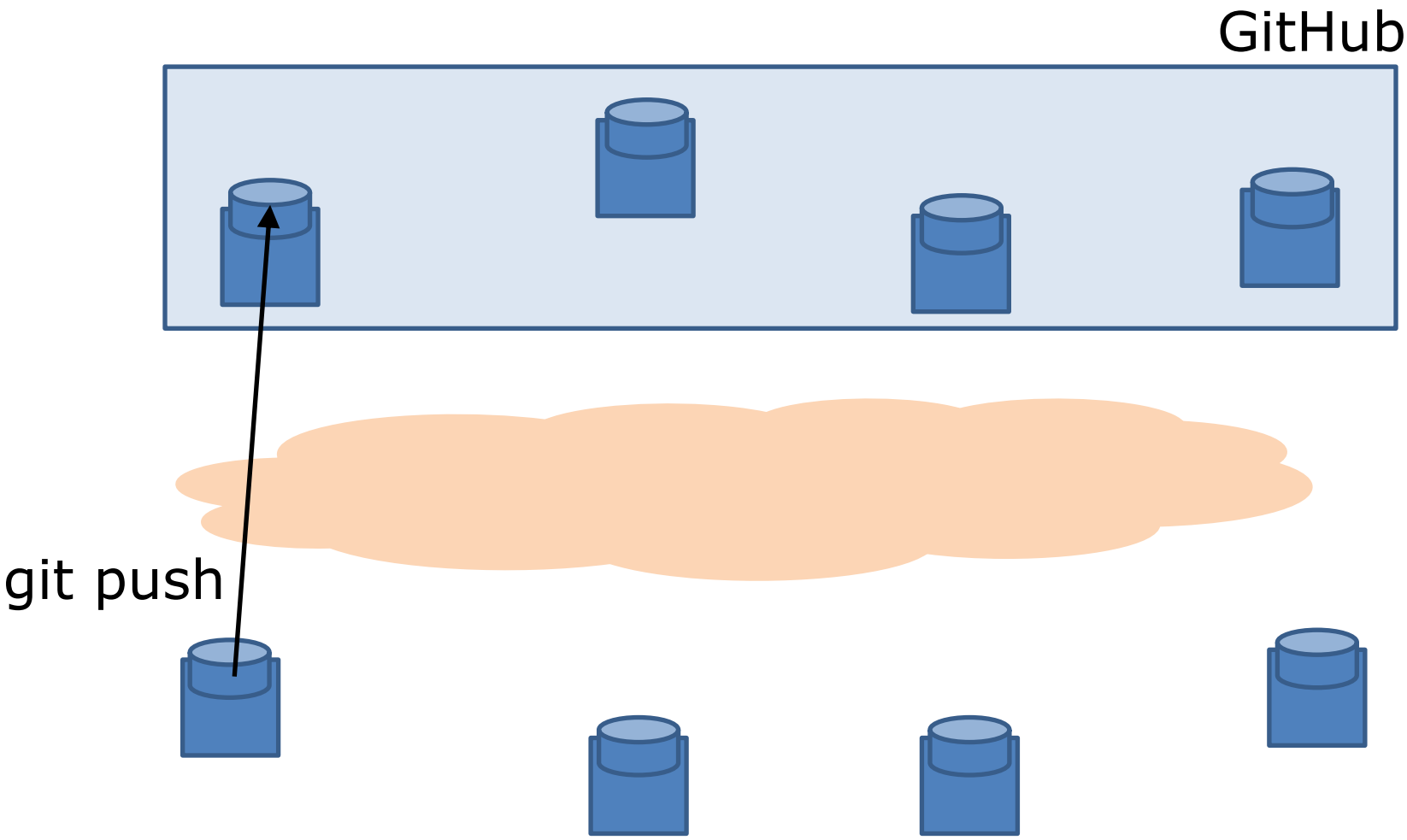
GitHub typical workflow



GitHub typical workflow

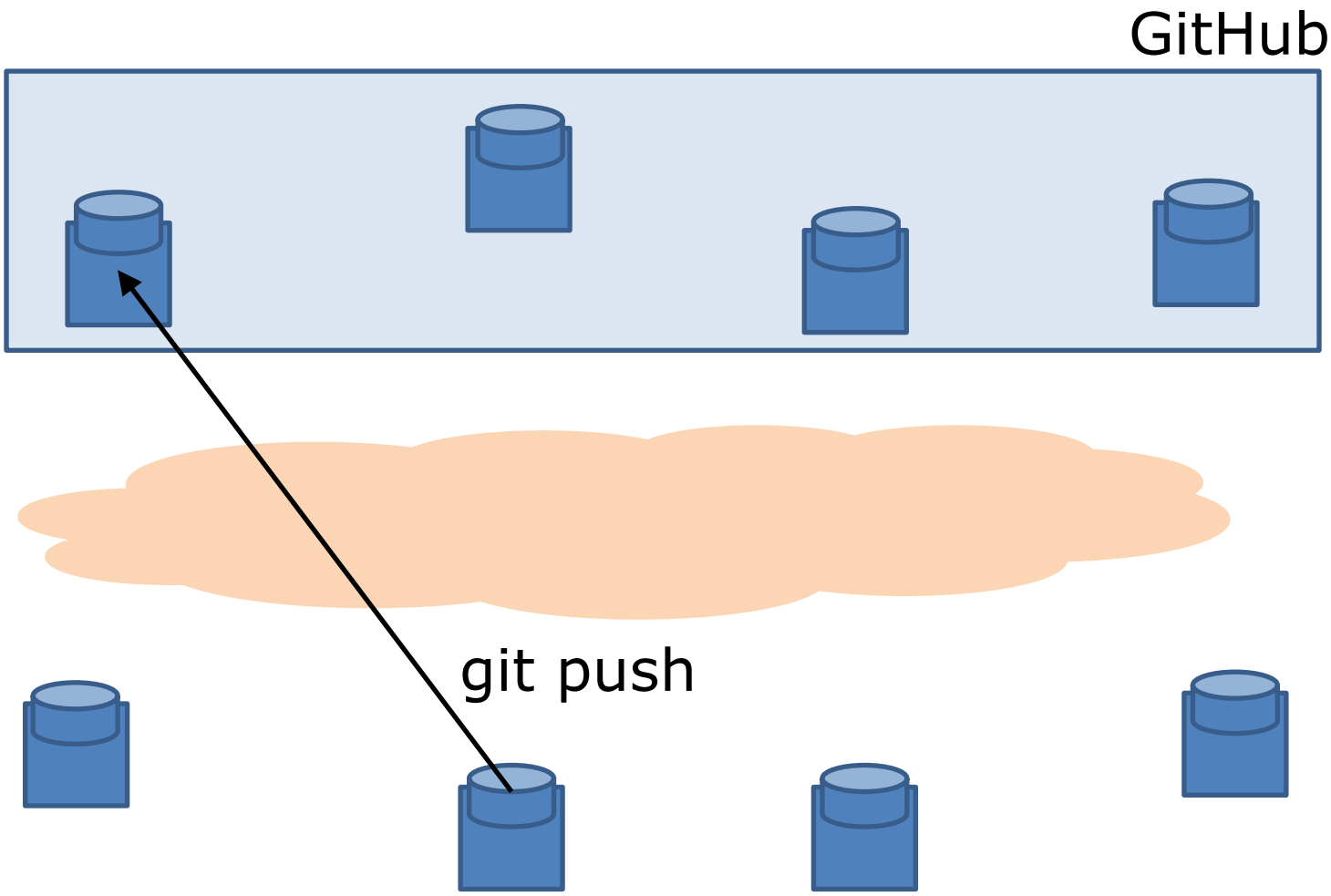


GitHub typical workflow



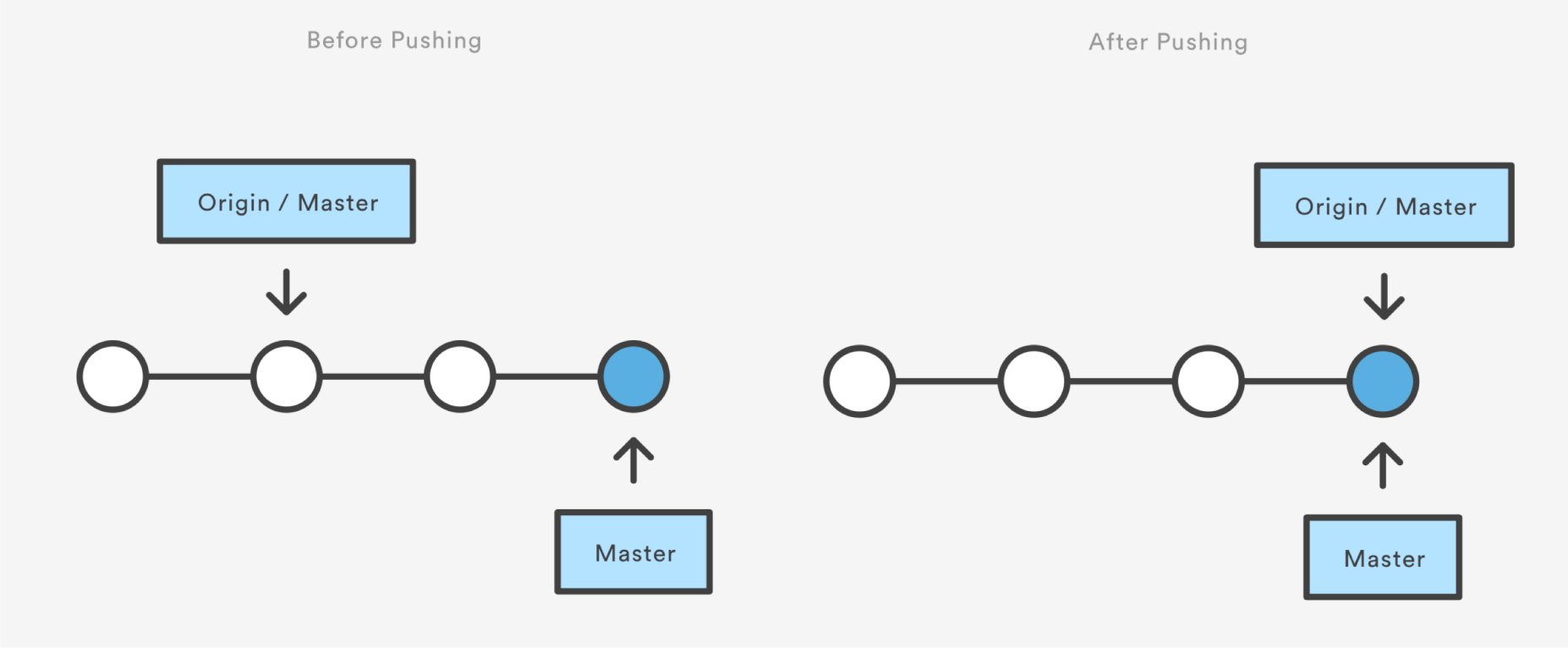
push your local changes into a remote repository.

GitHub typical workflow



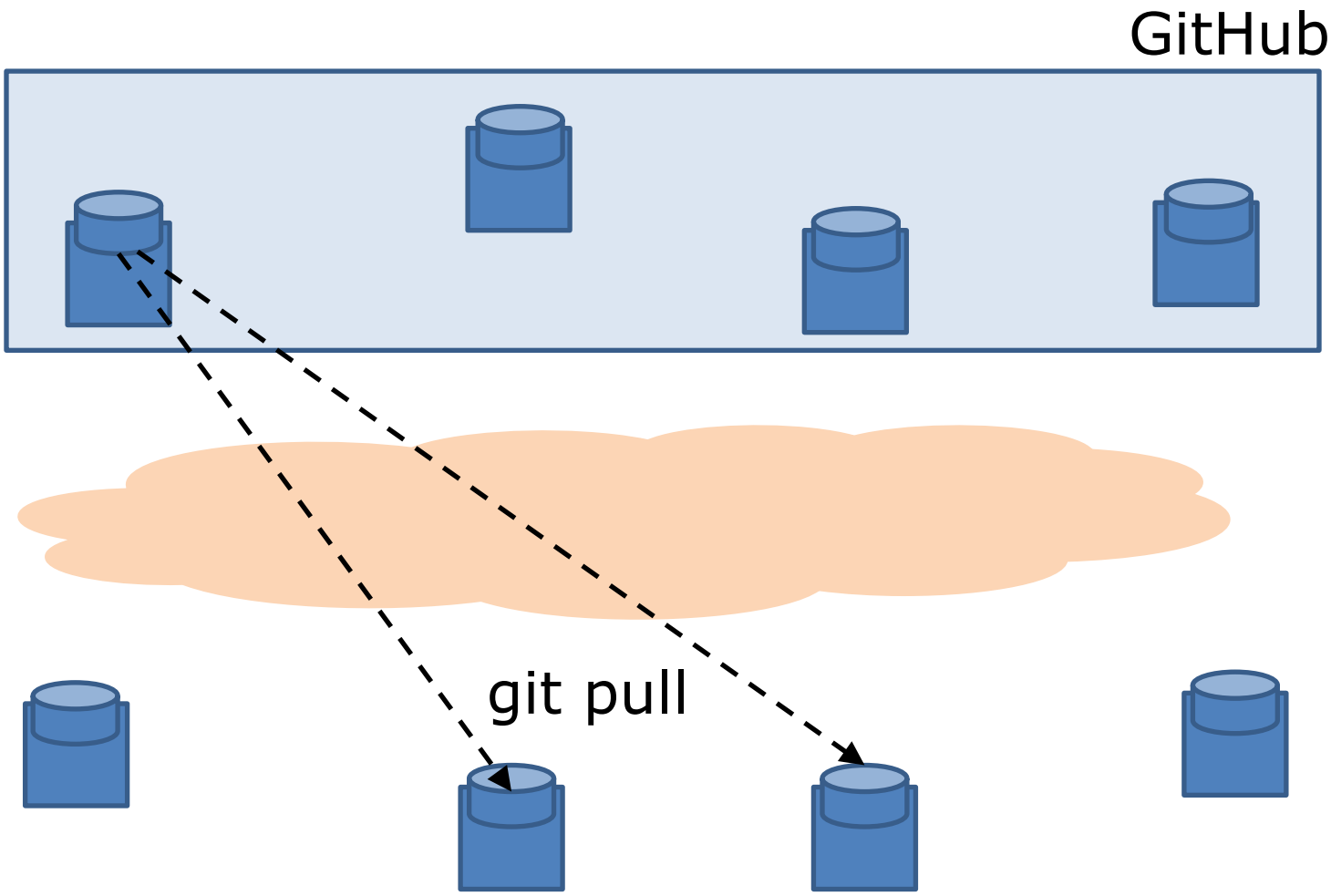
Collaborators can push too if they have access rights.

`git push <remote> <branch>`: upload local repository content to a remote repository



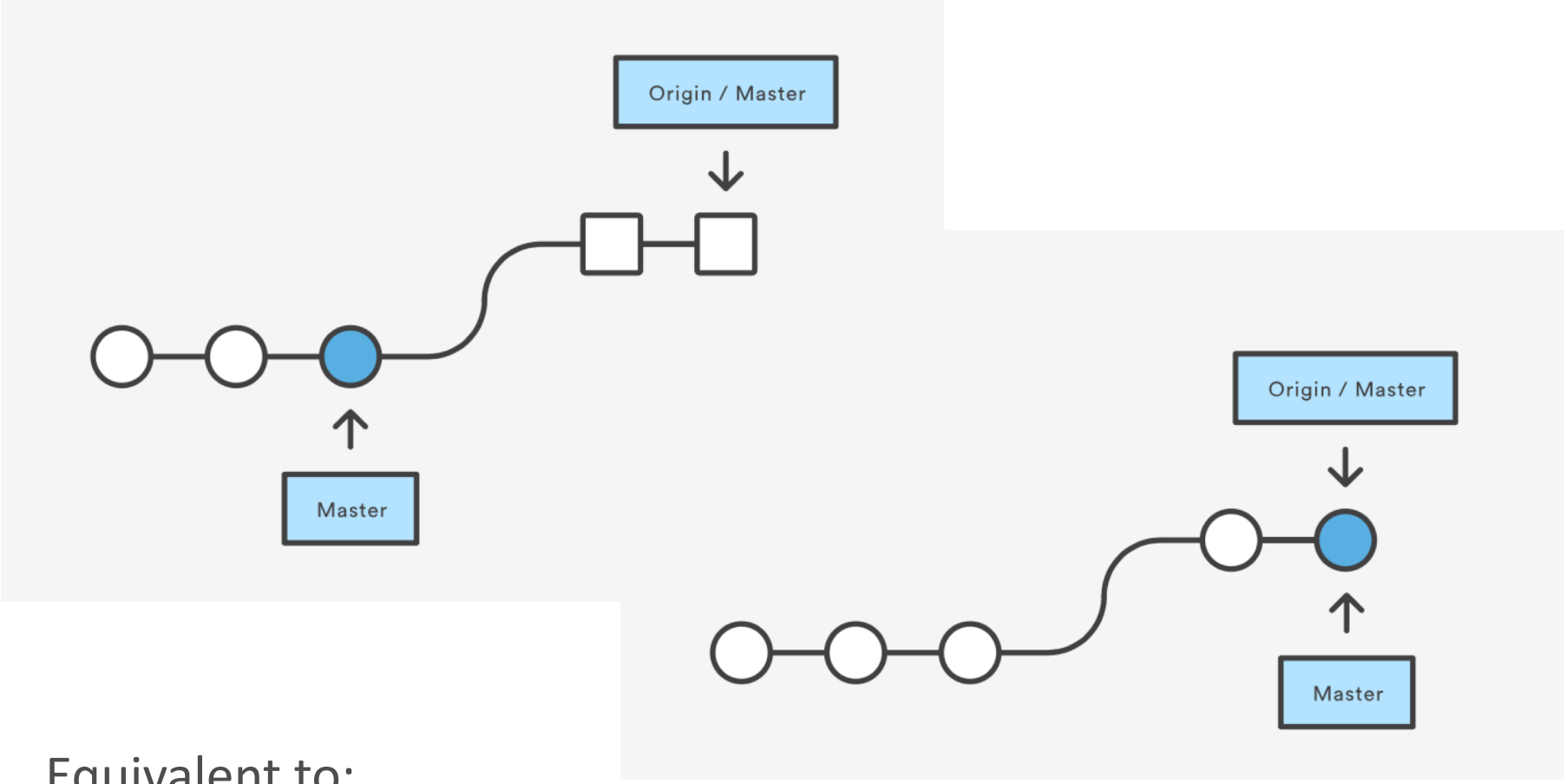
https://www.atlassian.com/git/tutorials/syncing/git-push

GitHub typical workflow



Without access rights, “don’t call us, we’ll call you” (*pull* from trusted sources) … But again requires host names / IP addresses.

`git pull <remote>`: Fetch the specified remote's copy of the current branch and immediately merge it into the local copy

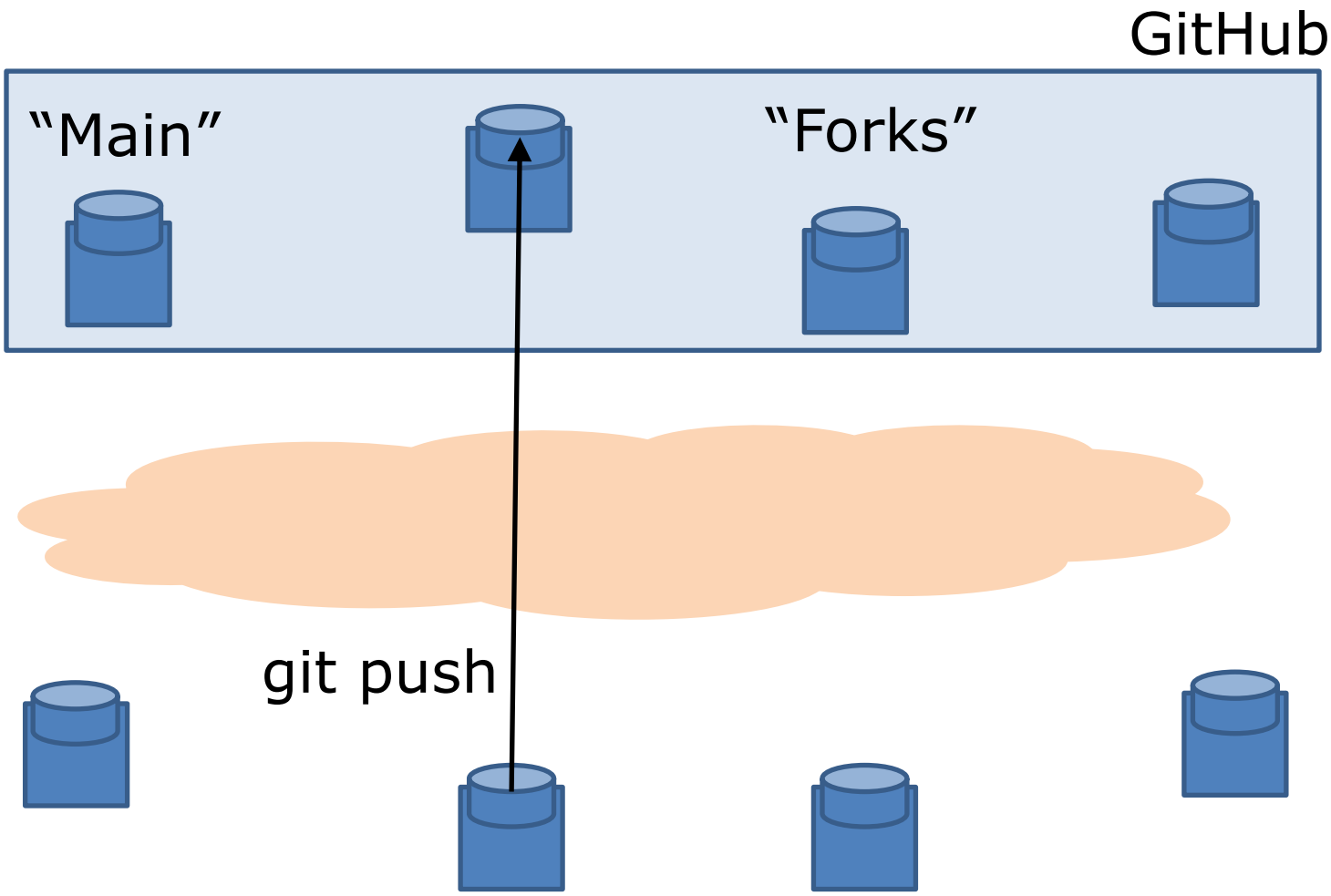


Equivalent to:

`git fetch origin HEAD` + `git merge HEAD`

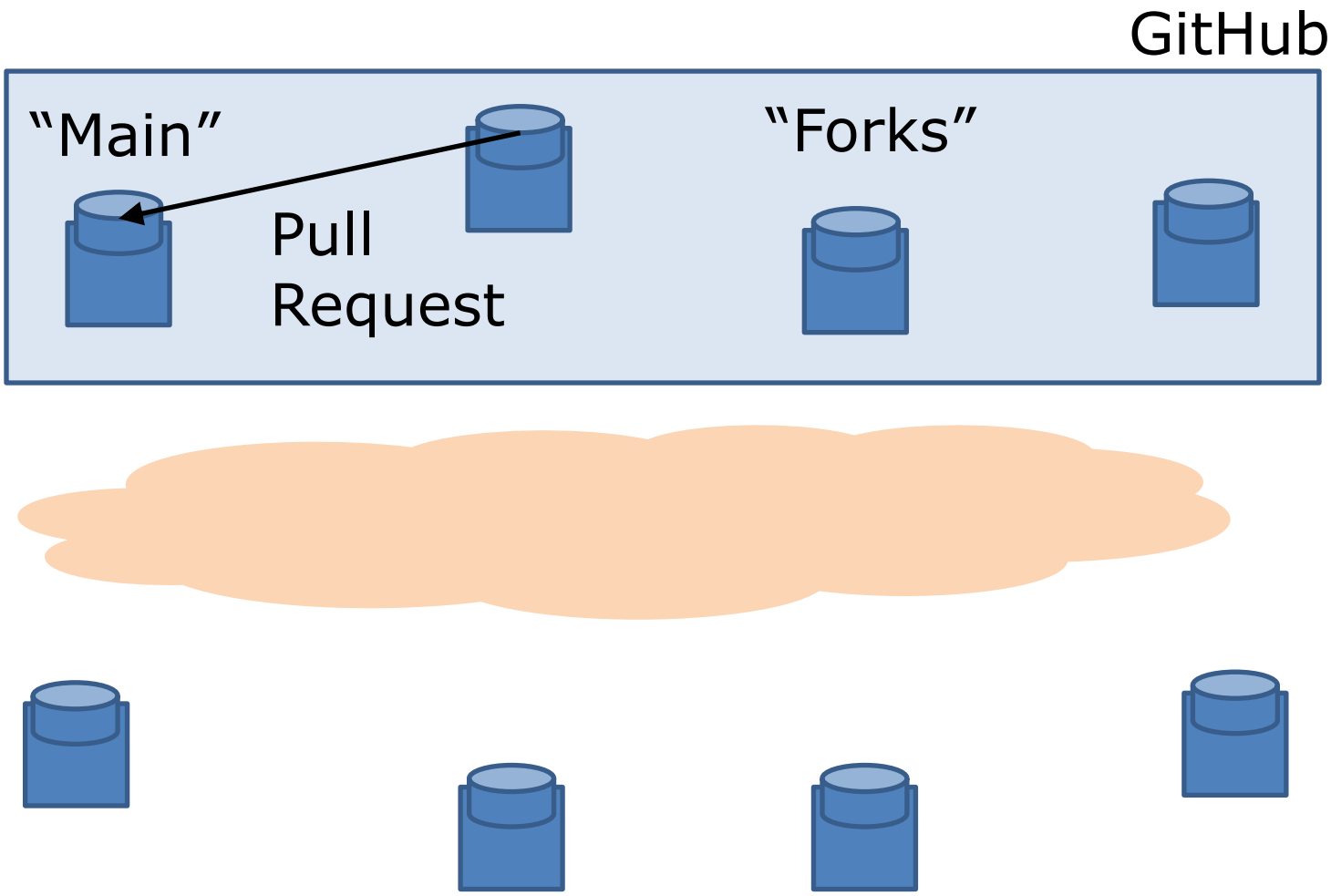
Also possible: `git pull --rebase origin`

GitHub typical workflow



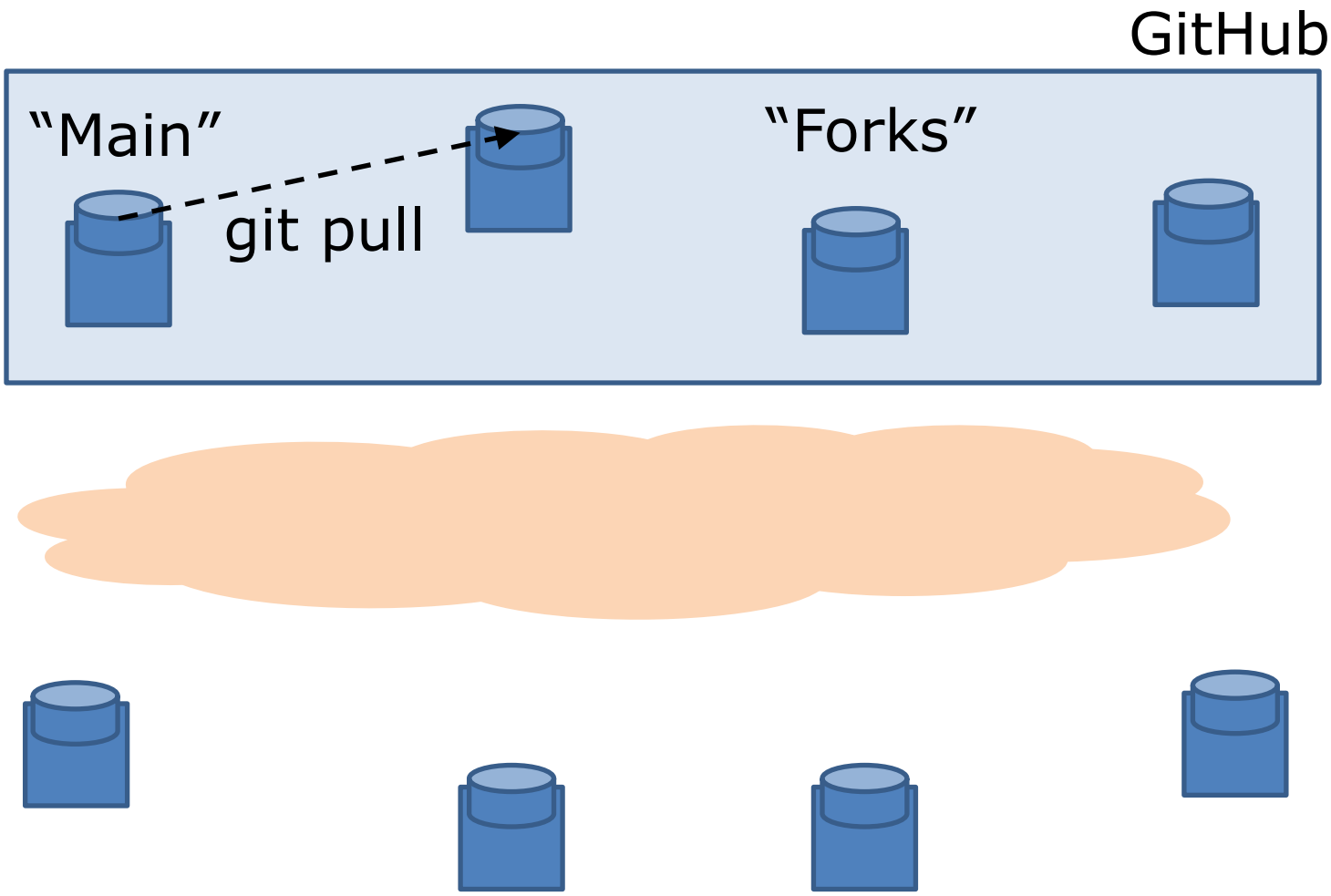
Instead, people maintain public remote “forks” of “main” repository on GitHub and push local changes.

GitHub typical workflow



Availability of new changes is signaled via ”Pull Request”.

GitHub typical workflow



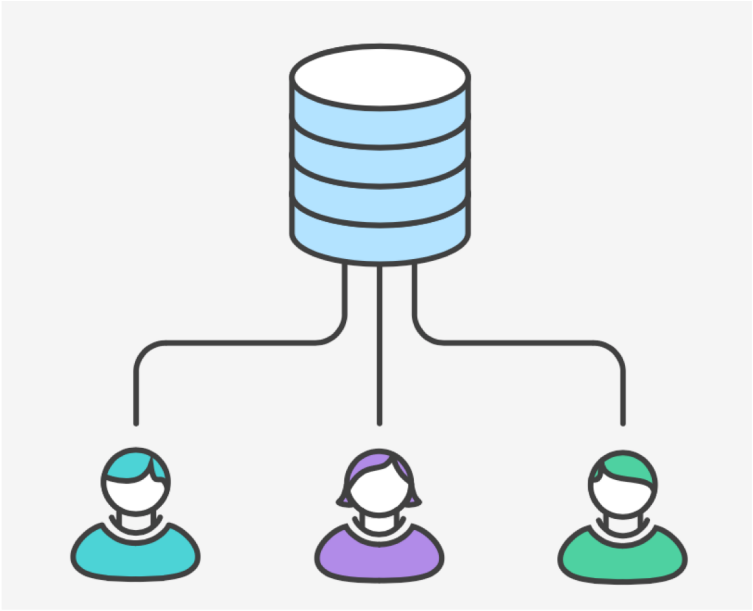
Changes are pulled into main if PR accepted.

BRANCH WORKFLOWS

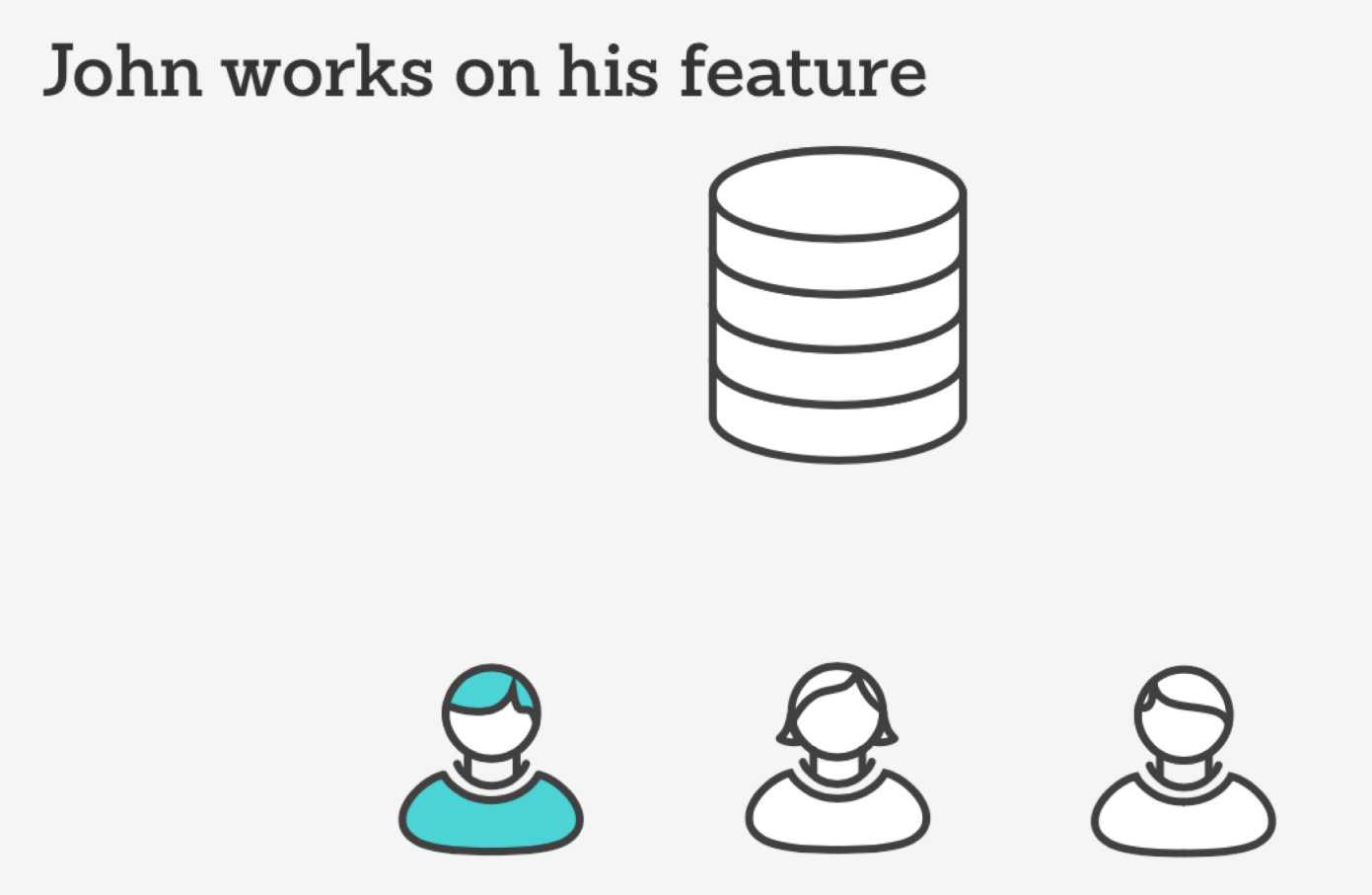
https://www.atlassian.com/git/tutorials/comparing-workflows

1. Centralized workflow

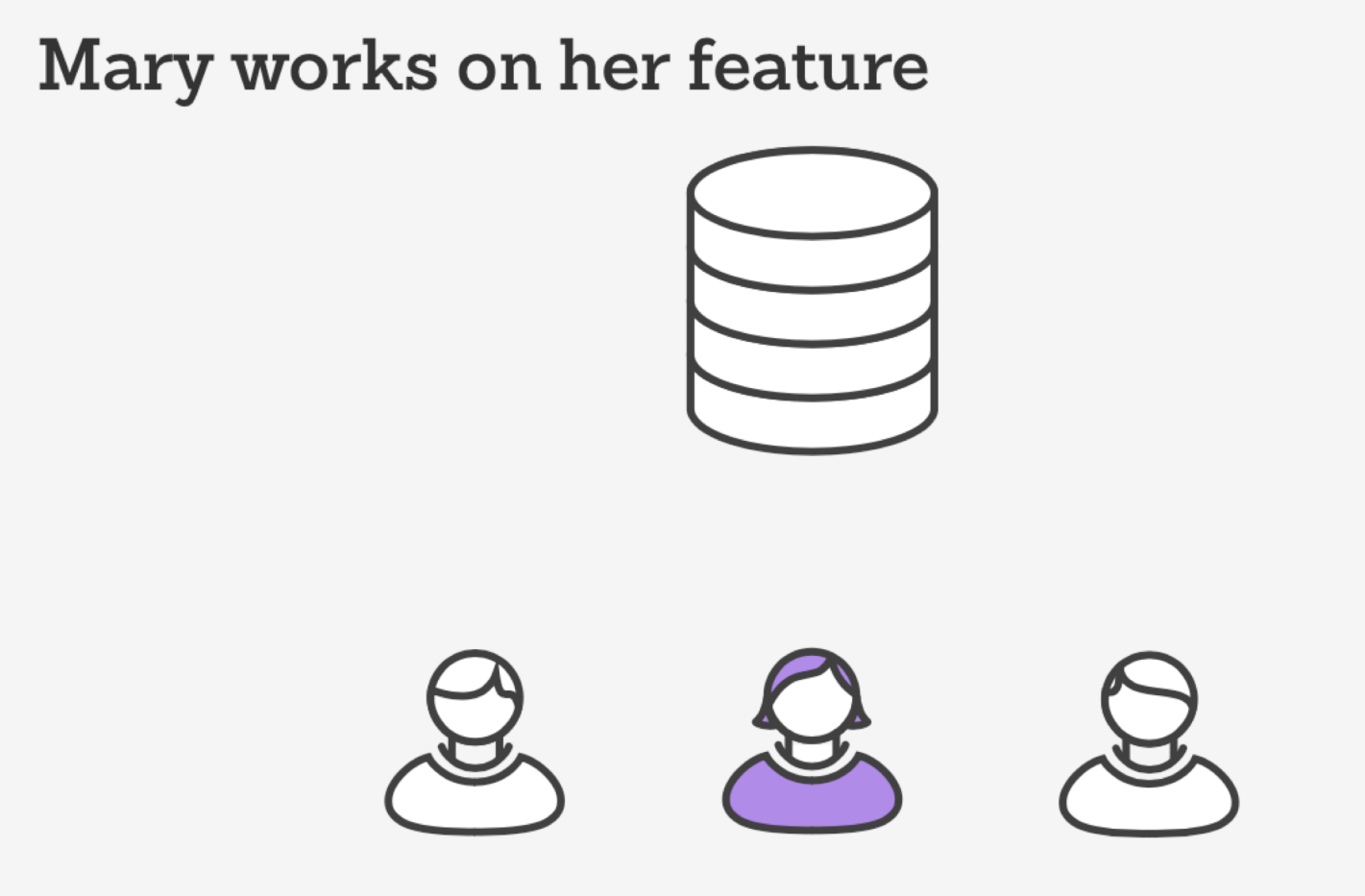
- Central repository to serve as the single point-of-entry for all changes to the project
- Default development branch is called master
  - all changes are committed into master
  - doesn't require any other branches



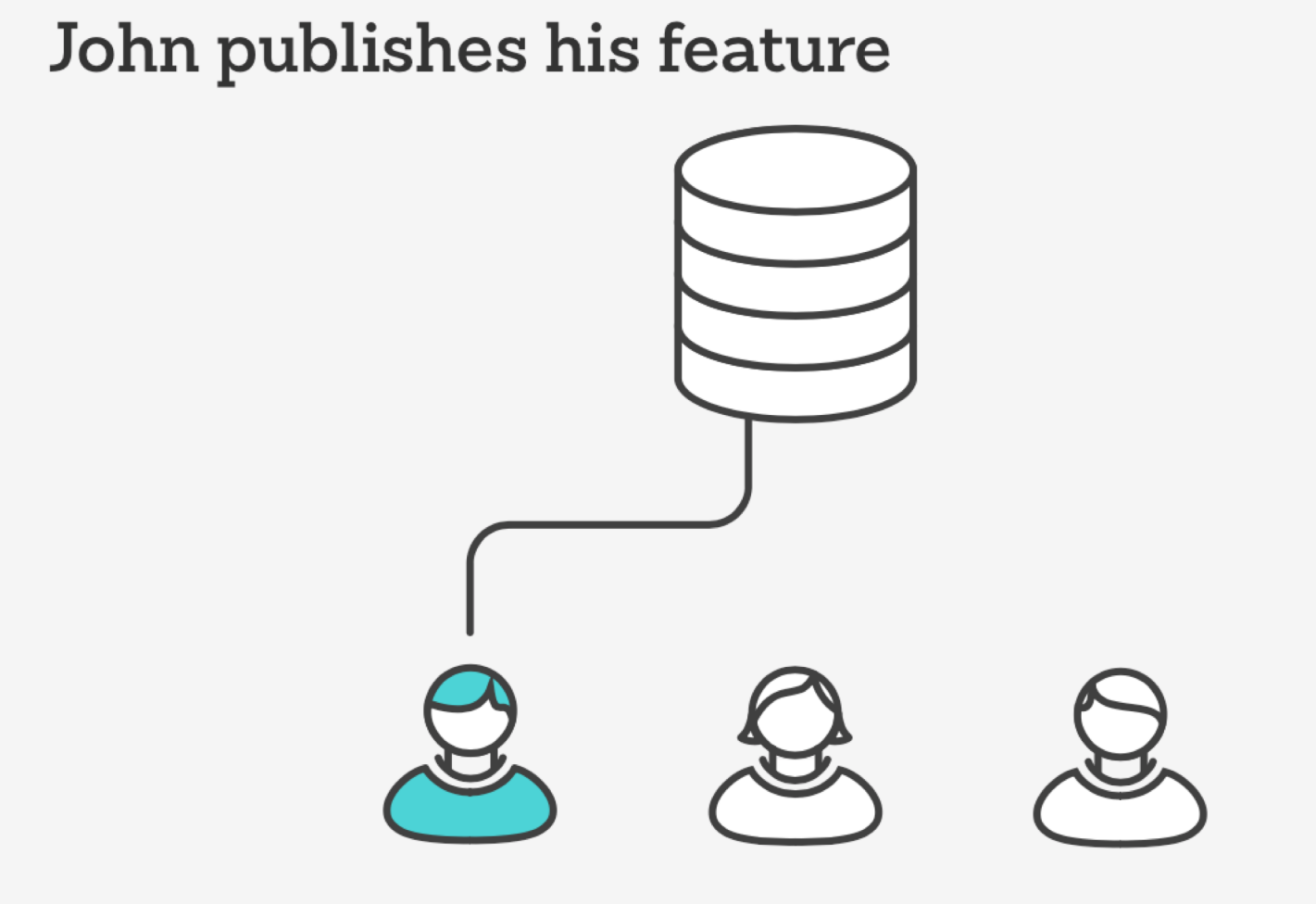
Example



Example



Example



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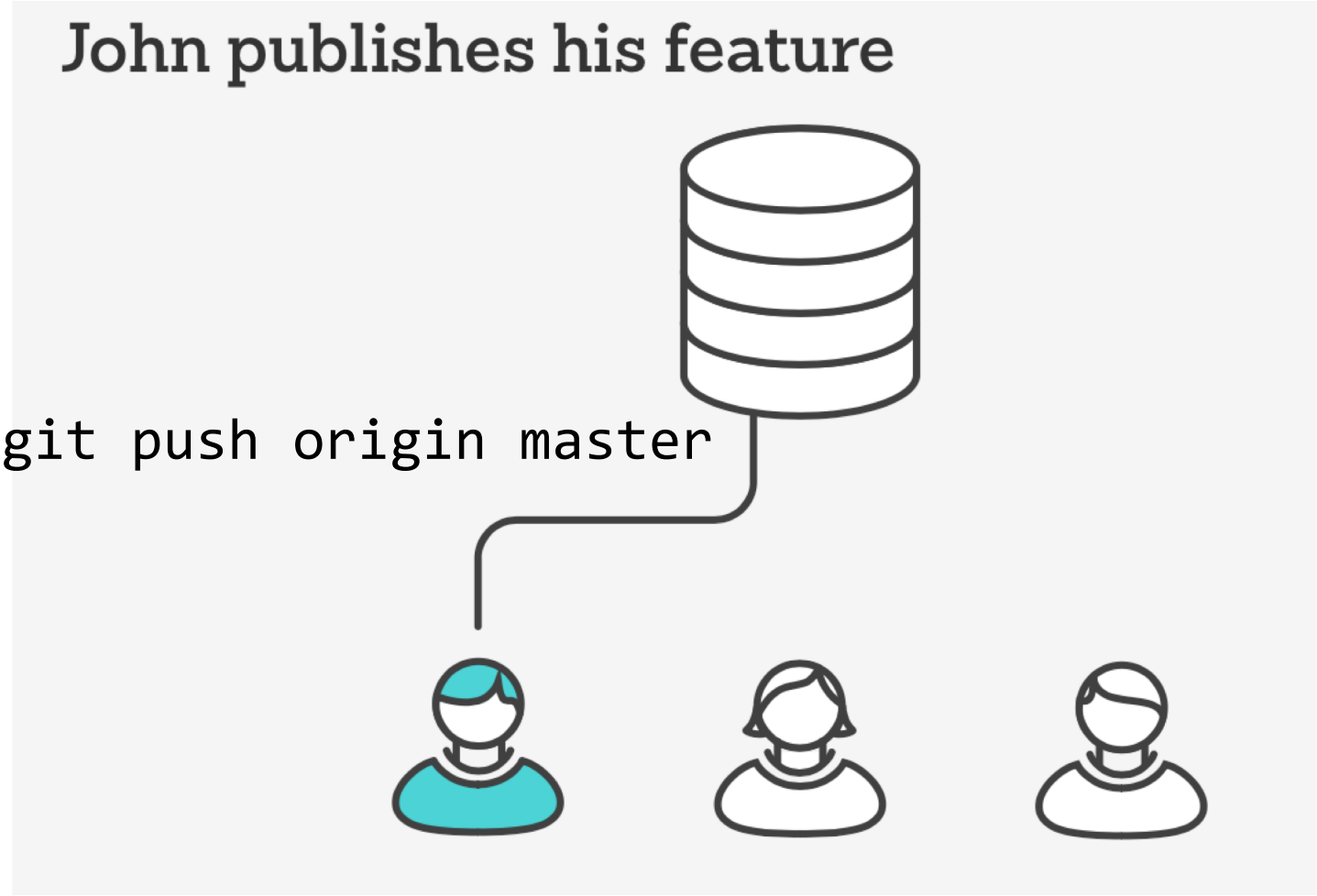
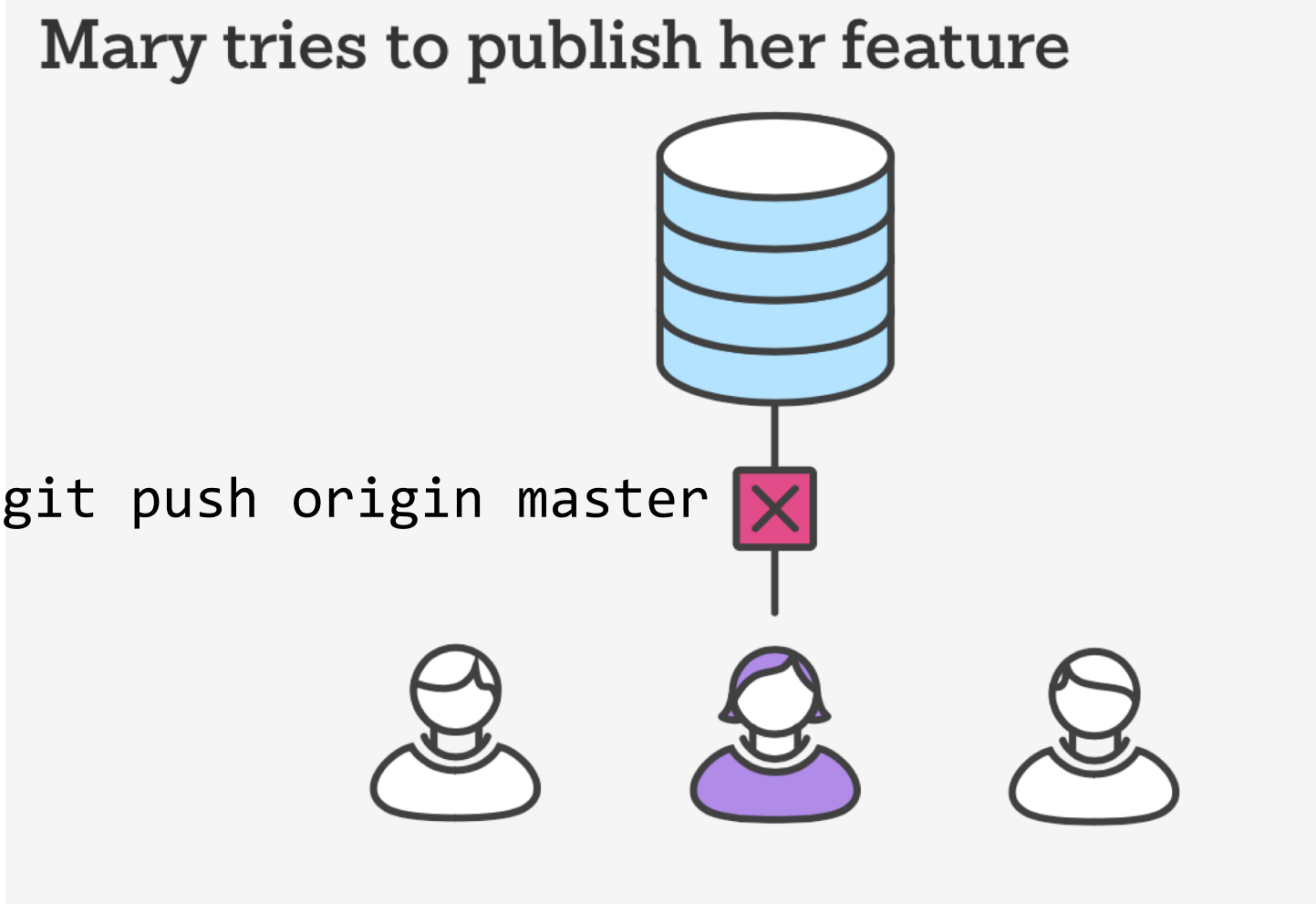
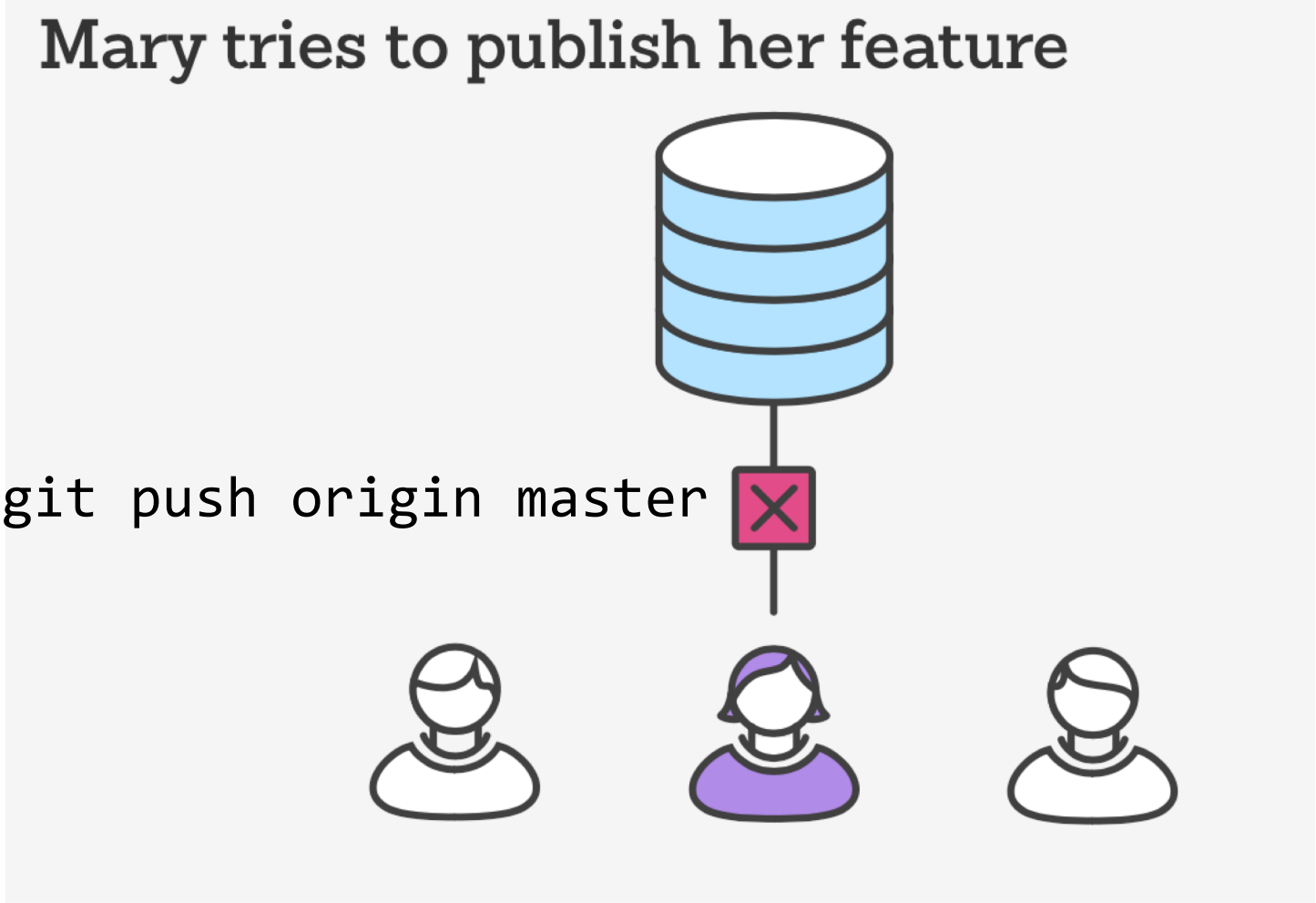


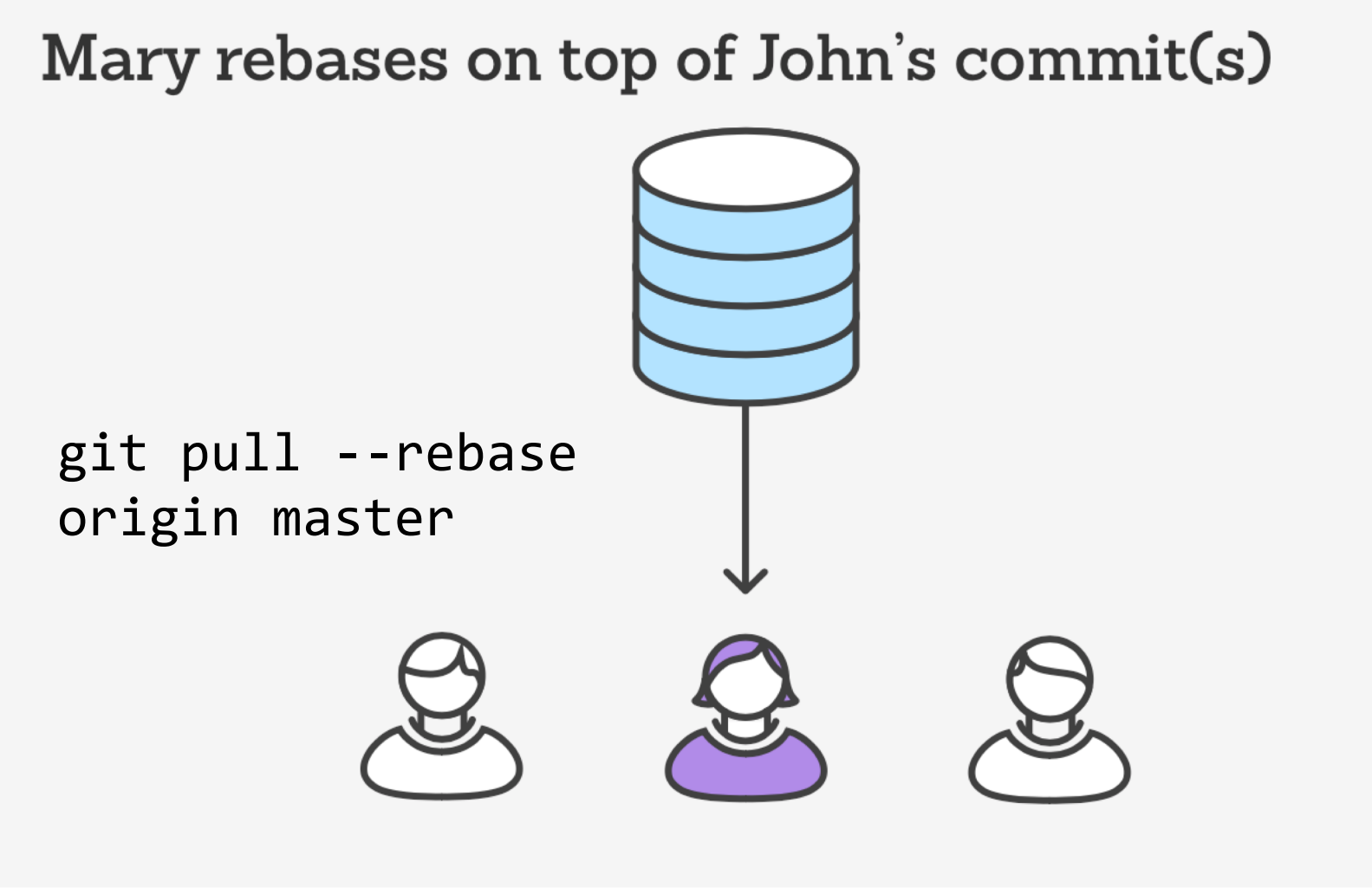
Example

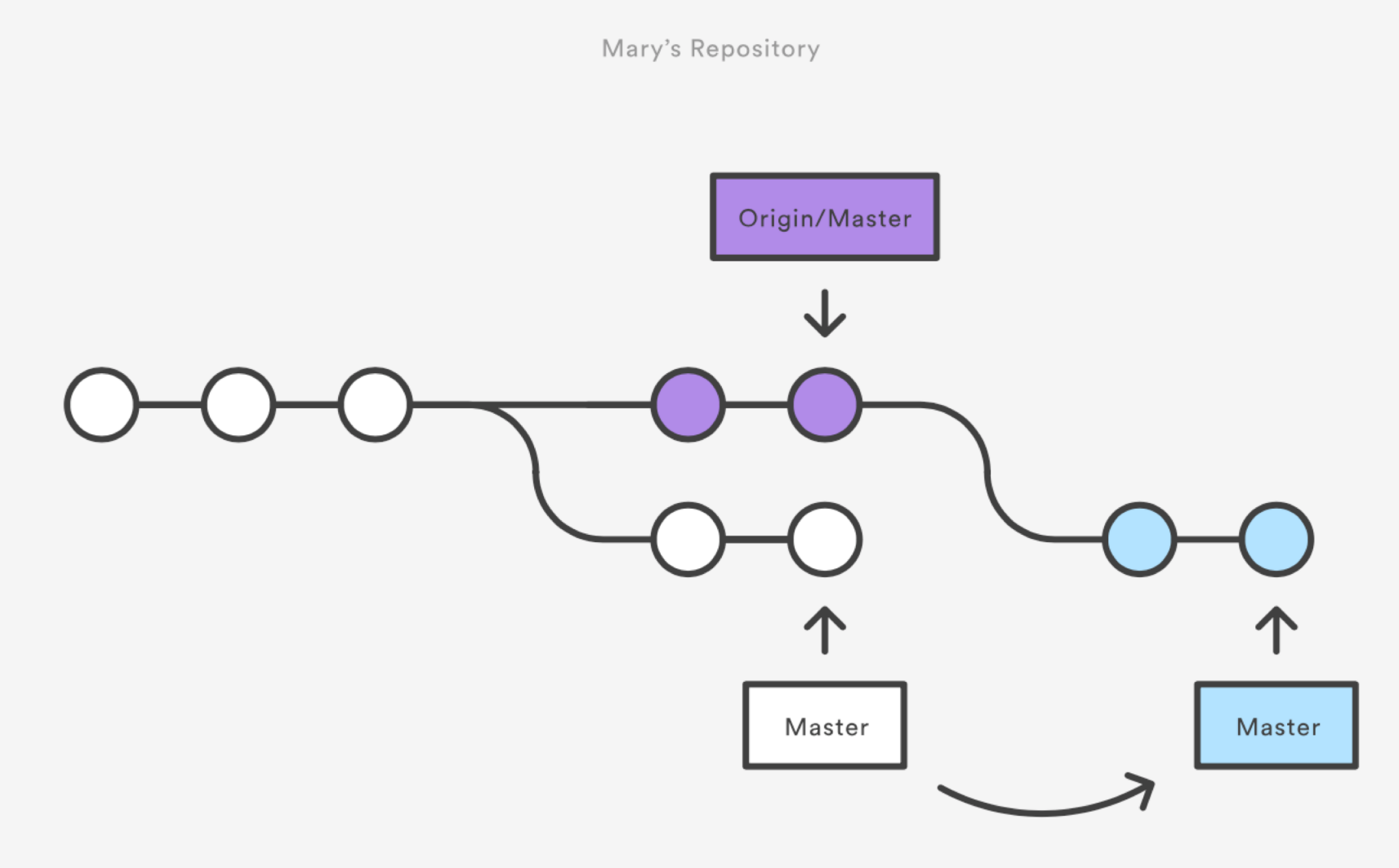


```
error: failed to push some refs to '/path/to/repo.git’
hint: Updates were rejected because the tip of your current
branch is behind its remote counterpart. Merge the remote
changes (e.g. 'git pull') before pushing again. See the 'Note
about fast-forwards' in 'git push --help' for details.
```

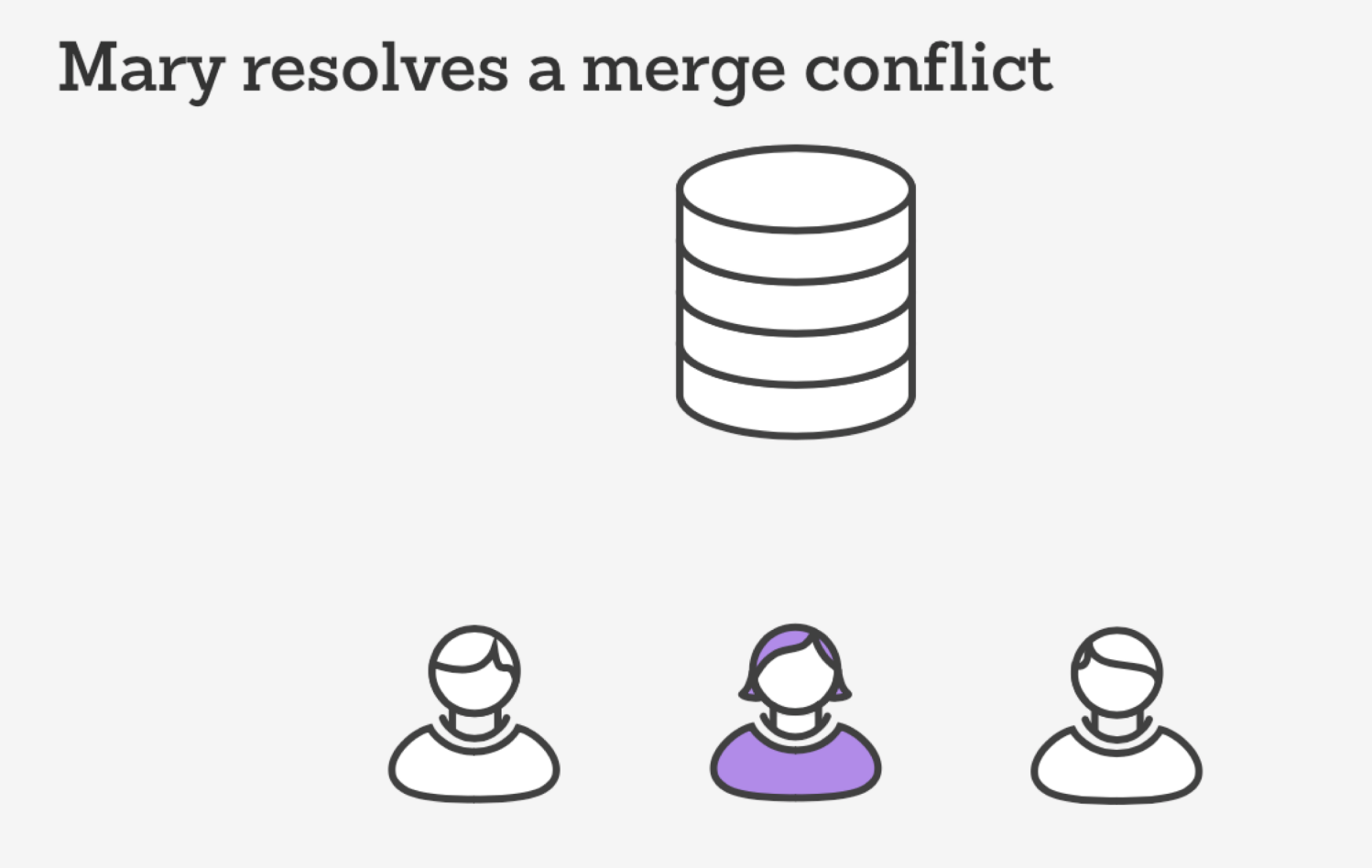


Example

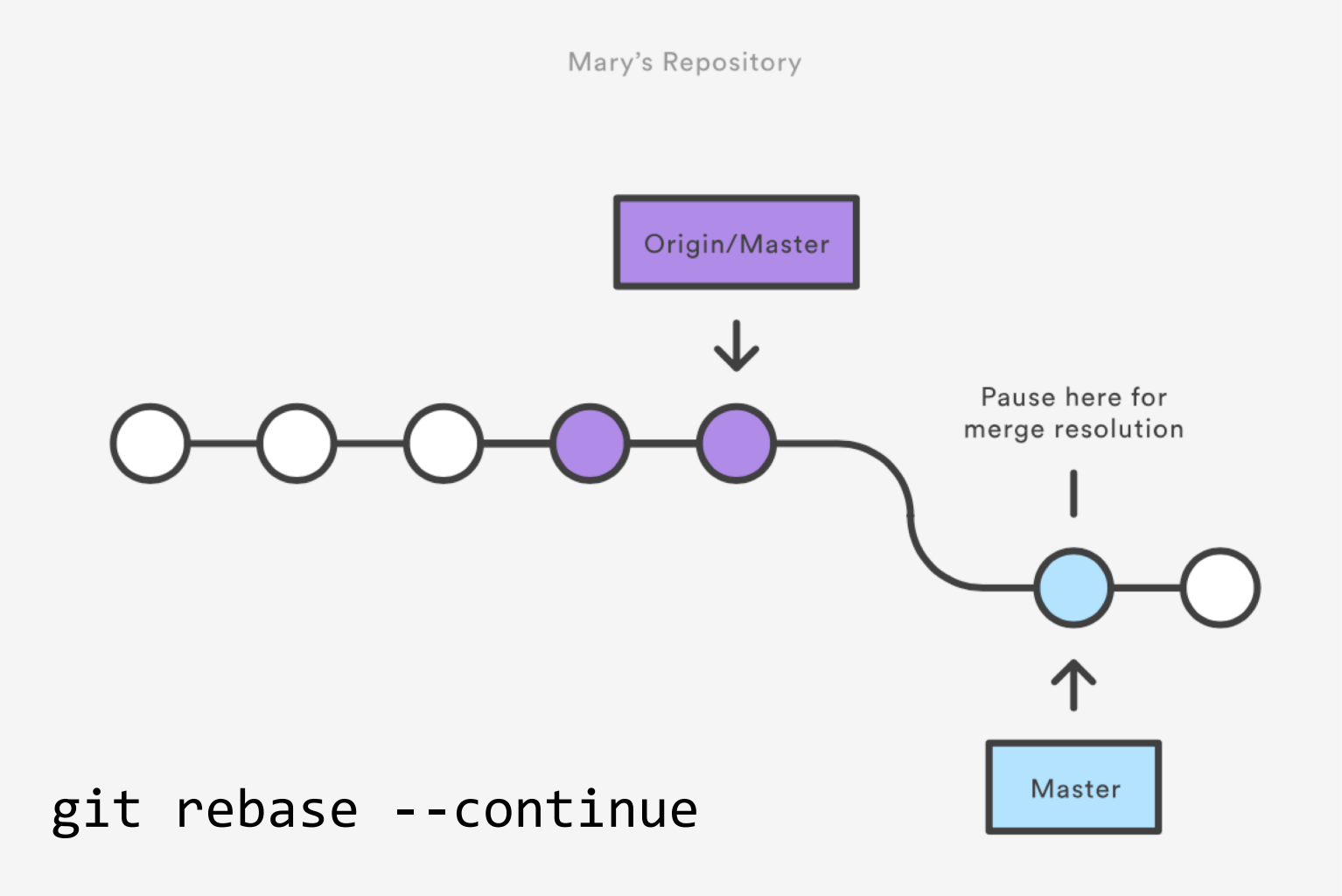




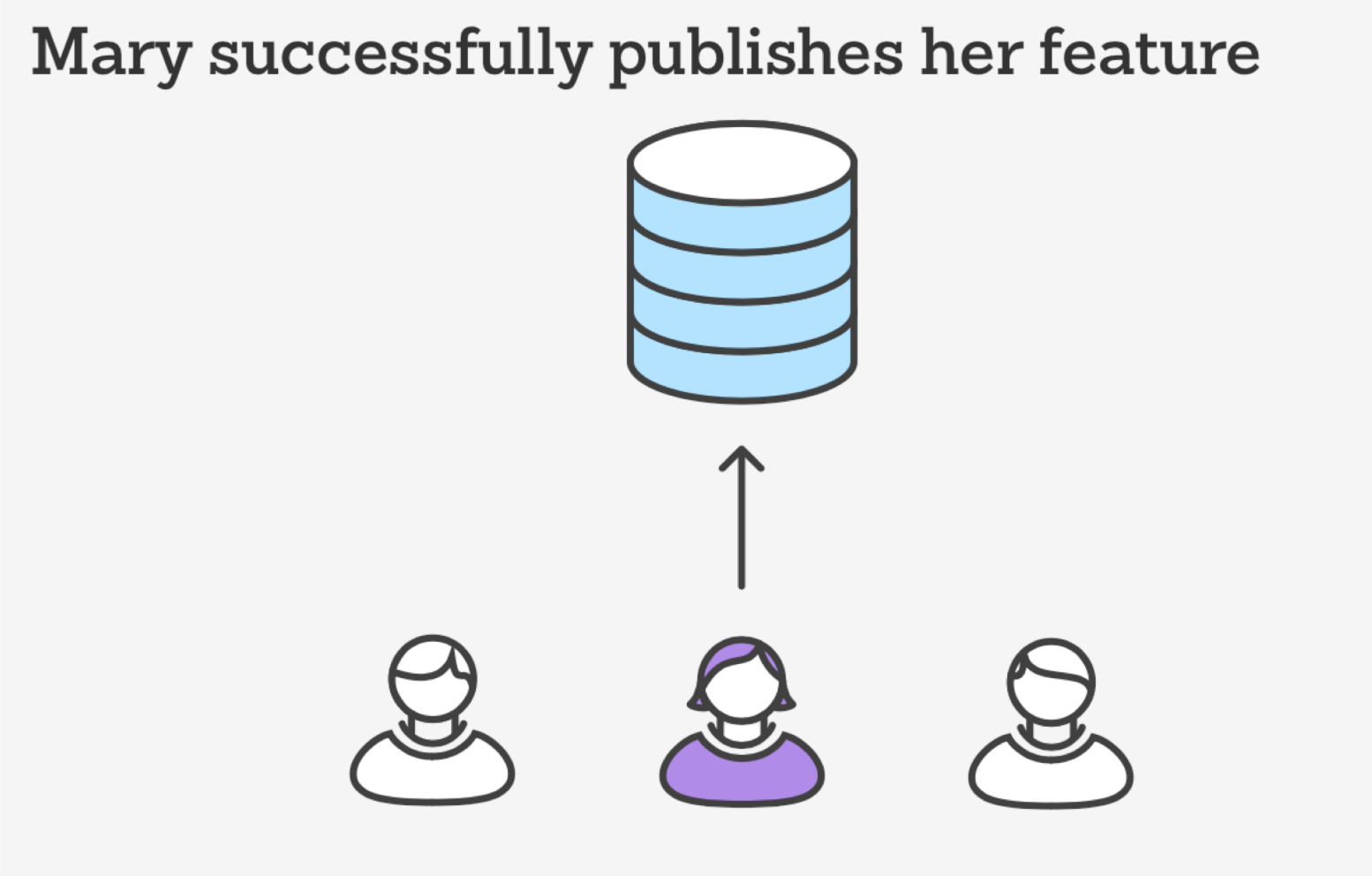
Example



Example



Example



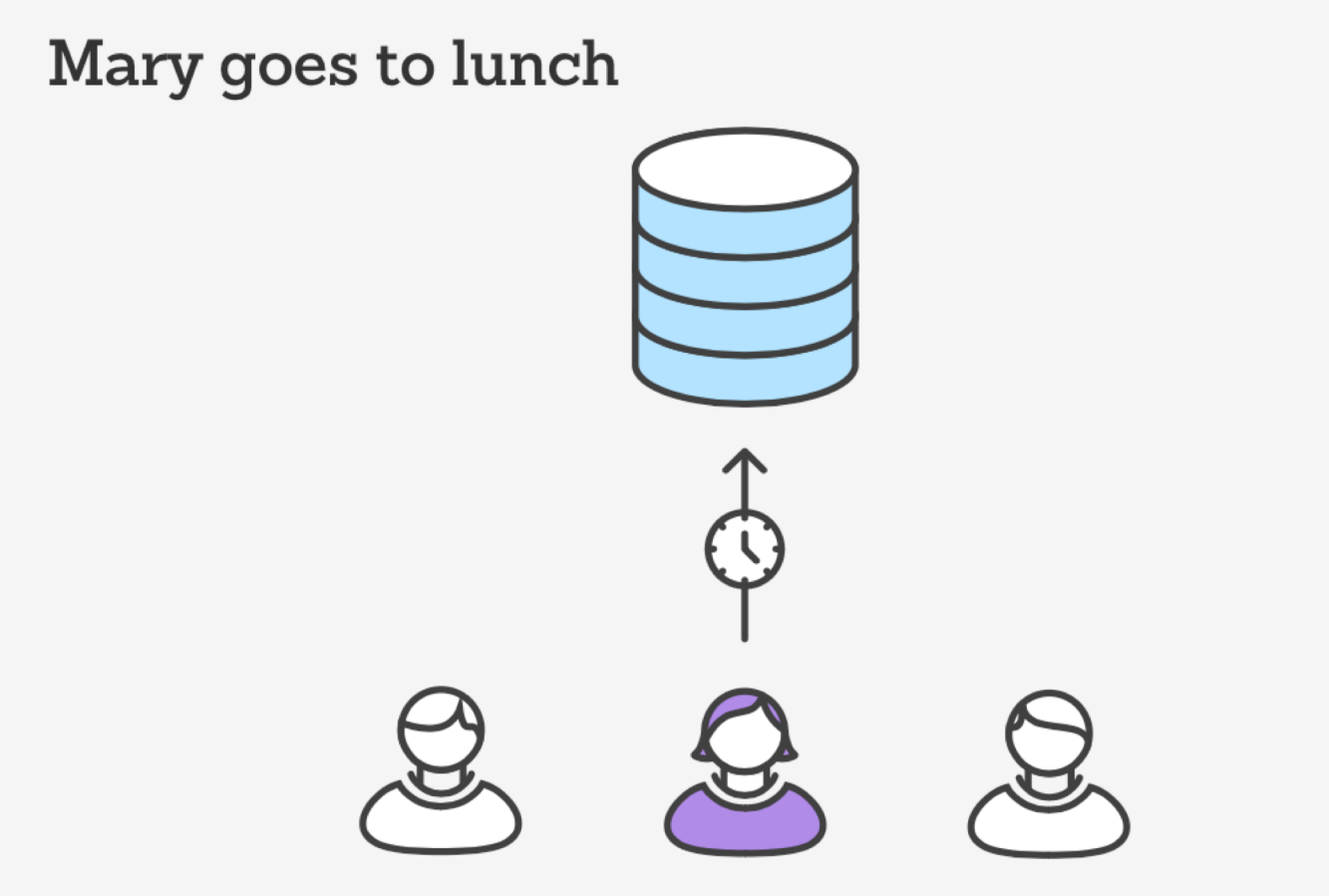
2. Git Feature Branch Workflow

- *All* feature development should take place in a dedicated branch instead of the master branch
- Multiple developers can work on a particular feature without disturbing the main codebase
  - master branch will never contain broken code (enables CI)
  - Enables pull requests (code review)

Example

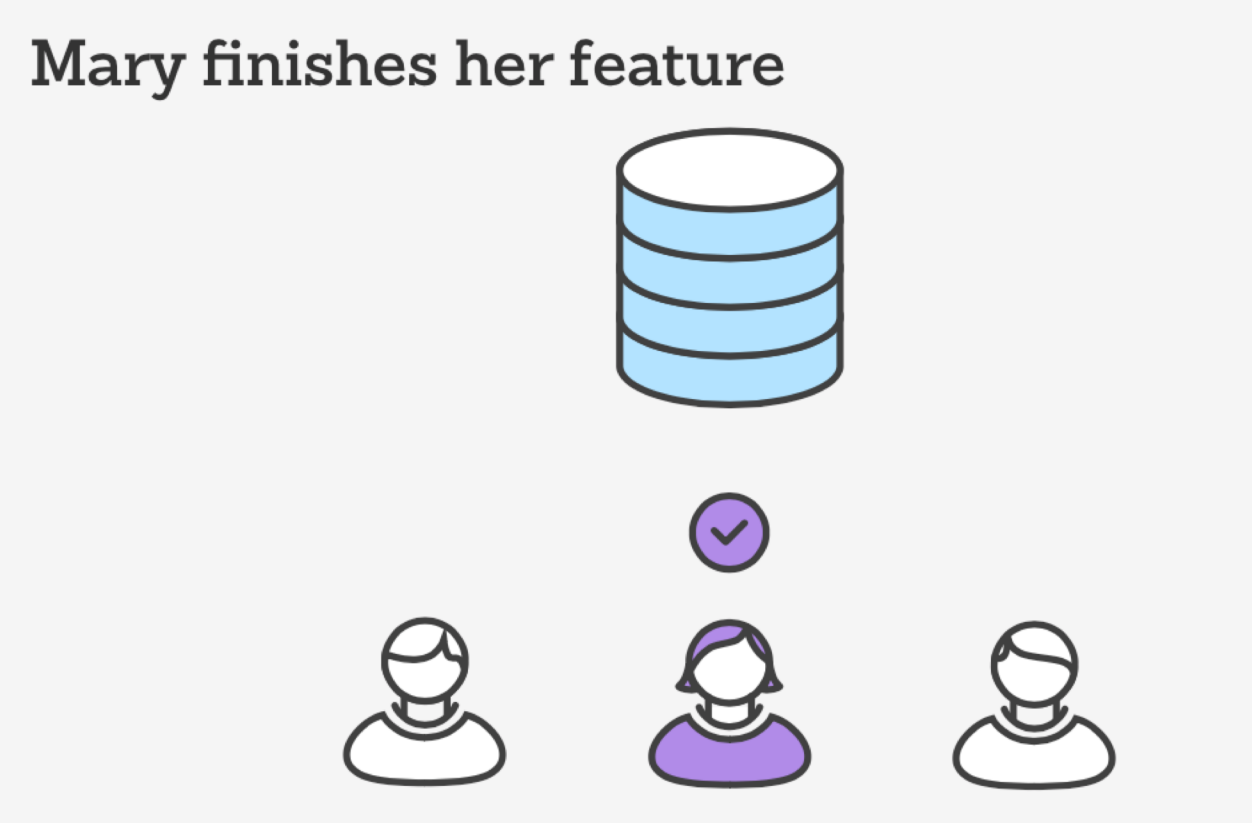

```
git checkout -b marys-feature master

git status
git add <some-file>
git commit
```

Example



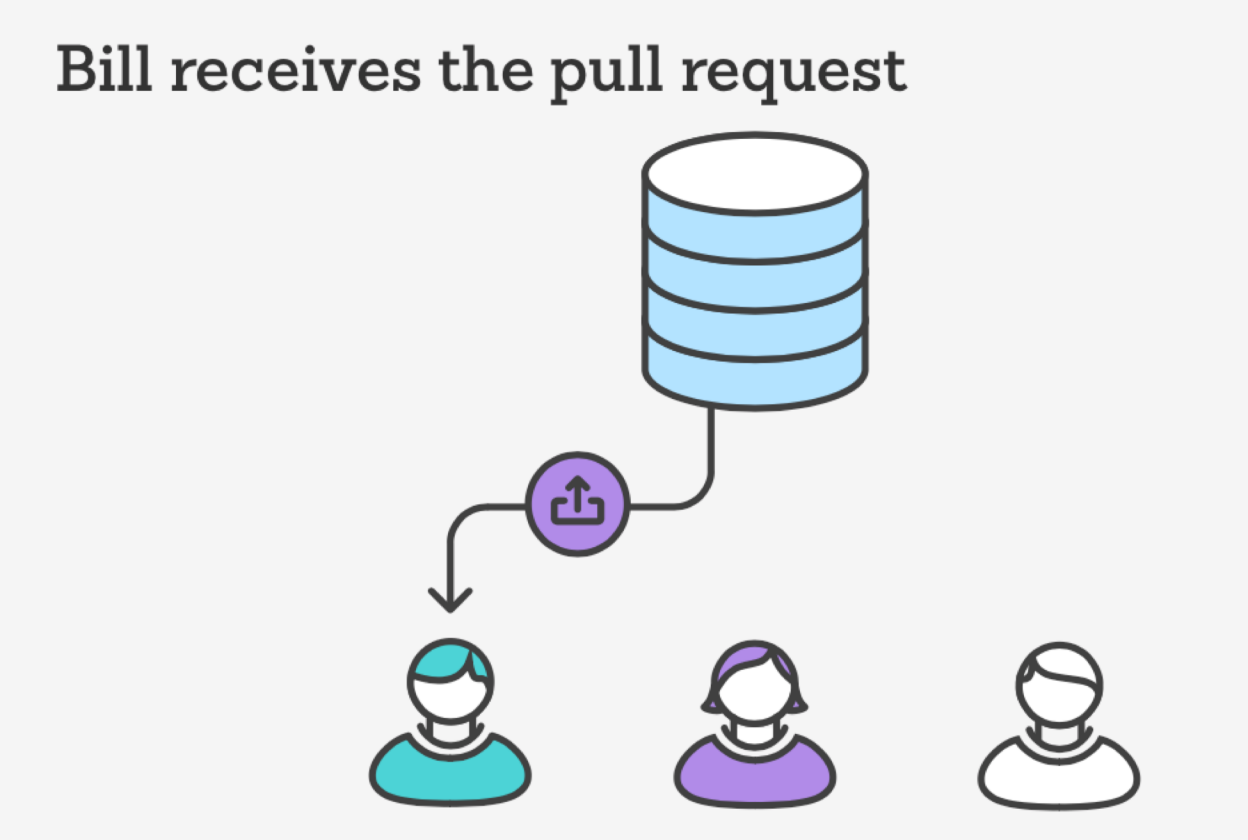

```
git push -u origin marys-feature
```

Example

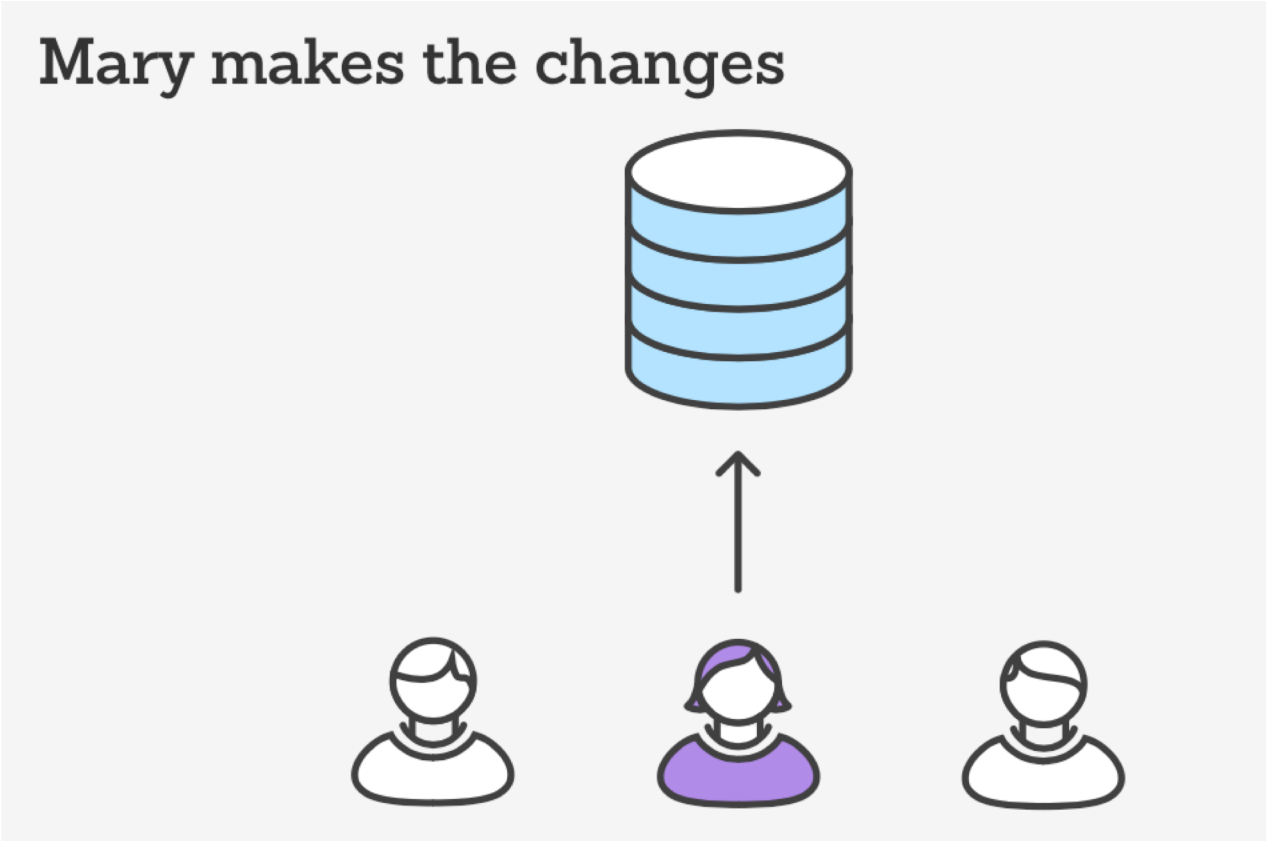


`git push`

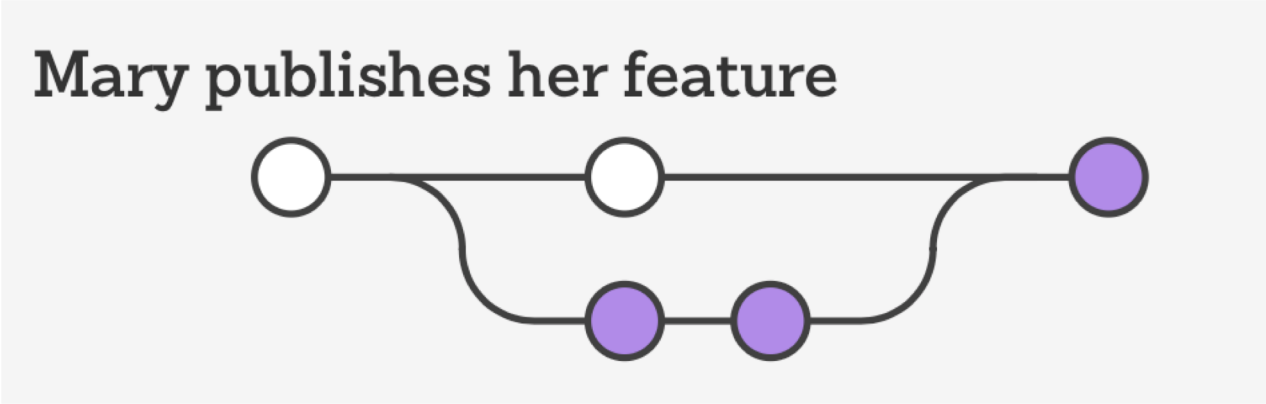
Example



Example

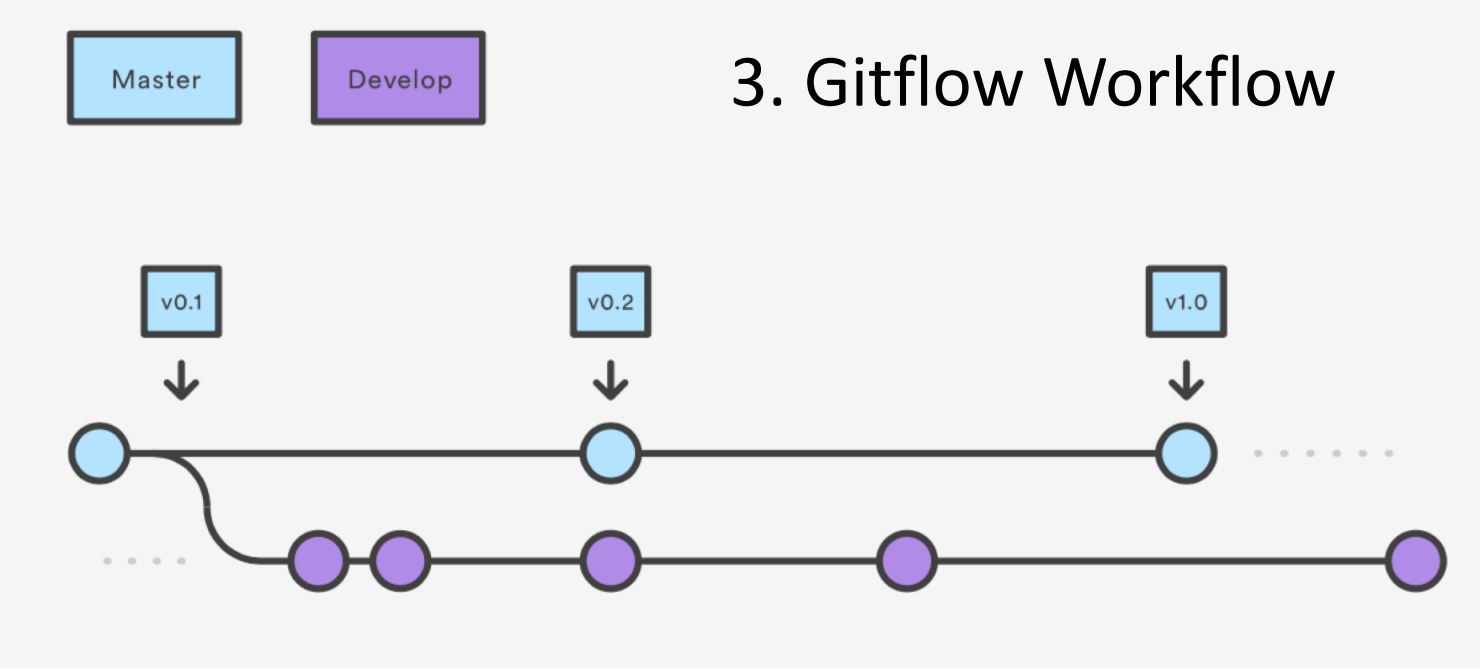


Example - Merge pull request



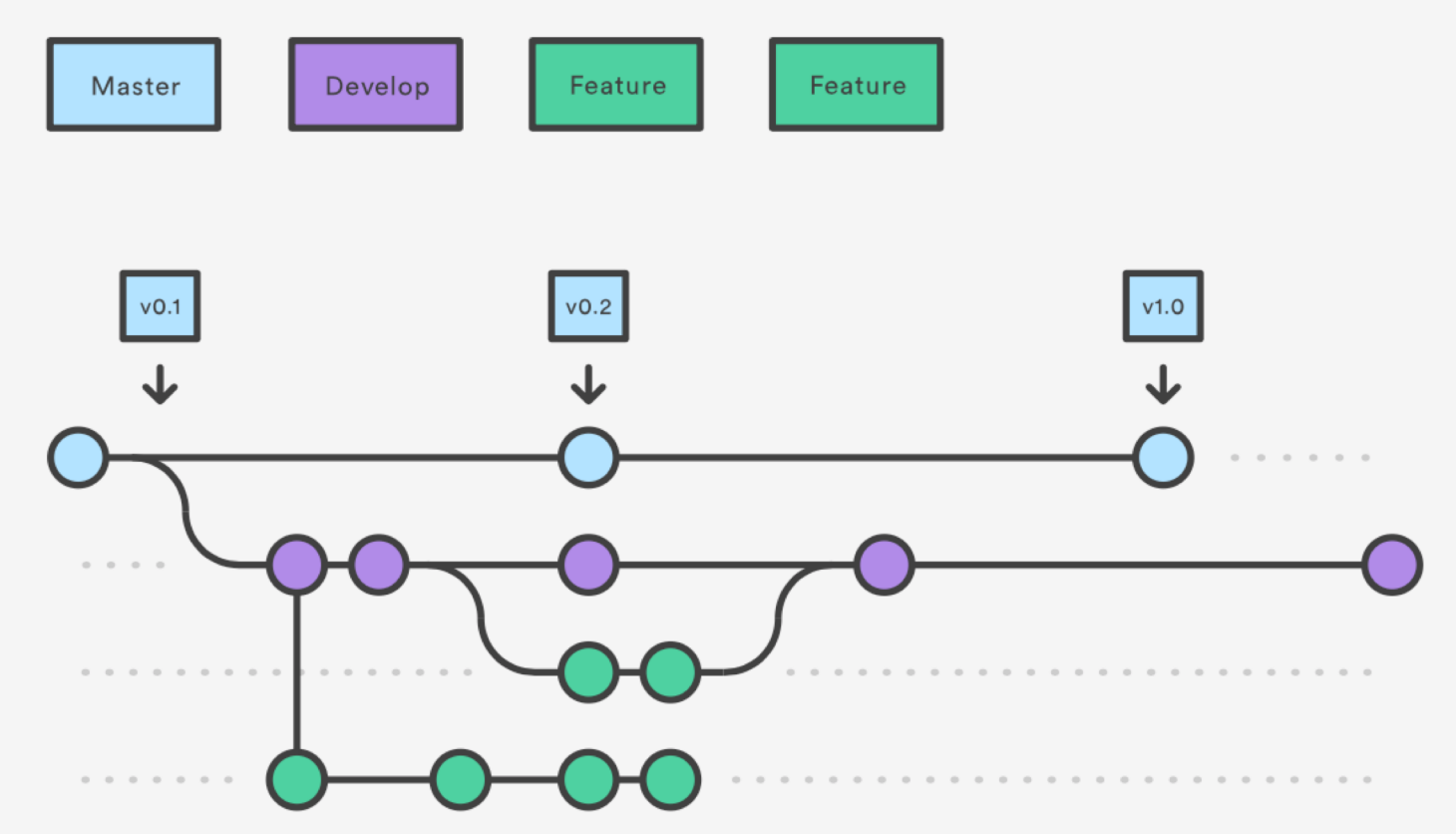

```
git checkout master
git pull
git pull origin marys-feature
git push
```

3. Gitflow Workflow

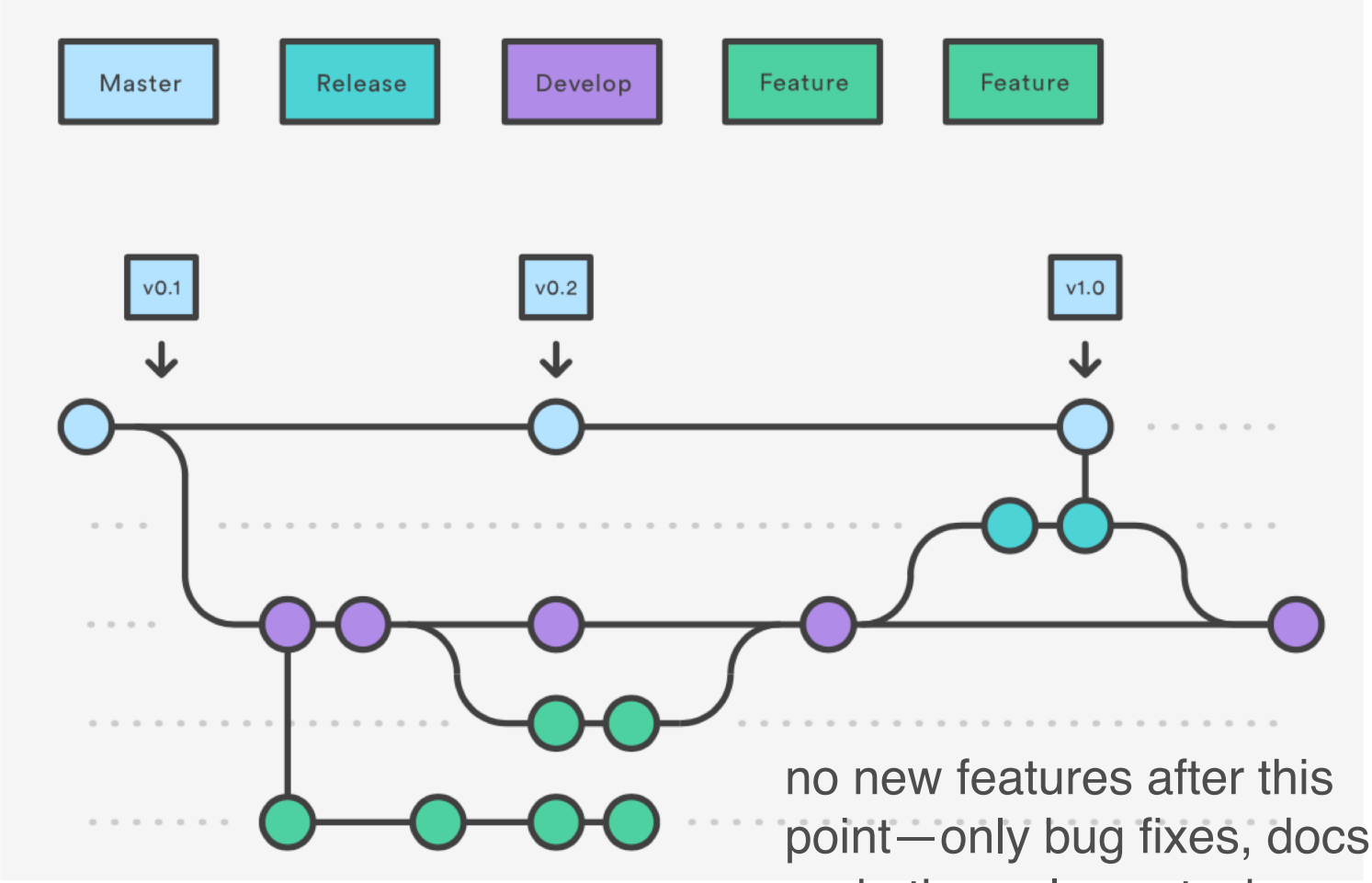


- Strict branching model designed around the project release
  - Suitable for projects that have a scheduled release cycle
- Branches have specific roles and interactions
- Uses two branches
  - master stores the official release history; tag all commits in the master branch with a version number
  - develop serves as an integration branch for features

GitFlow feature branches (from develop)

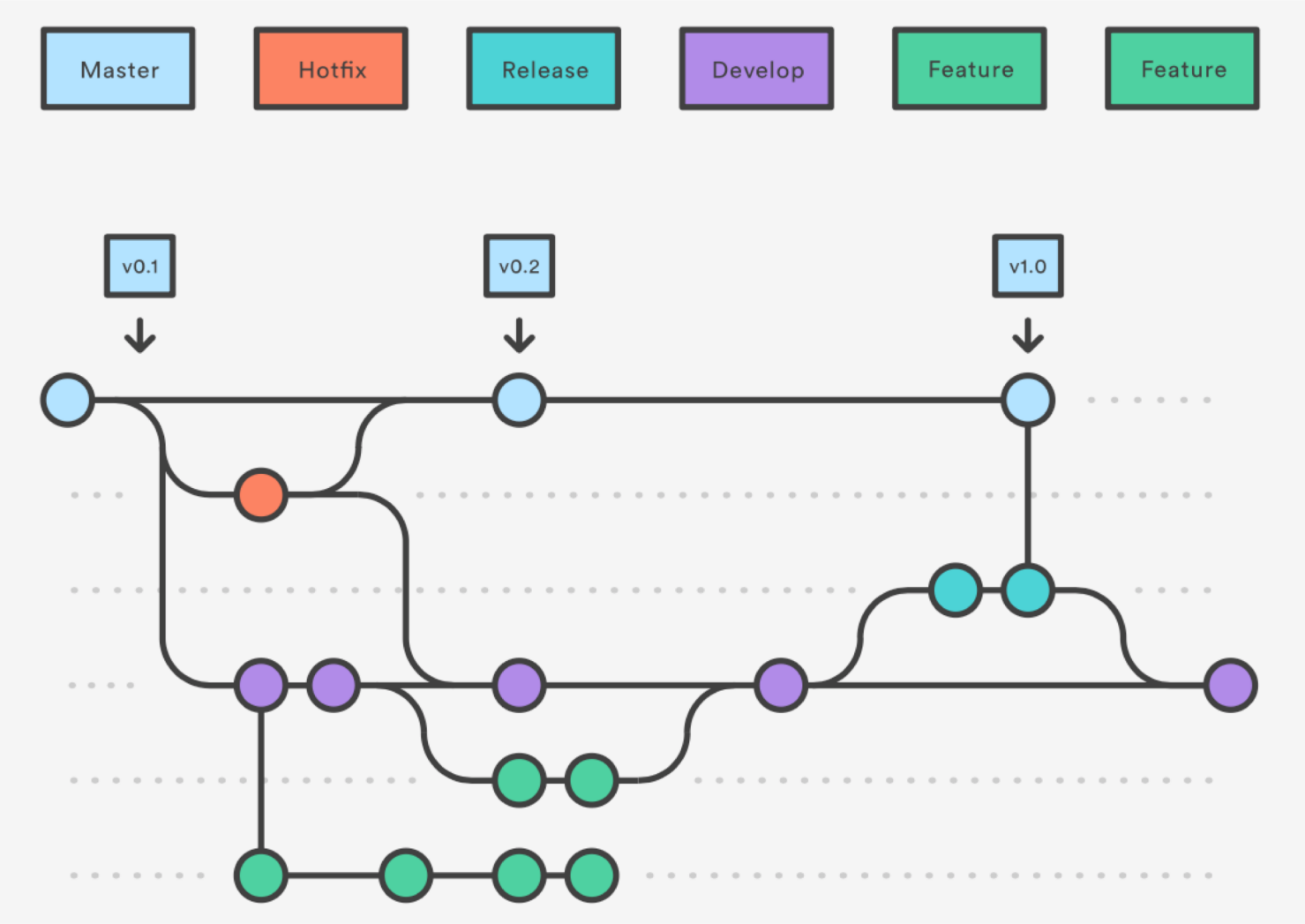


GitFlow release branches (eventually into master)



GitFlow hotfix branches

used to quickly patch production releases



Summary

- Version control has many advantages
  - History, traceability, versioning
  - Collaborative and parallel development
- Collaboration with branches
  - Different workflows