UNIVERSITY *of* WASHINGTON

Software Design for Data Science

Git, Part 2

Melissa Winstanley
University of Washington
February 6, 2025

Review

How do I…

- view the change history for a repository?

  ```
  git log
  ```
- see what files in the directory are modified since the last commit?

  ```
  git status
  ```
- examine the changes between modified files and the last commit?

  ```
  git diff
  ```
- place a modified file into the staging area?

  ```
  git add <file>
  ```
- move the staged files into the repository history?

  ```
  git commit -m “My commit message”
  ```

Review

What do the following verbs do?

- Push
- Clone
- Pull

UNIVERSITY of WASHINGTON

Review

What is…

- `HEAD`?
- `HEAD~3`?

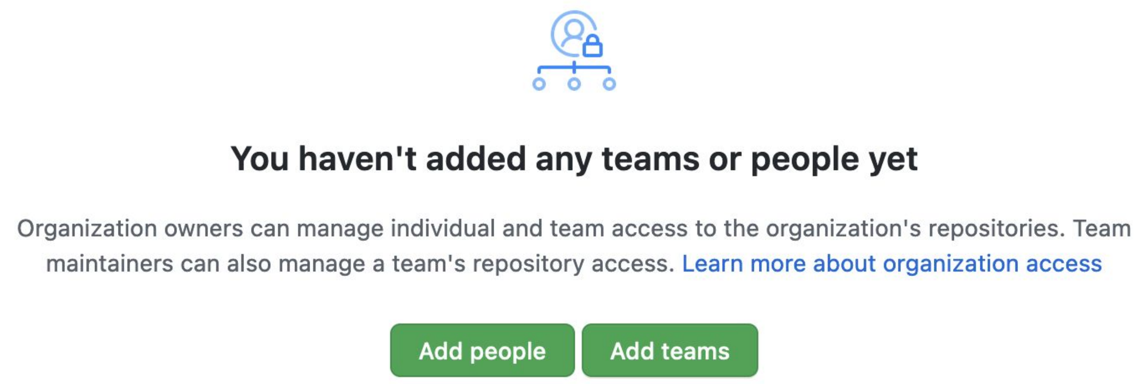
Exercise

- Get into teams of 2-3
- Identify someone to“own” a repository who will create it in their GitHub account (PUBLIC repository)
- Add a README.md, LICENSE and .gitignore using the UI
    - Python language & MIT license are good to start
- Add the other team members as collaborators to the repository
- Everyone clone on their computer

Exercise

To add collaborators to a repository

- Go to the repo
- Click on Settings, then Collaborators & Teams, then Add People



You haven't added any teams or people yet

Organization owners can manage individual and team access to the organization's repositories. Team maintainers can also manage a team's repository access. Learn more about organization access

Exercise

- Everyone make changes to the README.md
- Status, diff, add, commit, push
- What happens?

Mary

Alice

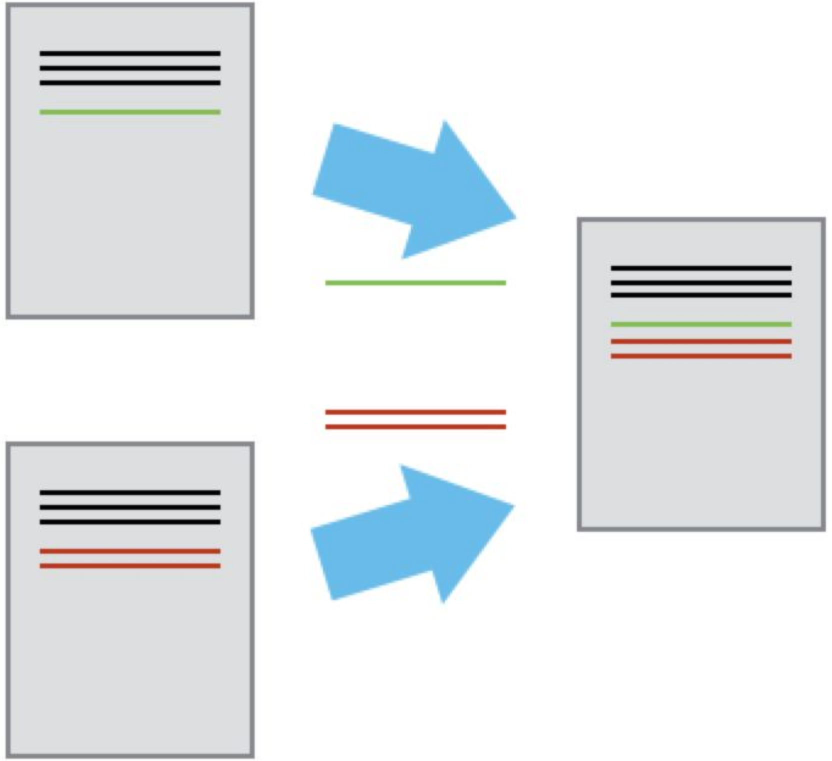


Figure: Multiple versions can be merged

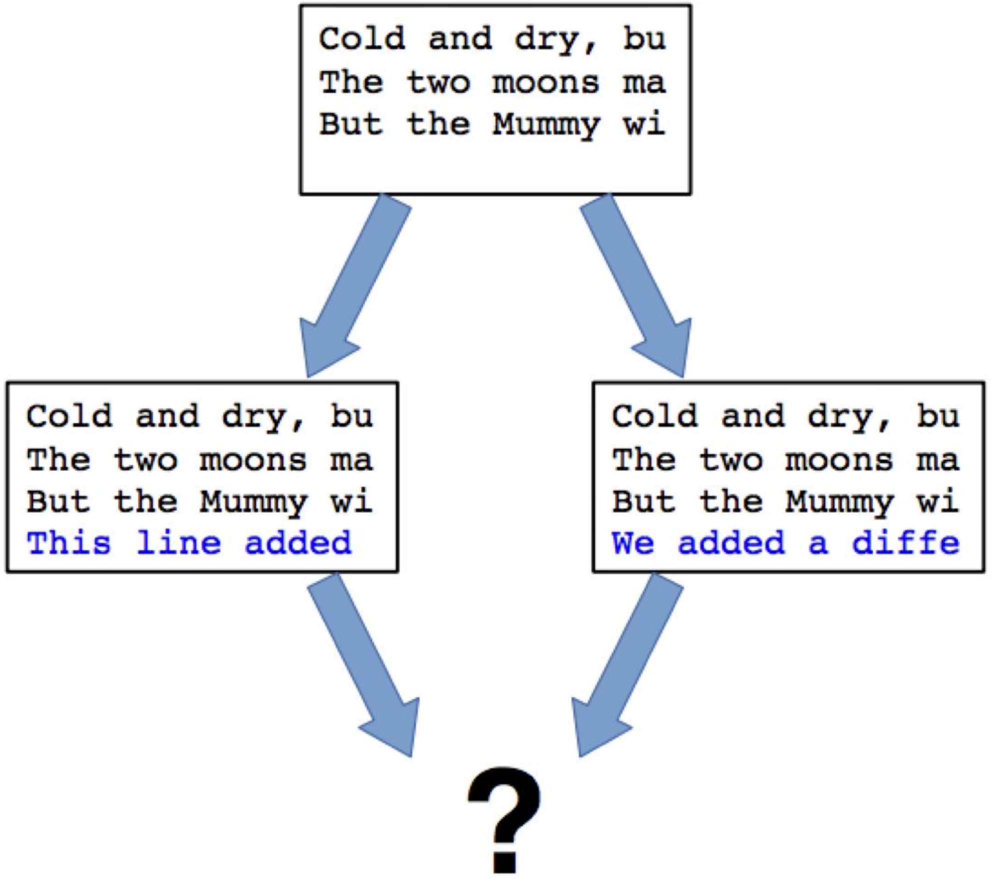
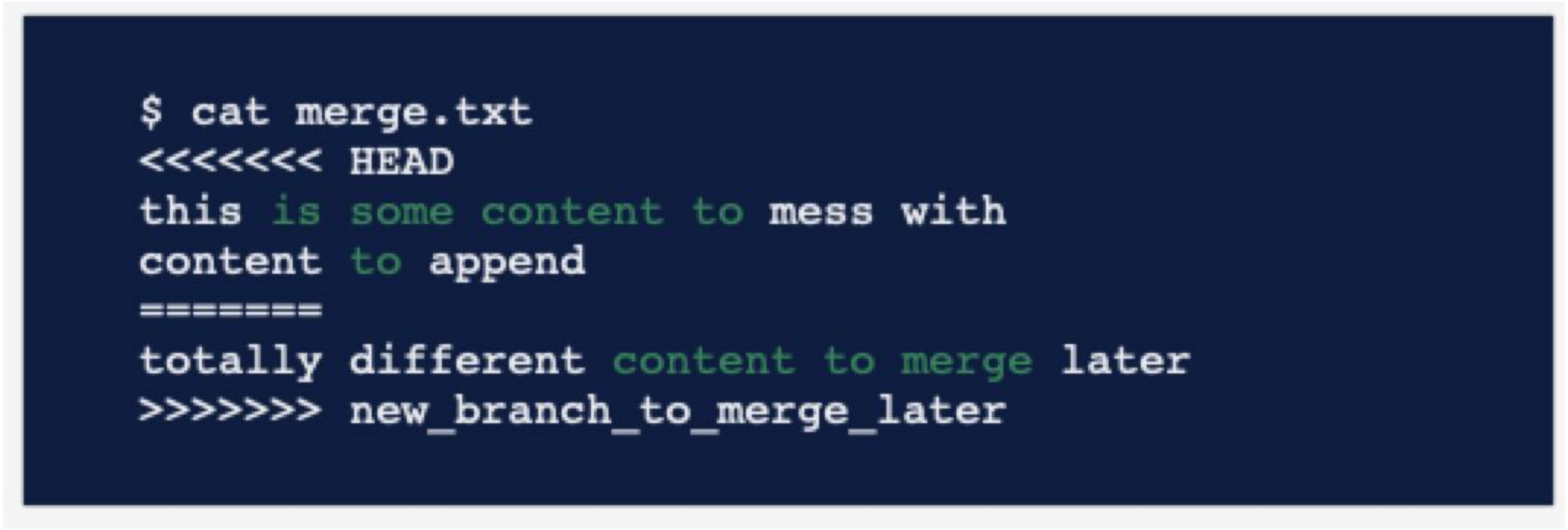


Figure: The conflicting changes

Merge conflicts



```
$ cat merge.txt
<<<<<<< HEAD
this is some content to mess with
content to append
=======
totally different content to merge later
>>>>>>> new_branch_to_merge_later
```

Fixing your merge conflict

```
git fetch

git merge origin
```

Open the files with the conflict in a text editor

Find the conflict, which always has lots of <<<<<< and >>>>>>

Rewrite the block between the brackets to what you want it to be

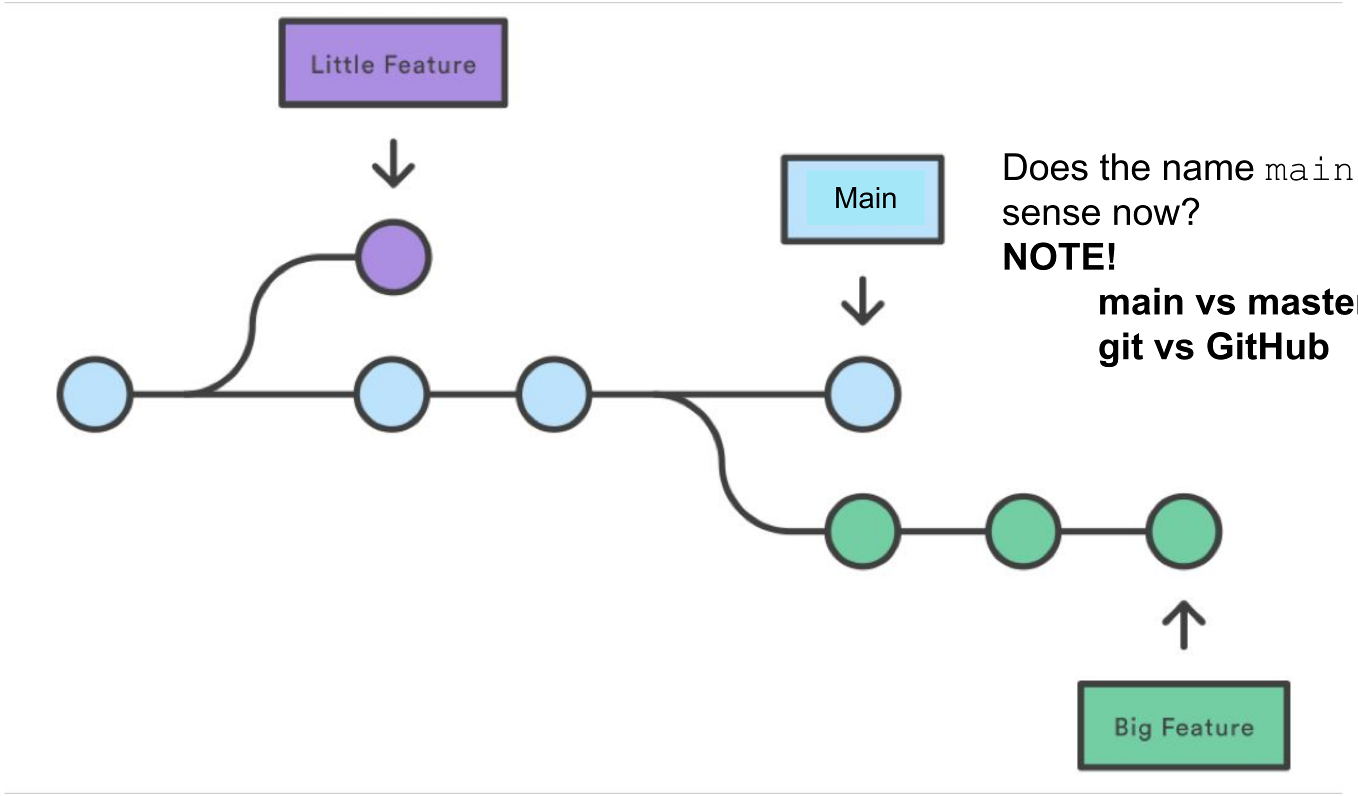
Remove the brackets and equals signs too

```
git commit
```

Collaborating Scenario

- Main development trunk of codebase
- Bug comes in via issue report on GitHub
- You need to work on the bug but don’t want to screw up the main development trunk
- What to do?

Branches



Does the name `main` make more sense now?

NOTE!

main vs master

git vs GitHub

Branch commands

- Create a new branch on your local computer

```
git branch name-of-branch
```

- Delete a branch

```
git branch -D name-of-branch
```

- Switch to a branch (or main)

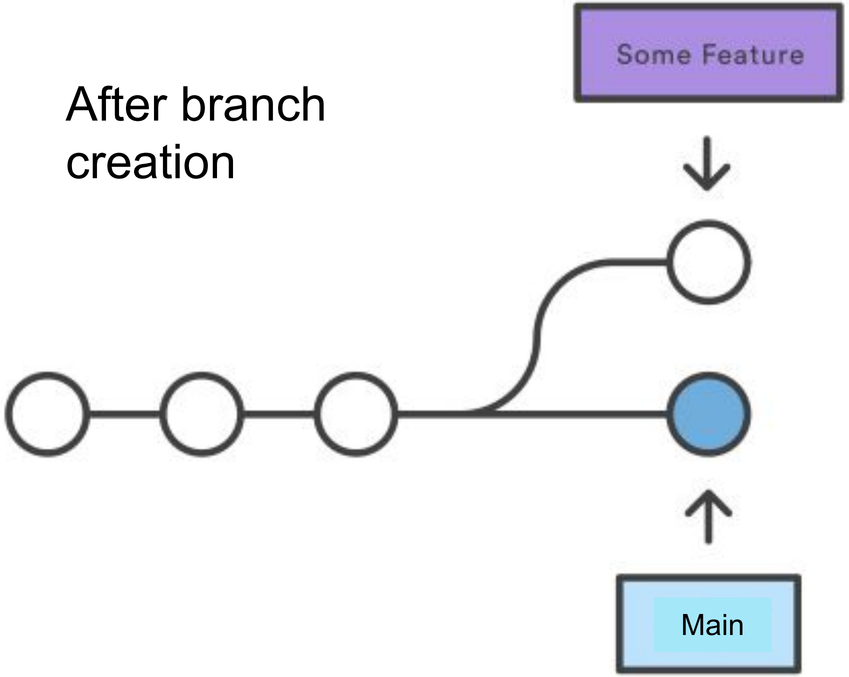
```
git checkout name-of-branch
git checkout main
```

- Make a new branch and switch into it all at once

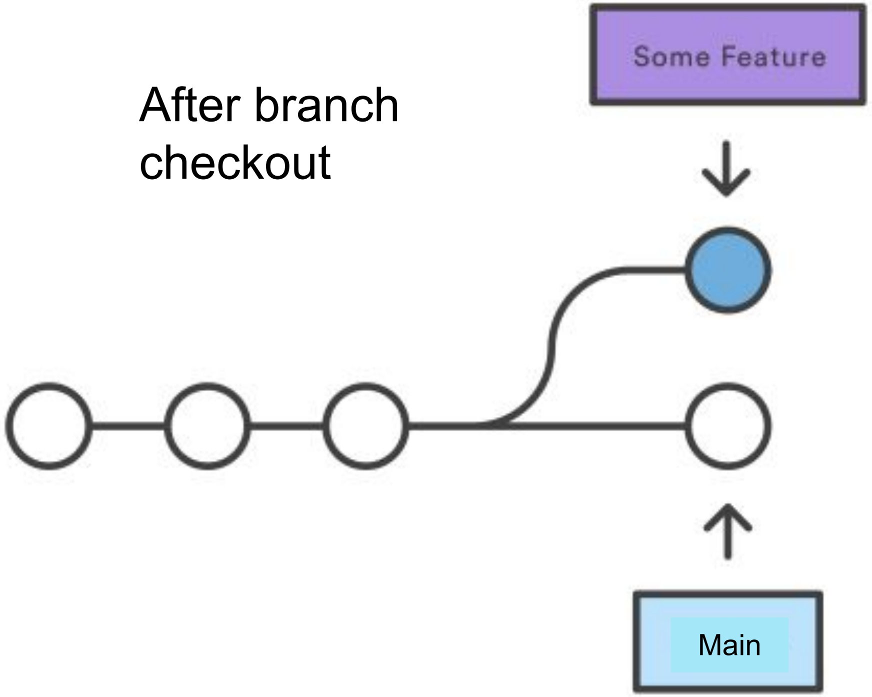
```
git checkout -b name-of-new-branch
```

Branches: visual

After branch creation

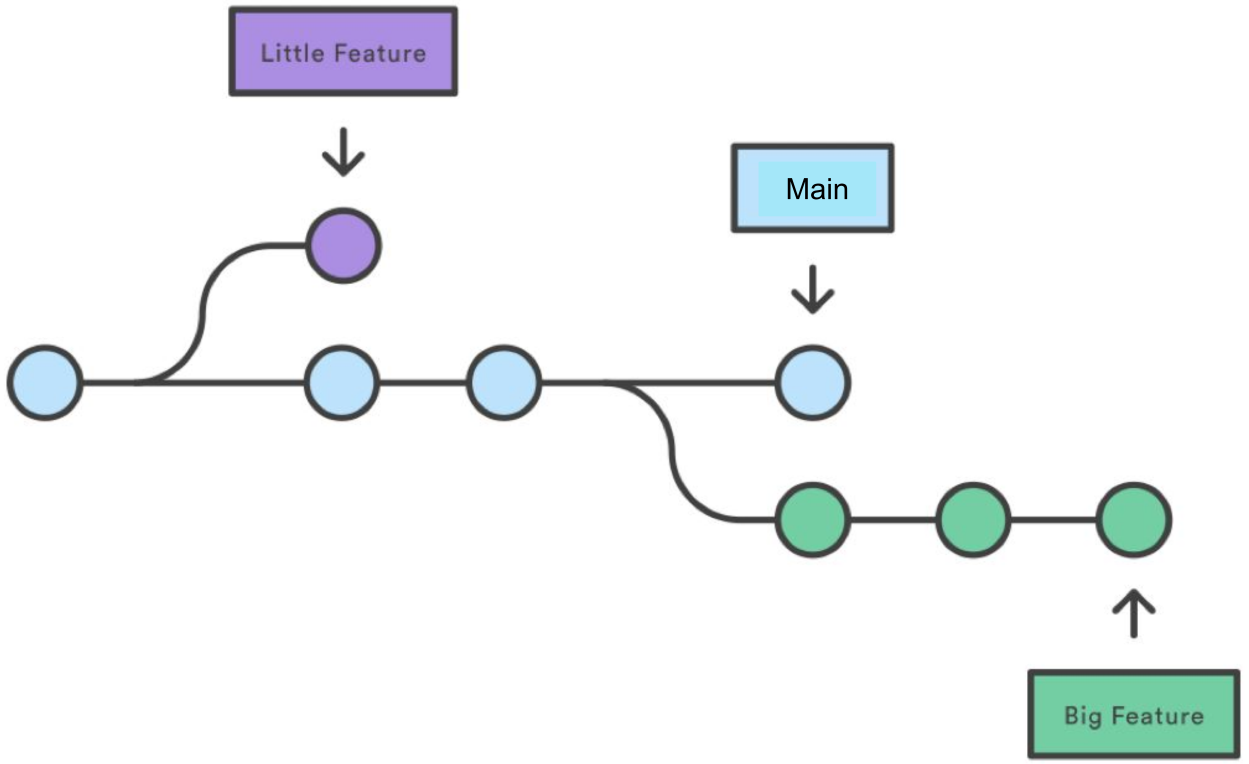


After branch checkout

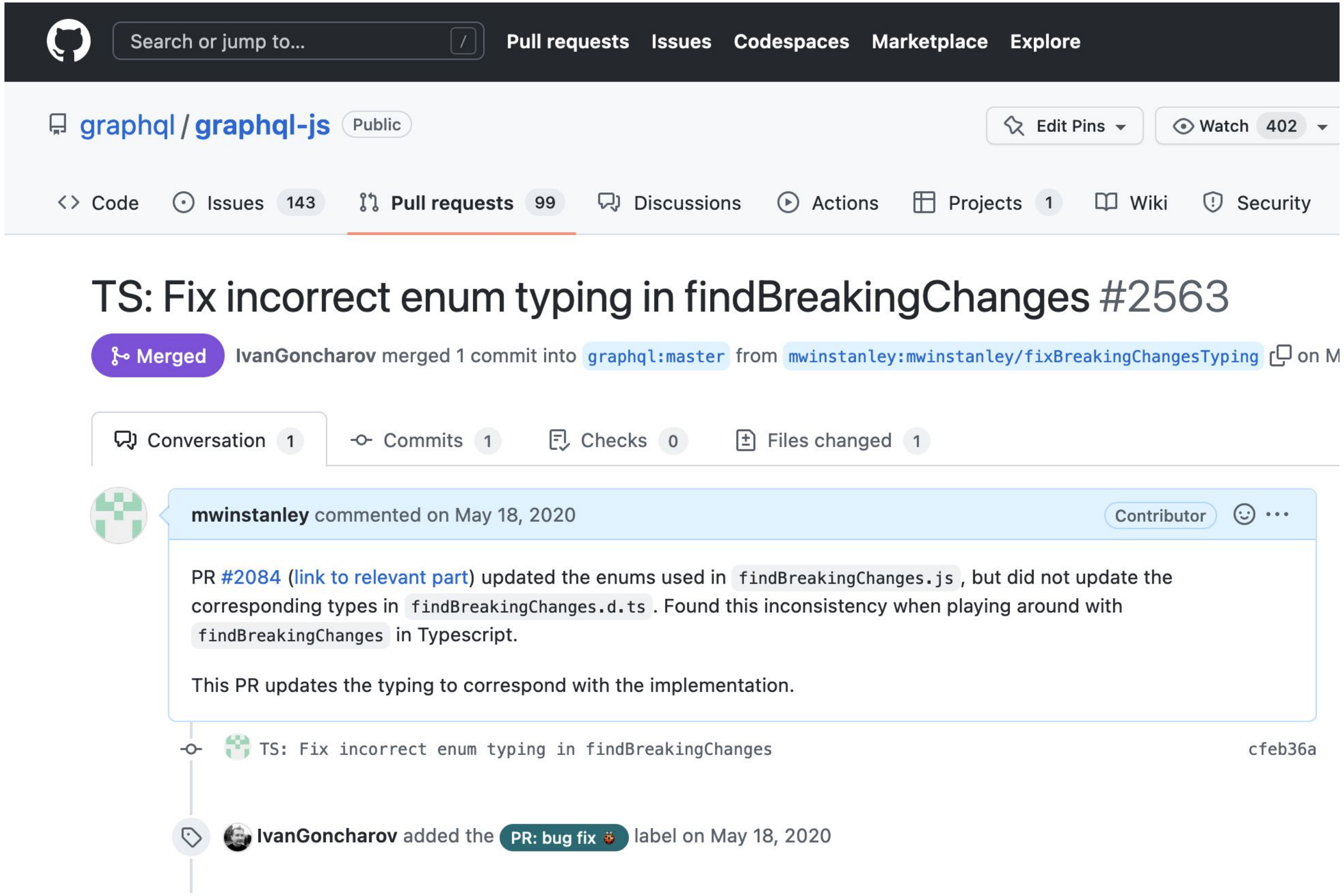


Merges

But how do we get our features back into main?



Pull requests



TS: Fix incorrect enum typing in findBreakingChanges #2563

Merged IvanGoncharov merged 1 commit into `graphql:master` from `mwinstanley:mwinstanley/fixBreakingChangesTyping` on M

mwinstanley commented on May 18, 2020 Contributor

PR #2084 (link to relevant part) updated the enums used in `findBreakingChanges.js`, but did not update the corresponding types in `findBreakingChanges.d.ts`. Found this inconsistency when playing around with `findBreakingChanges` in Typescript.

This PR updates the typing to correspond with the implementation.

`TS: Fix incorrect enum typing in findBreakingChanges` cfeb36a

IvanGoncharov added the PR: bug fix label on May 18, 2020

Submitting a pull request

From your branch, push the branch to GitHub:

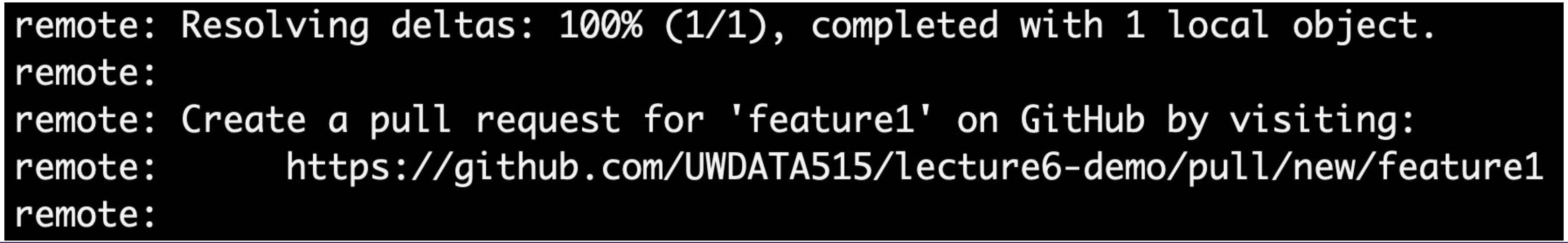
```
git push
```

You'll need to configure git:

```
git config --global --add --bool push.autoSetupRemote true
```

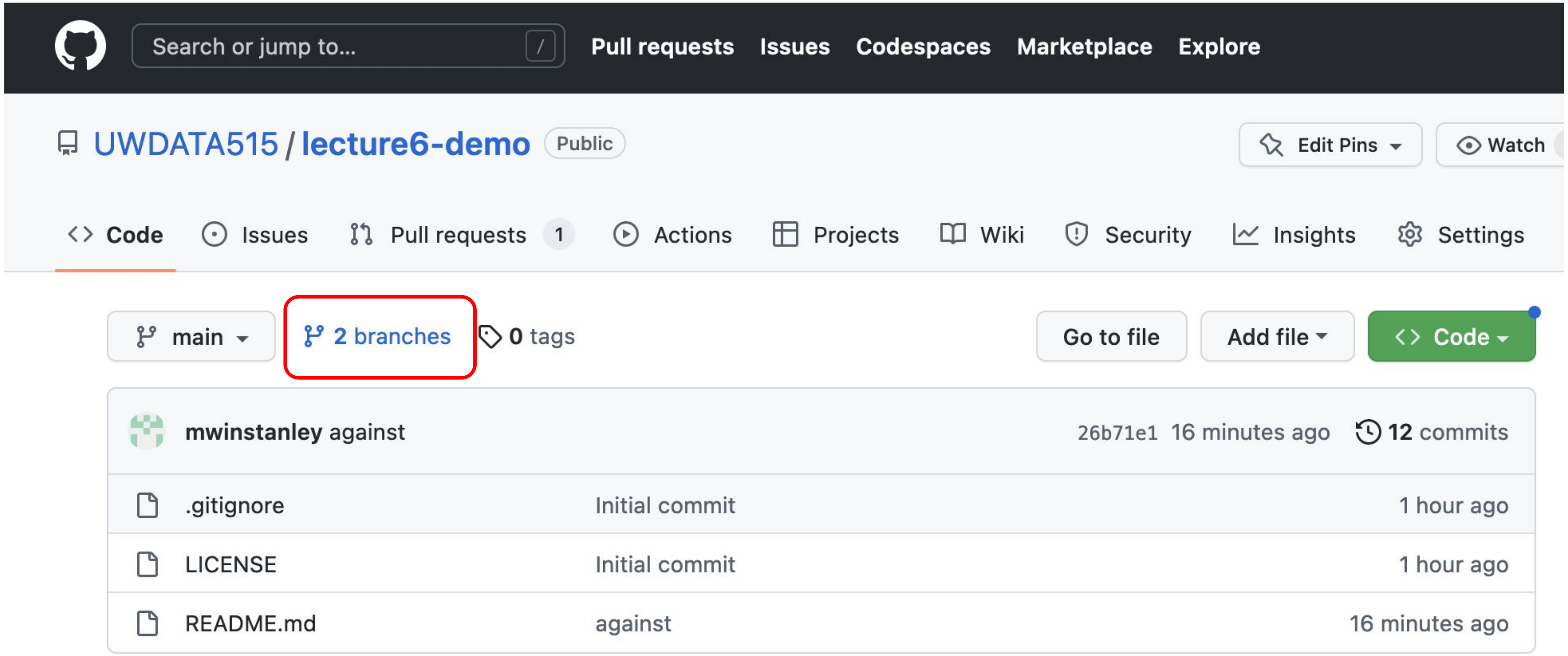
This tells git to automatically sync the proper branch with GitHub when you push

Follow the link:



```
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote:
remote: Create a pull request for 'feature1' on GitHub by visiting:
remote:      https://github.com/UWDATA515/lecture6-demo/pull/new/feature1
remote:
```

Branches on GitHub

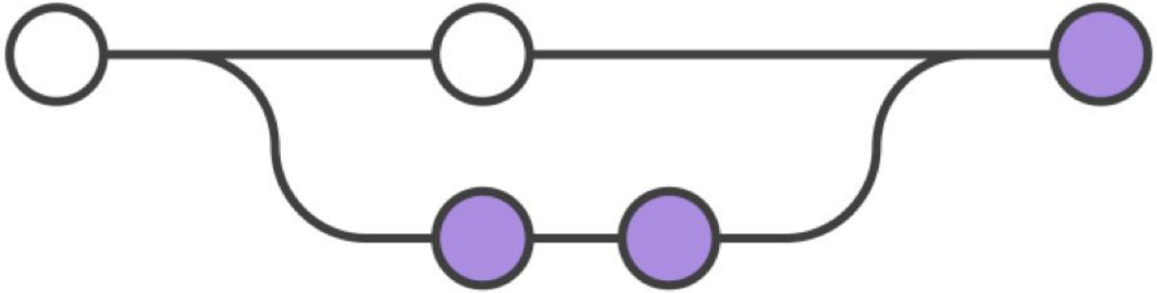


mwinstanley against 26b71e1 16 minutes ago 12 commits

.gitignore	Initial commit	1 hour ago
LICENSE	Initial commit	1 hour ago
README.md	against	16 minutes ago

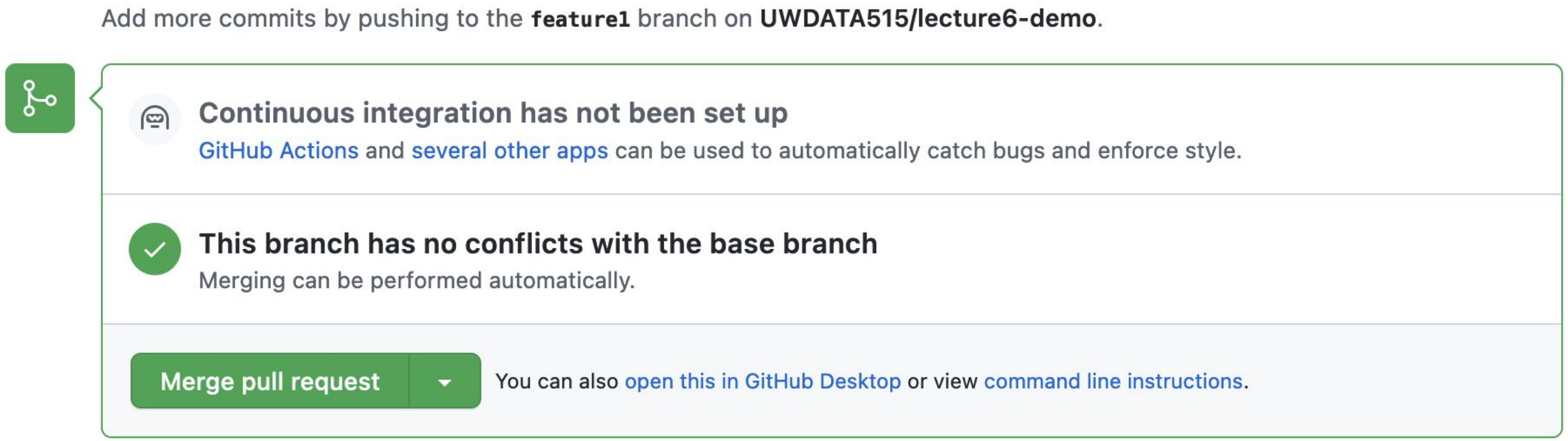
Merges

Usually: via the GitHub interface in a Pull Request (more in next slide!)



Or: `git merge branch-name` *(familiar?)*

Merging through the GitHub UI for a Pull Request


Add more commits by pushing to the **feature1** branch on **UWDATA515/lecture6-demo**.

Continuous integration has not been set up
GitHub Actions and several other apps can be used to automatically catch bugs and enforce style.

This branch has no conflicts with the base branch
Merging can be performed automatically.

You can also open this in GitHub Desktop or view command line instructions.

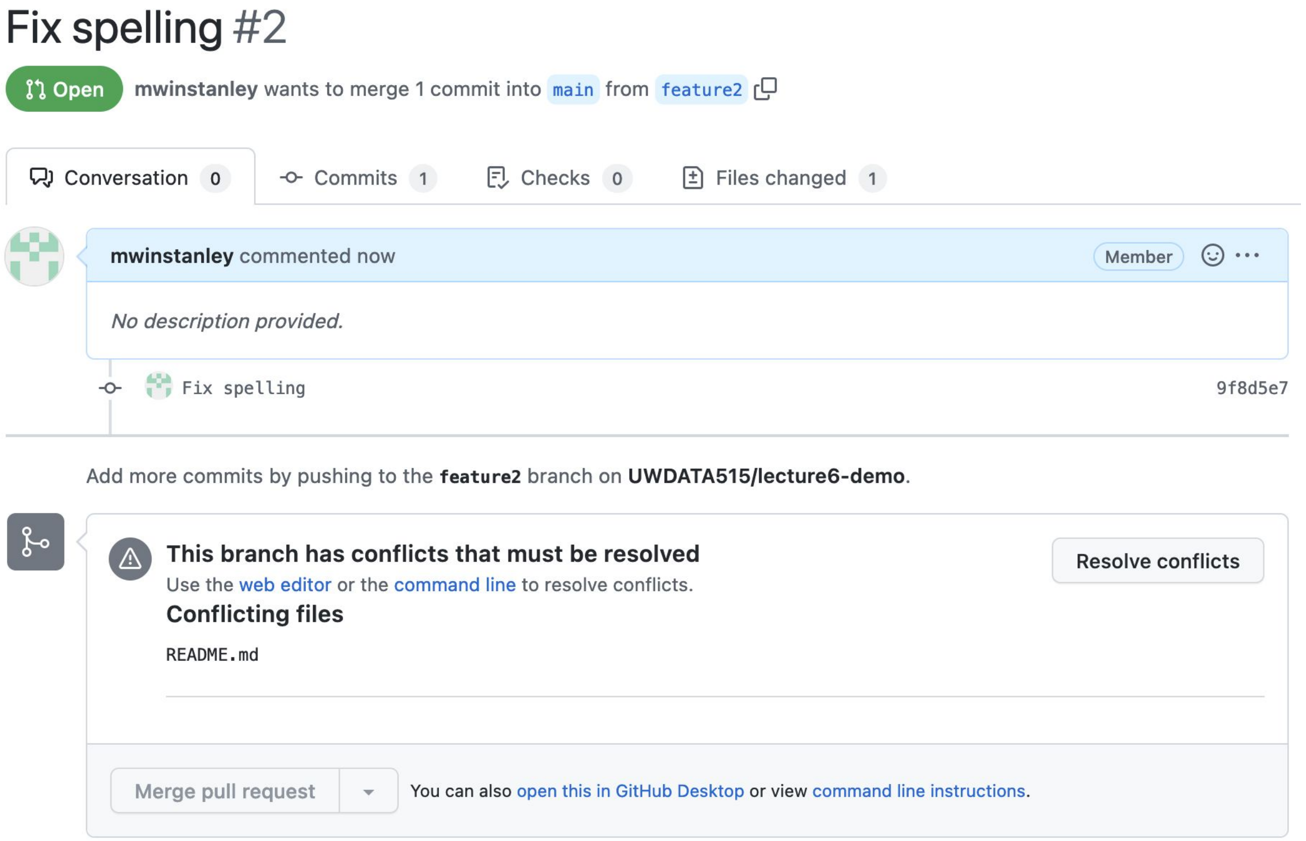
Don’t forget to delete the branch when you’re done!

(or configure auto-deletion in the repo Settings)

Merge conflicts

Uh oh!

Someone else merged a conflicting change so I can't merge my branch



Fix spelling #2

Open mwinstanley wants to merge 1 commit into main from feature2

mwinstanley commented now

No description provided.

Fix spelling 9f8d5e7

Add more commits by pushing to the **feature2** branch on **UWDATA515/lecture6-demo**.

This branch has conflicts that must be resolved

Use the web editor or the command line to resolve conflicts.

Conflicting files

README.md

You can also open this in GitHub Desktop or view command line instructions.

Merge conflicts: merging main into your branch

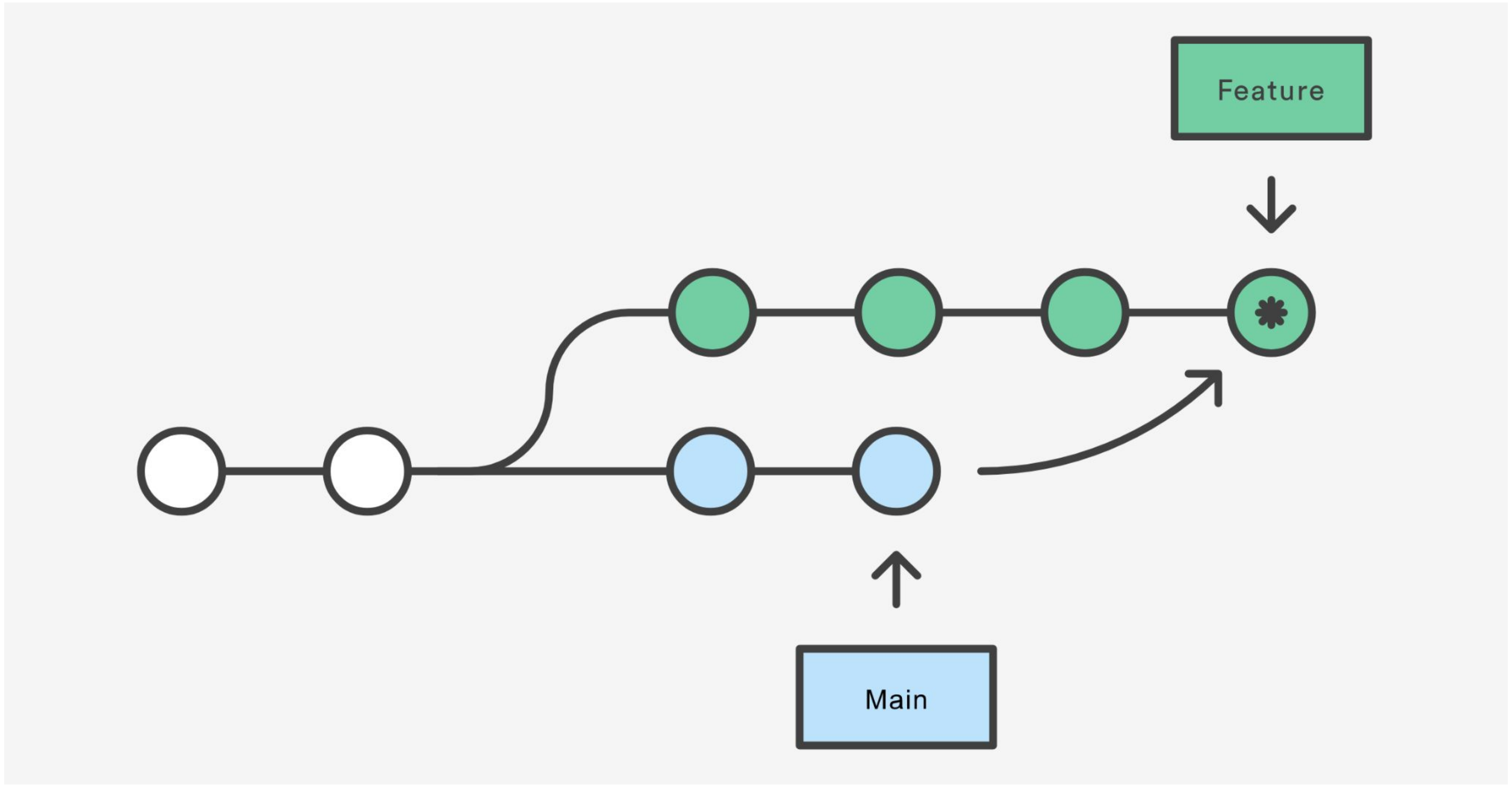
- Via the GitHub interface (ONLY if simple eg Markdown files)

Or

```
git checkout main
git pull        # pull in the conflict
git checkout your-feature-branch
git merge main
```

(fix merge conflicts by editing the conflicting files, git add as needed)

```
git commit
git push        # update the remote version of your branch
```


Feature
Main

UNIVERSITY of WASHINGTON

Merging main into your branch

Pros

- Non-destructive - existing branches are not changed in any way

Cons

- Extra “merge commits” in the history

Merge conflicts: rebasing

If you're like me and HATE those "merge commits"

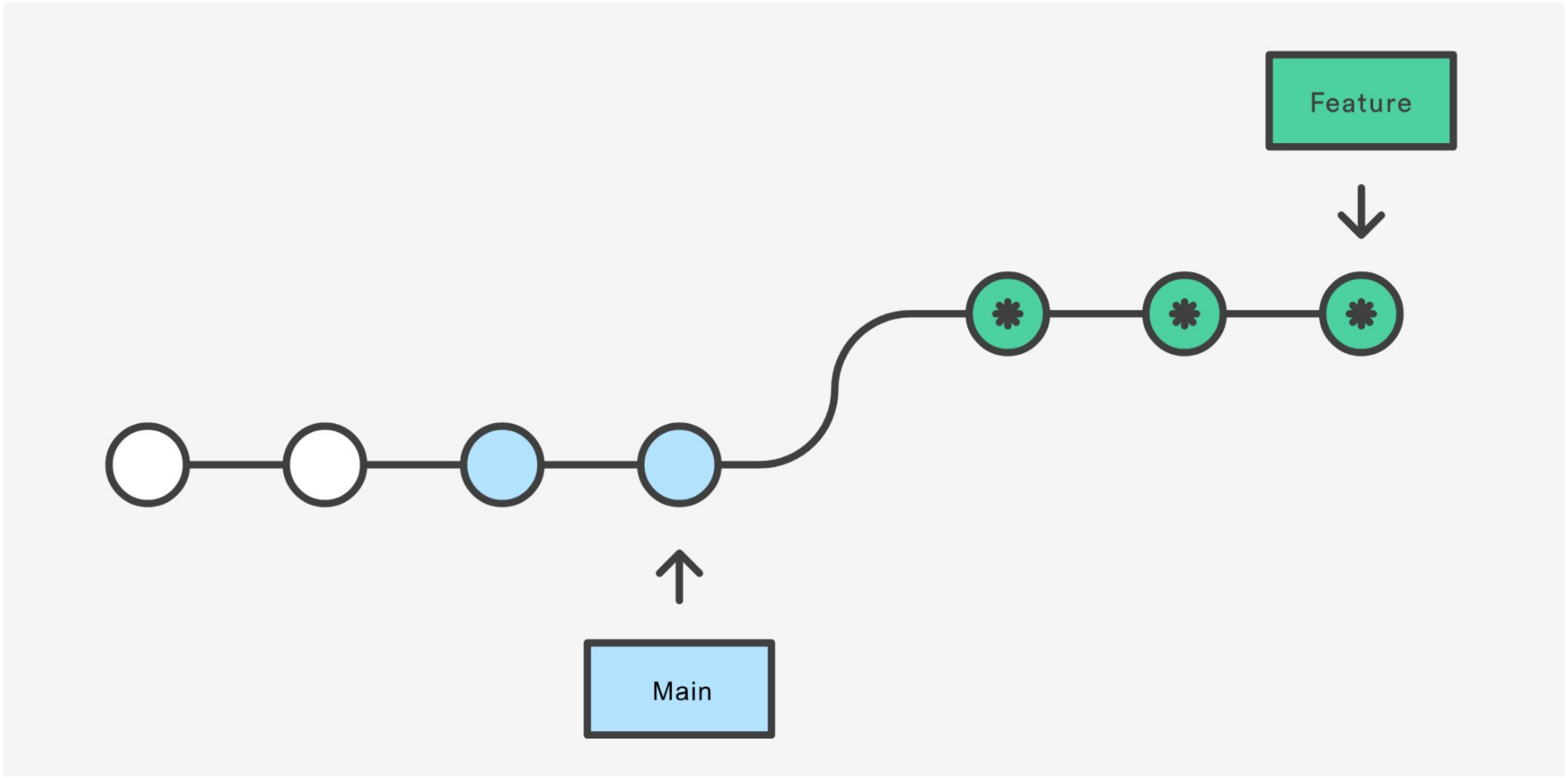
```
git checkout main
git pull      # pull in the conflict
git checkout your-feature-branch
git rebase main
```

(fix merge conflicts by editing the conflicting files, git add as needed)

```
git rebase --continue
git push --force
```

This "rewrites history" - hence why you need to `--force`

More about merging vs rebasing


Feature
Main

Rebasing

Pros

- Perfectly linear history
- No extraneous “merge commits” - cleaner history

Cons

- Rewriting history
- You can’t tell when things were rebased exactly

NEVER USE REBASING ON A PUBLIC BRANCH (ie main)

Only your own private branches

Rebasing

- You don’t have to wait until you have an approval to rebase or merge main into your branch!
- It’s a good idea if you know someone else submitted a major change that might affect yours

UNIVERSITY *of* WASHINGTON

Standard Collaborative Flow

- Create a new branch (`git checkout -b new-branch-name`)
- Commit some changes
- Push your branch to GitHub
- Create a pull request in the UI
- Pull and merge main into your branch again, resolving conflicts, if necessary (`git merge main` or `git rebase main`)
- Merge the pull request using github.com and the big green button

Exercise

Everyone:

Follow the standard collaborative flow to make a change to README.md

Review each other's pull requests

Everyone should merge

UNIVERSITY *of* WASHINGTON

Common mistake

Oops! I forgot to switch to a new branch and now I my commits are on `main`!

- Create a new branch where you are. This will save your commits and give then the new branch name
- Checkout the main branch
- Reset main back to before your commits. Count how many commits back you want to go, then reset. For example, if you've accidentally added 2 commits:

This says get rid of the commits entirely

```
    git reset --hard HEAD~2
```

- Now you can checkout your new branch and continue with your changes

Real-World Branch Notes

- Conflicts are natural! There is nothing wrong
- Name your branch something descriptive
- Prefix your branch name with your user id

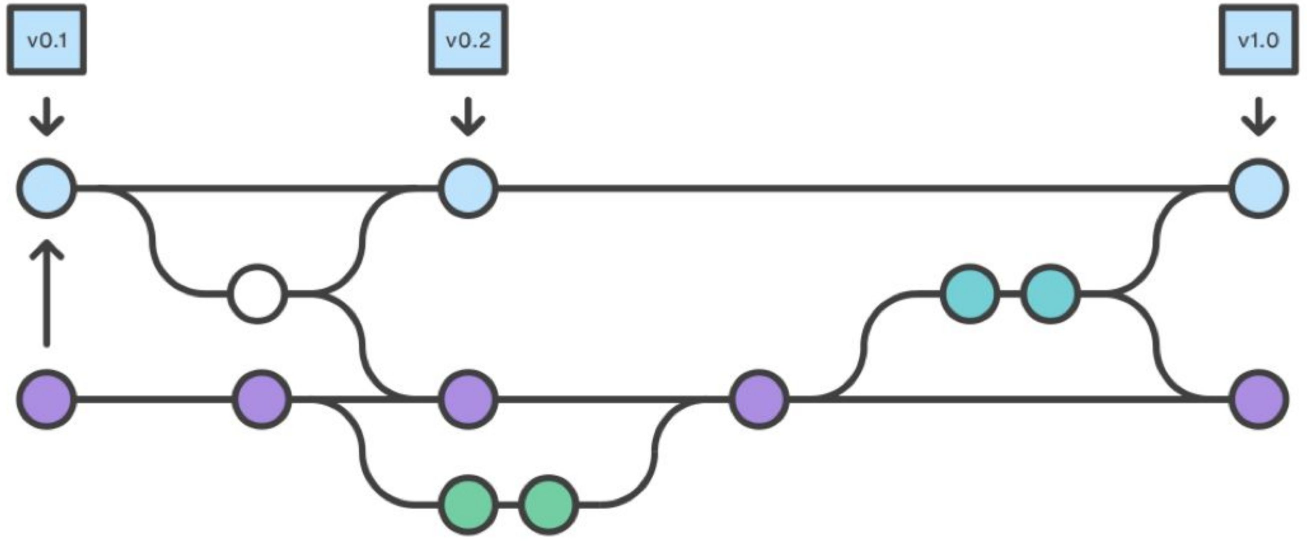
  `mwinstanley/readmeUpdate`
- Delete your branch when you’re done
  - Configure auto-deletion in the repository
  - Settings > Automatically delete head branches

Forking

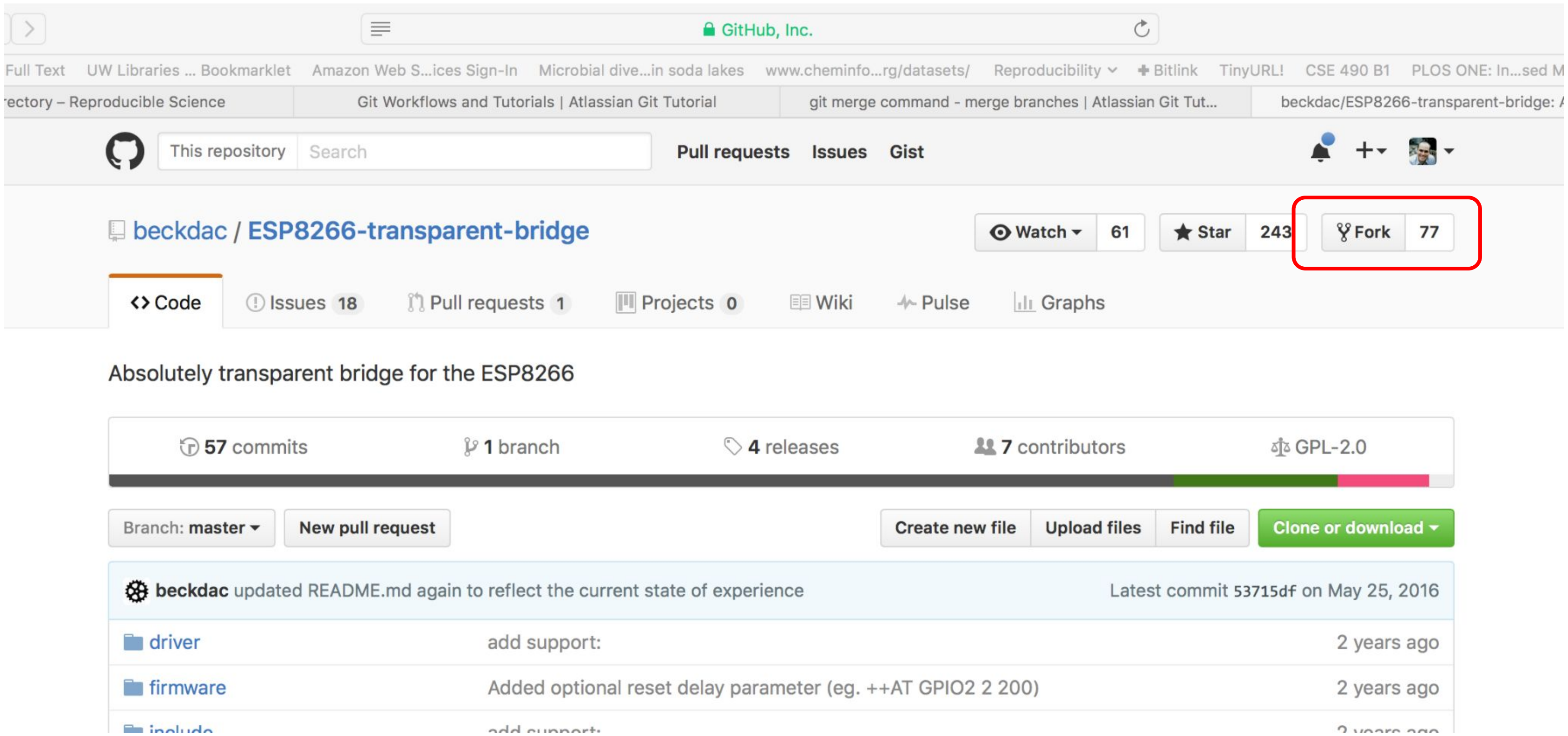
Another solution!

Forking

A totally new copy of the repository, which you can change and ask the original owners to “pull” back into their own version.



Forking



beckdac / ESP8266-transparent-bridge

Absolutely transparent bridge for the ESP8266

beckdac updated README.md again to reflect the current state of experience — Latest commit 53715df on May 25, 2016

driver	add support:	2 years ago
firmware	Added optional reset delay parameter (eg. ++AT GPIO2 2 200)	2 years ago
include	add support:	2 years ago

UNIVERSITY *of* WASHINGTON

Forking

Probably not in this class (use branches)!

Making changes to open-source libraries