THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

9. Agile Development

CSCI 2541W Database Systems & Team Projects

Gabe

Slides adapted from Lucas Chaufournier & Tim Wood

This project is huge, how do we possibly get started working on it?

How do we decide who should work on what?

How do we make sure we can deliver on time?

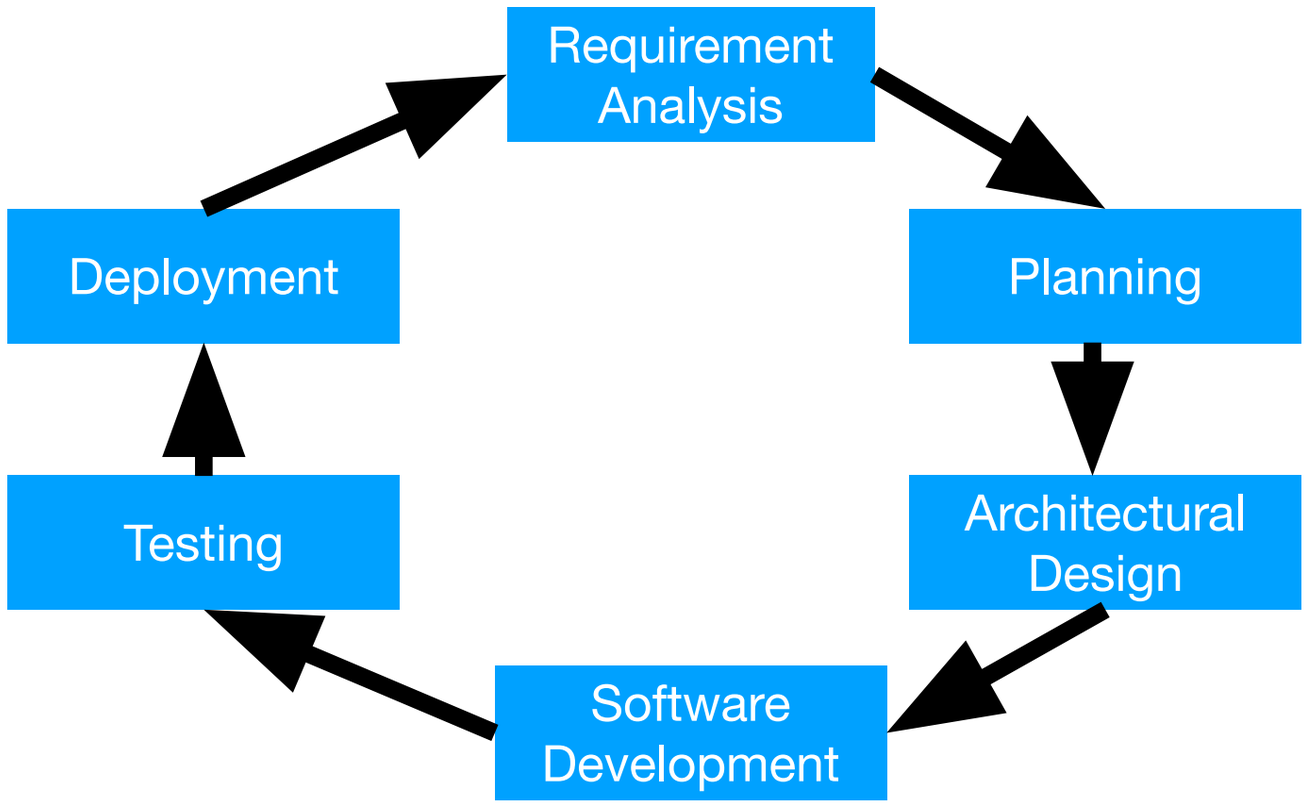
How do we make progress without being in the same place?

Software Development Lifecycle (SDLC)

"A process that produces software with the **highest quality** and **lowest cost** in the **shortest time** possible."

Provides a set of phases "to quickly produce high-quality software which is **well-tested** and ready for **production use**."

A strong **emphasis on testing**, as you need to ensure code quality at every release.



Source: https://stackify.com/what-is-sdlc/

Agile

A *methodology* for *delivering software* to customers faster and with limited headache.

Instead of having large product launches, *product features are released in smaller increments*.

Requirements and designs are *continuously reevaluated* to make teams flexible to change

Key concepts are **open communication, collaboration, adaptability, trust**.

A *value system* rather than a framework or defined set of steps.

If Agile is just a set of values how does it help us?

This is where Scrum and Kanban come in.

Scrum

Scrum

Scrum is a framework for getting things done

Scrum encourages teams to *learn from their past, work together on problems, and reflect to always improve*.

Designed to allow teams to improve and be *adaptive to change* as they work on projects and *reprioritize features as needed*.

Work is organized into *increments* that are completed in *sprints*.

Releases generally happen at the end of a sprint or a series of sprints.

More Info: https://www.atlassian.com/agile/scrum

Scrum Concepts

Scrum board - used to represent *stories* in progress.

Sprint - A *period of time* (usually 2 weeks) of which work will be completed.

A User Story - The *smallest unit of work*, usually written in human readable terms

- i.e. When I click the login button, I am logged into the website.

Product Backlog - The total list of *all todo stories* relating to the product. Includes new features, bug fixes, and enhancements

Sprint Backlog - The list of *all todo stories to be completed by the end of the sprint*.

Increment - The *goal for the end of the sprint*. What should be completed at the end of your sprint period.

The Scrum Ceremonies

Backlog Grooming: Prioritize items and clean stories to *keep the backlog up to date*

Sprint Planning: Deciding what stories will be undertaken for the *next sprint.*

Sprint: The time period during which developers actually undertake the work for the increment and make progress. Usually around 2 weeks.

Daily Stand Up: Allows for everyone to update their status and keep *everyone on the same page* and *voice concerns*.

Sprint Review: Team gets together to *demo* what was completed during the sprint.

Sprint Retrospective: Team meets to discuss things that *went well and that need work.*

Scrum in Review

A incremental process that favors **working in sprints** and **deploying features** on a **set release schedule.**

Key metric is **burndown**, the number of stories completed in a sprint.

It’s the entire team’s responsibility to *learn from past mistakes and work together to grow*.

Can work great, but it's **structured timeline is hard to adapt to our projects**

Kanban

Kanban

Relies on **Real-time communication** of *capacity* and full *transparency of work*

The *amount of work in progress* is *matched to team capacity* to make sure things are kept on schedule and no one is overwhelmed.

Work items are *represented visually on a kanban board* so any team member can view the status of items.

The *kanban board* is the **single source of truth for progress**. All impediments and blockers are clearly made visible.

It's the entire team's responsibility to ensure items are moving efficiently through the process.

Releases generally happen as features make its way through the whole process.

More info: https://www.atlassian.com/agile/kanban

Kanban Concepts

Kanban Board - A visual board with columns representing the state of work. i.e. Todo, In Progress, Code Review, Done

A **User Story** - The smallest unit of work, usually written in human readable terms.

Product Backlog - The total list of all todo stories relating to the product.

WIP - The work in progress limit. The total number of stories a developer can take on at a given time.

Cycle Time - The amount of time it takes for a unit to travel through the process from In Progress to Done.

A Sample Kanban Board

thelimeburner / demo-aws-app

Unwatch 1 Star

Code | Issues 7 | Pull requests | Actions | Projects 1 | Wiki | Security | Insights | Settings

Sample Kanban Board

Updated 6 minutes ago

Filter cards | + Add cards

3 To do

- Feature 2/ add login page
  #4 opened by thelimeburner
- Feature 3/implement session storage of user cart
  #5 opened by thelimeburner
- Feature 7/ Purchase Product Endpoint
  #9 opened by thelimeburner

2 In Progress

- Feature 1/ Add new home page
  #3 opened by thelimeburner
- Feature 5/ Define database schema
  #7 opened by thelimeburner

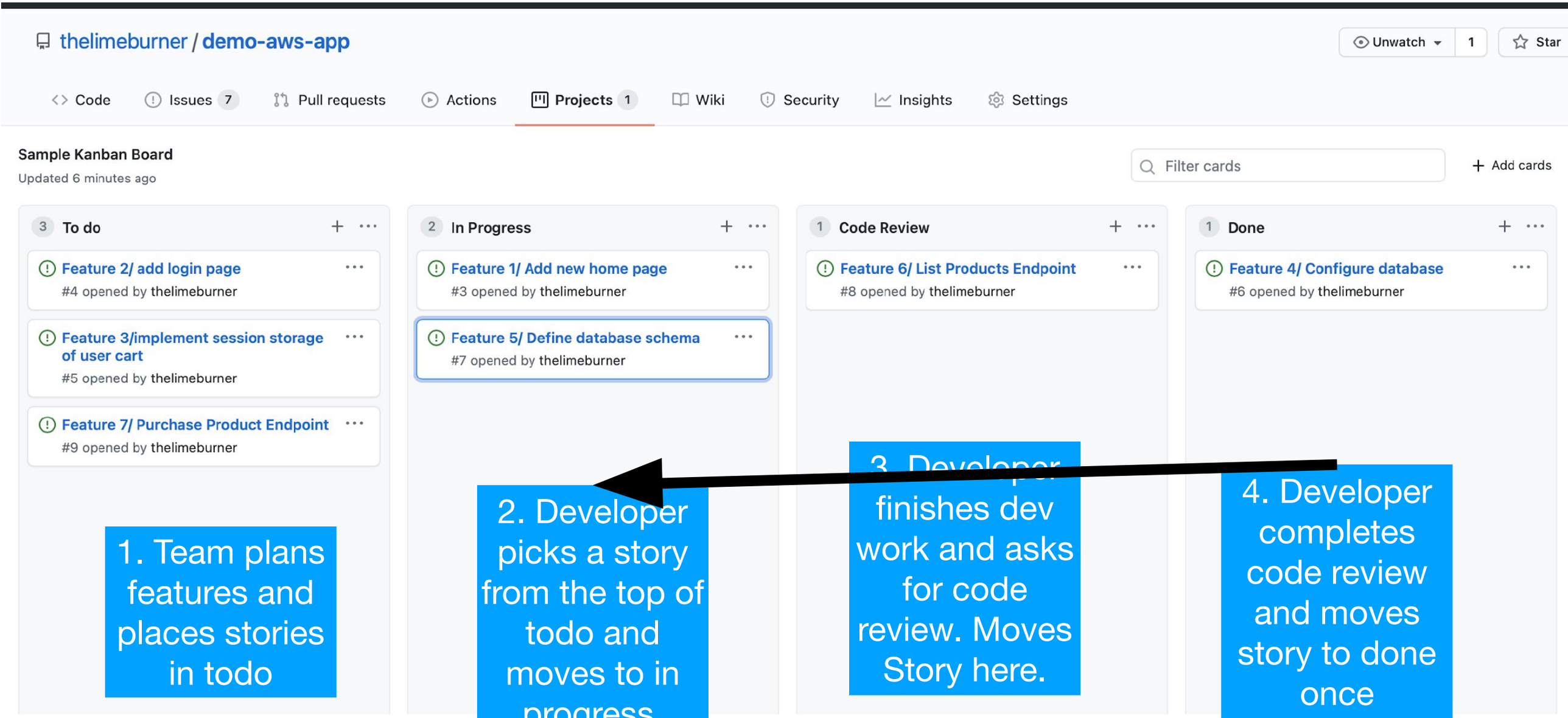
1 Code Review

- Feature 6/ List Products Endpoint
  #8 opened by thelimeburner

1 Done

- Feature 4/ Configure database
  #6 opened by thelimeburner

The Kanban Process



1. Team plans features and places stories in todo

2. Developer picks a story from the top of todo and moves to in progress.

3. Developer finishes dev work and asks for code review. Moves Story here.

4. Developer completes code review and moves story to done once deployed.

5. Repeat

Kanban in Review

A continuous process that favors **limiting work in progress** and *deploying features as they finish*.

Key metric is **minimizing the cycle time** for a story

It's the *entire team's responsibility* to keep *stories moving through the process*.

Low overheard framework and very flexible to change.

Course Project

You must follow the Kanban Agile Dev Methodology

We will use **Trello** to host project boards

- Each team must create its own board (free account)
- Invite mentor and instructors

Break the project down into user stories

Use Trello to track who is working on what

We will review your board and commit history to track how work was divided up!

- Source of truth!
- “I finished X” What’s the “card’s” URL?
- “I have a bug with Y” What’s the “card’s” URL?

User Story

Describes a user interaction with the system with a well defined output/result

Clicking "login" lets a user log into the website

- User should enter username and password
- Check form data against DB
- Store authenticated user info in session or return error

DB can store course offering information

- Define tables for storing a course (department, number, title?) and a specific offering (course id, instructor, term, year?)
- Pre-load sample courses and offerings into DB and provide SQL syntax to insert and search for courses

Tips:

Try to keep user stories small

- Something you can do in a day

Use Trello's commenting feature to discuss issues / make suggestions

- Or ask for help from your mentor!
- Can use github issues, and link them from Trello

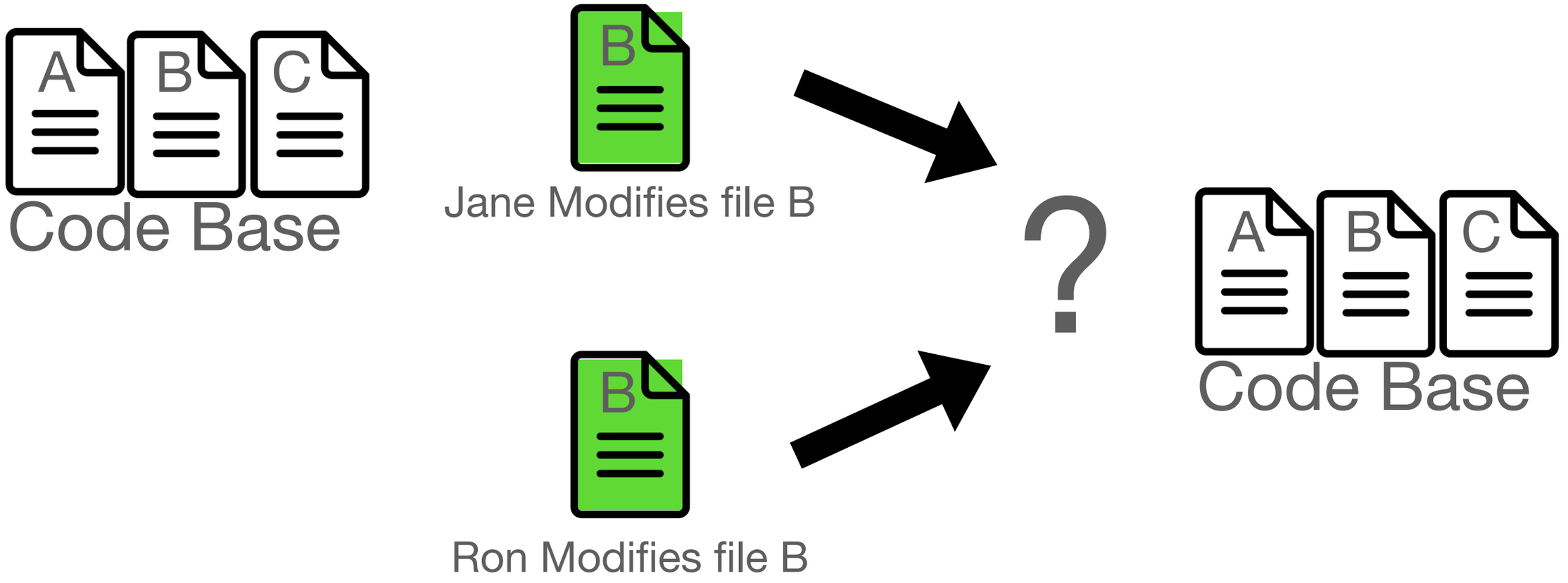
During Phase 2, you **cannot** talk with your Phase 1 teammates

- But you can look back at your old Trello board and the documentation you write!

How do we all work on the same code base without stepping over each other?

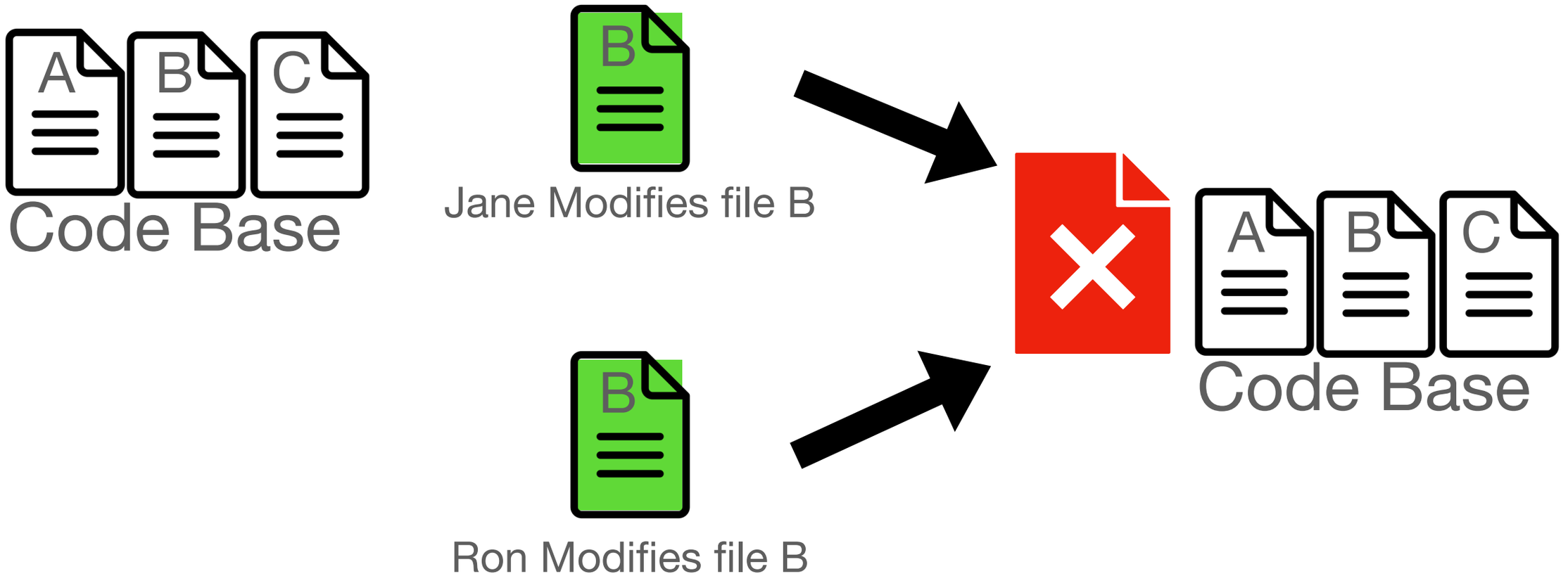
Why do we need version control

How do you decide whose changes to use?

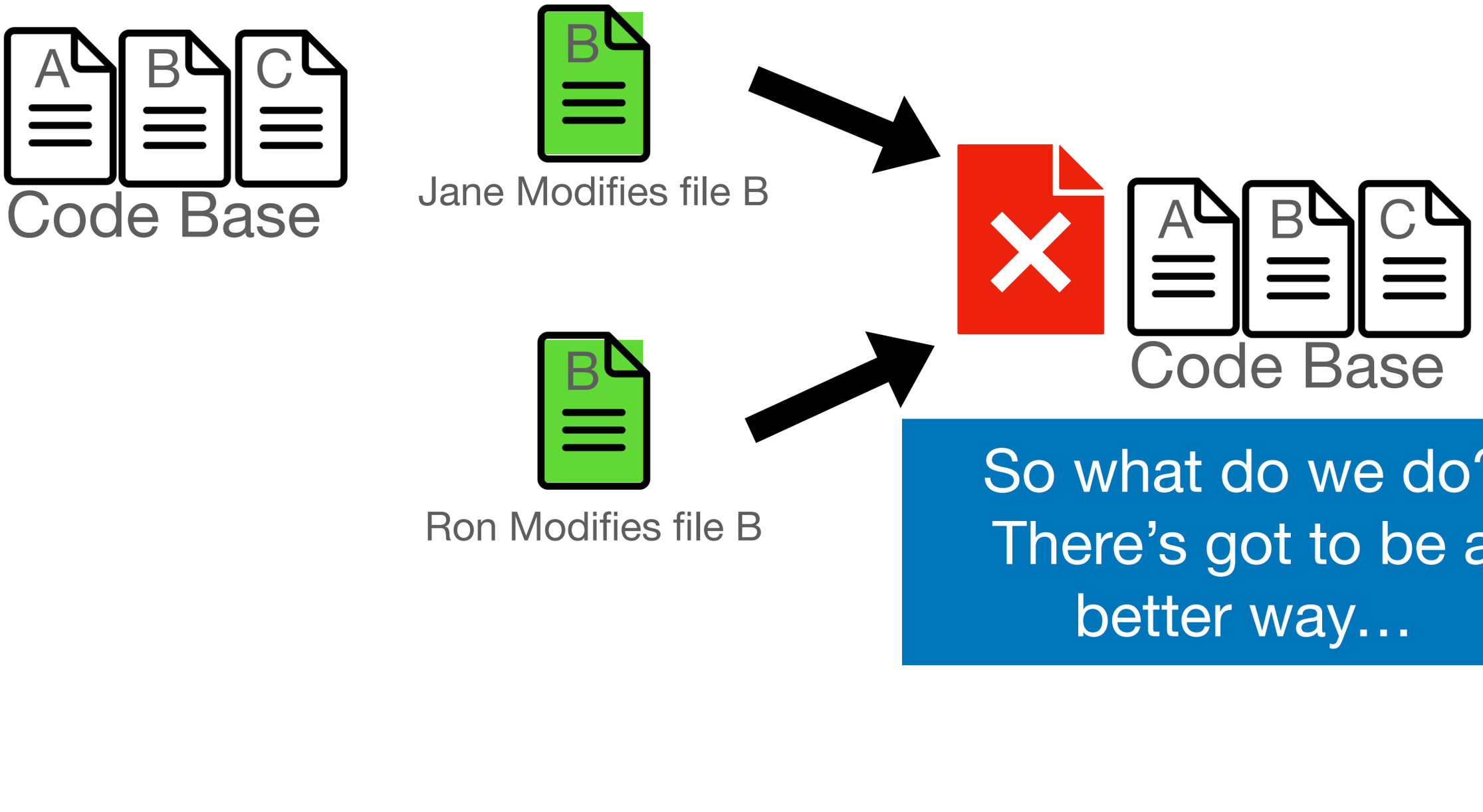


Why do we need version control

The files conflict without a reasonable way to decide.



Why do we need version control

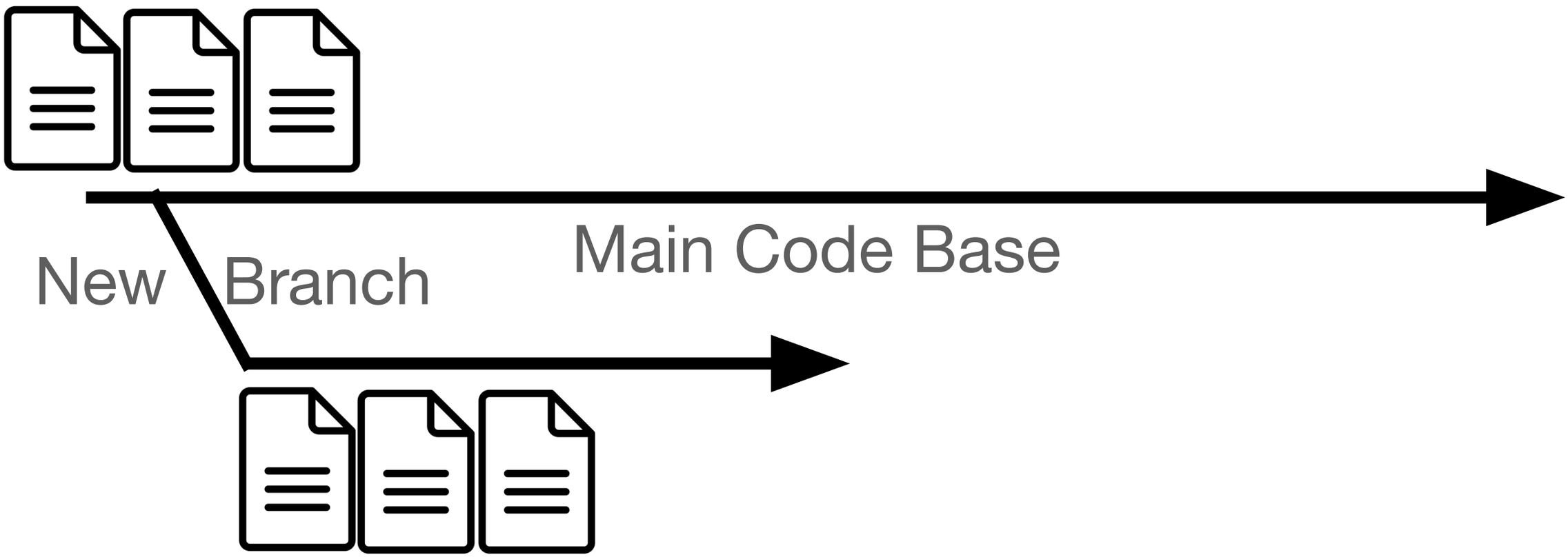


Distributed Version Control

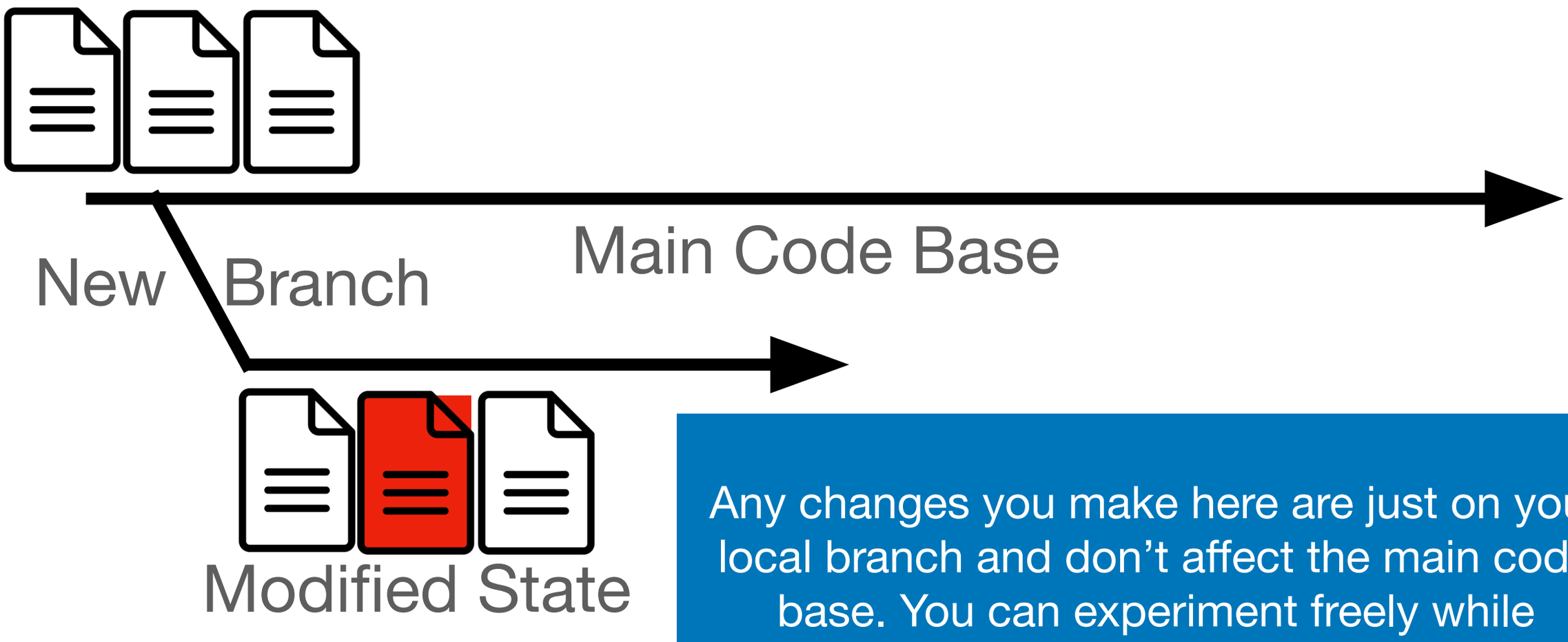
Think of your codebase like the main timeline

Main Code Base

To make changes you first create a new branch



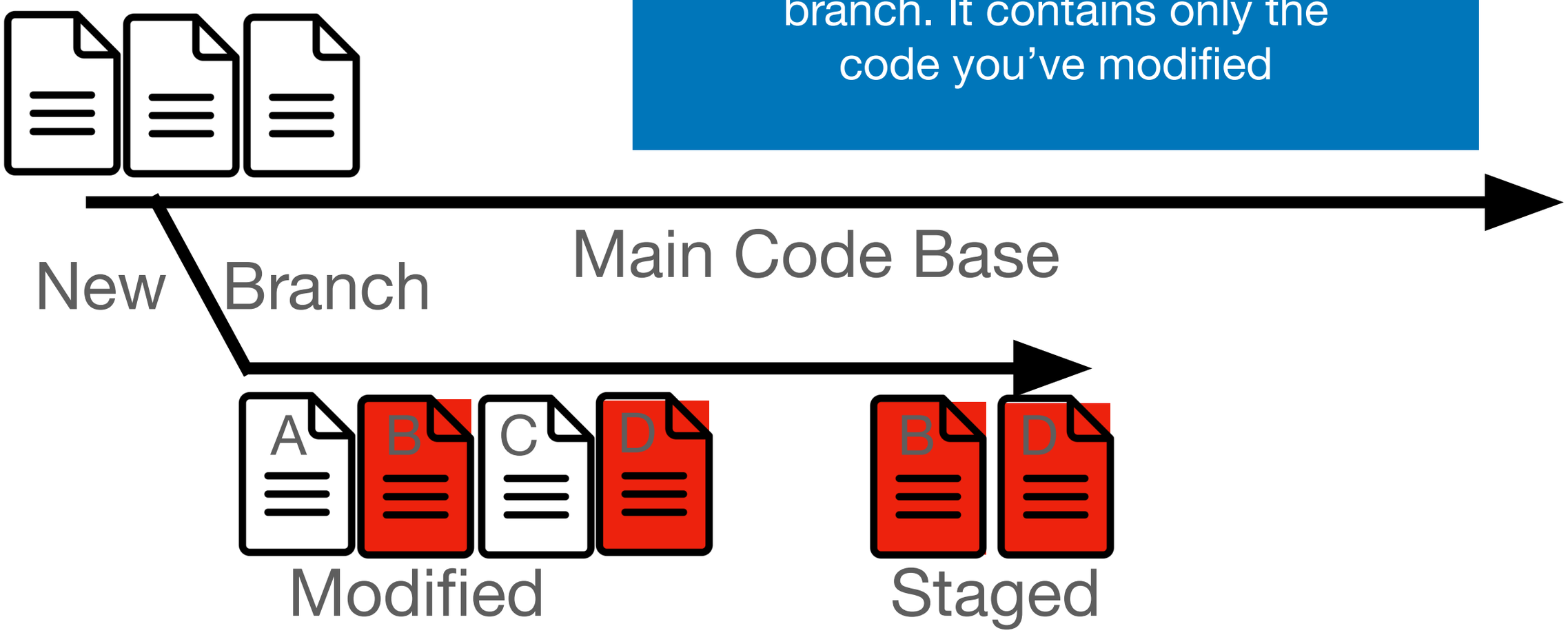
Entering the Modified State



Any changes you make here are just on your local branch and don't affect the main code base. You can experiment freely while developing new features without worrying about breaking the main branch.

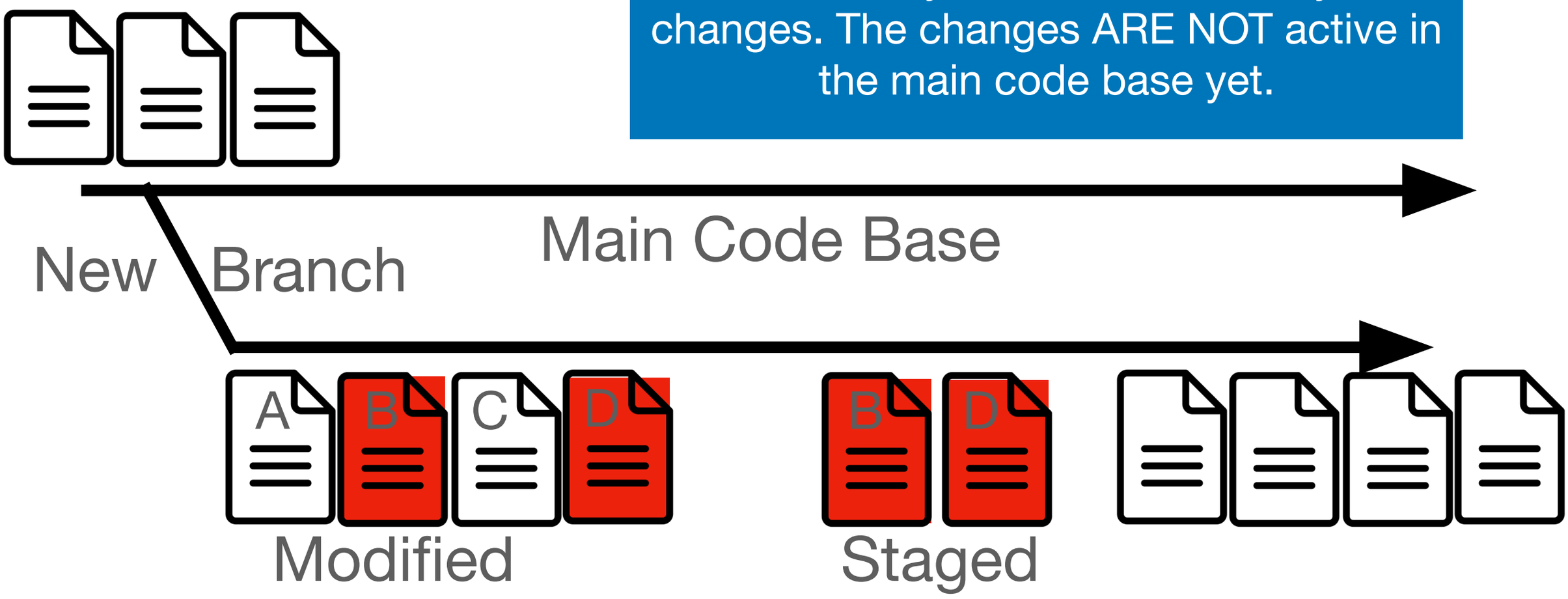
Entering the Staged State

The Staged State prepares your changes for being merged back into the main branch. It contains only the code you've modified



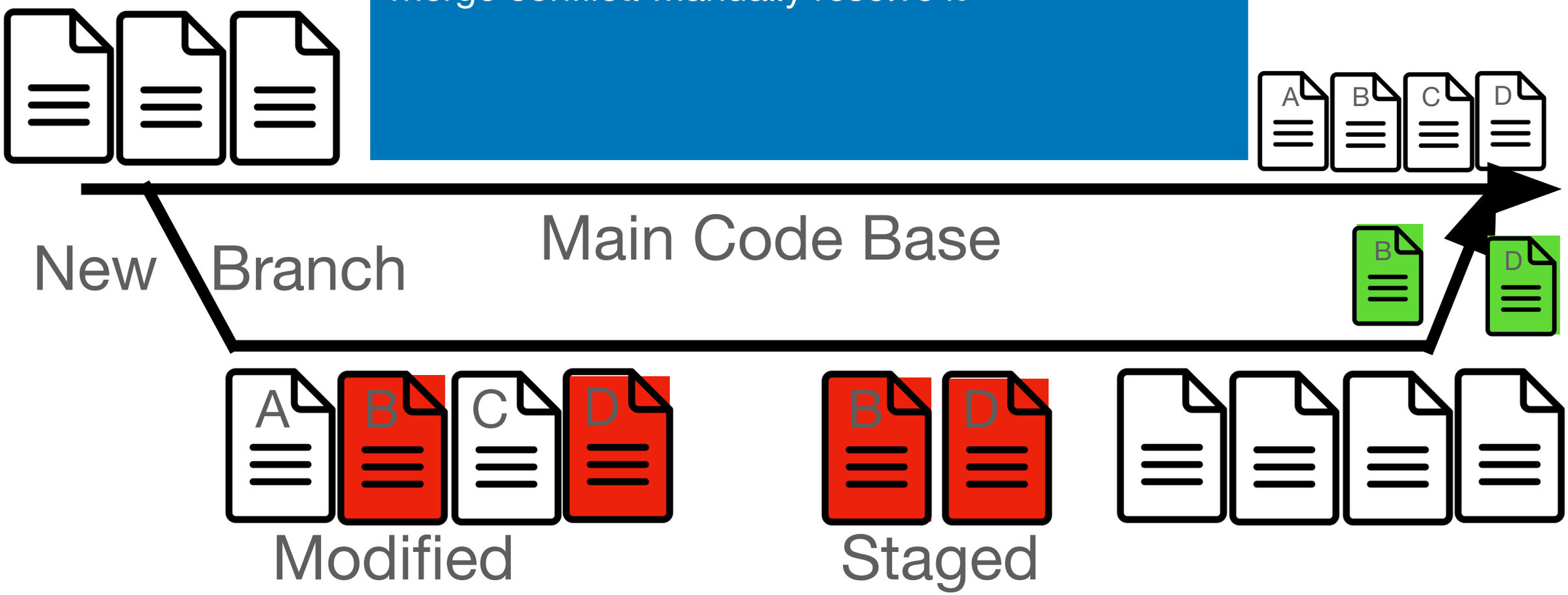
Committing your changes

Committing your code, makes your changes active in your branch. Anyone who clones your branch will see your changes. The changes ARE NOT active in the main code base yet.



Merging your changes to main

By merging to Main you:
- Take all files that have modifications
- Compare them against the main branch.
- If no ones made changes the changes are applied
- If someone modified the same code, you get a merge conflict. Manually resolve it



Merging your changes to main

By merging to Main you:
- Take all files that have modifications
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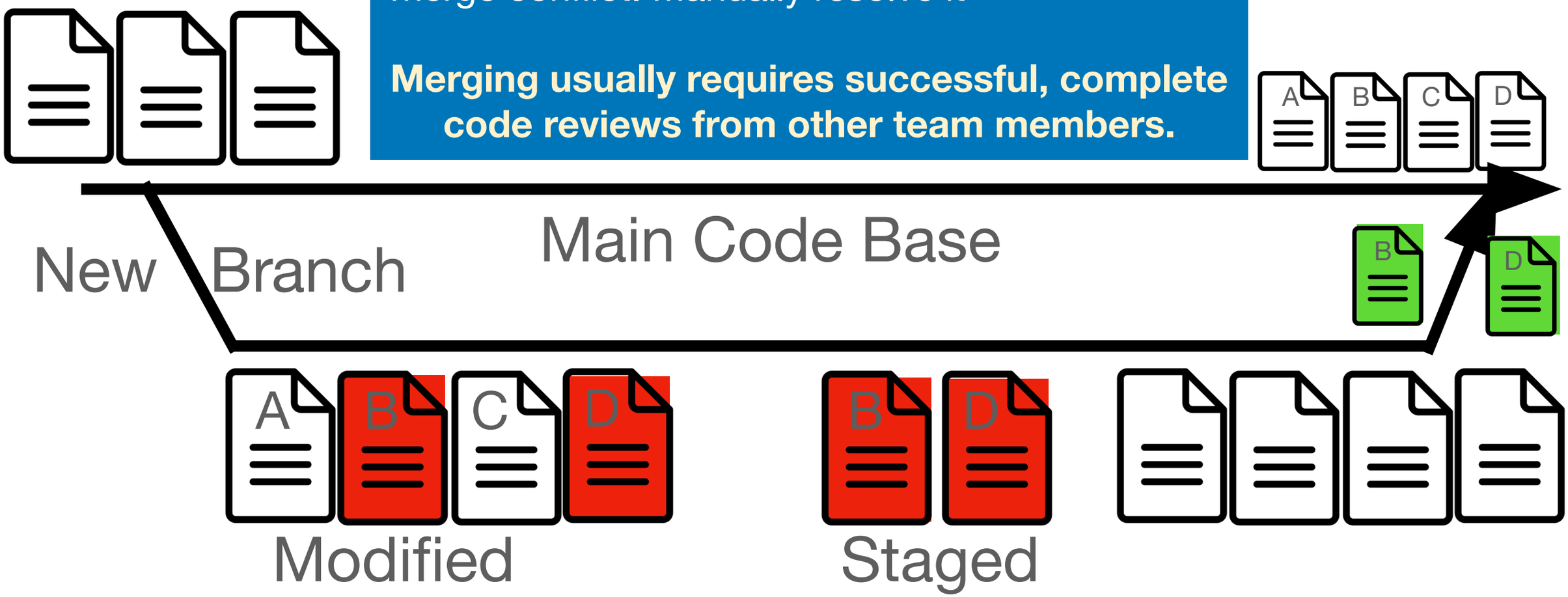
Merging usually requires successful, complete code reviews from other team members.



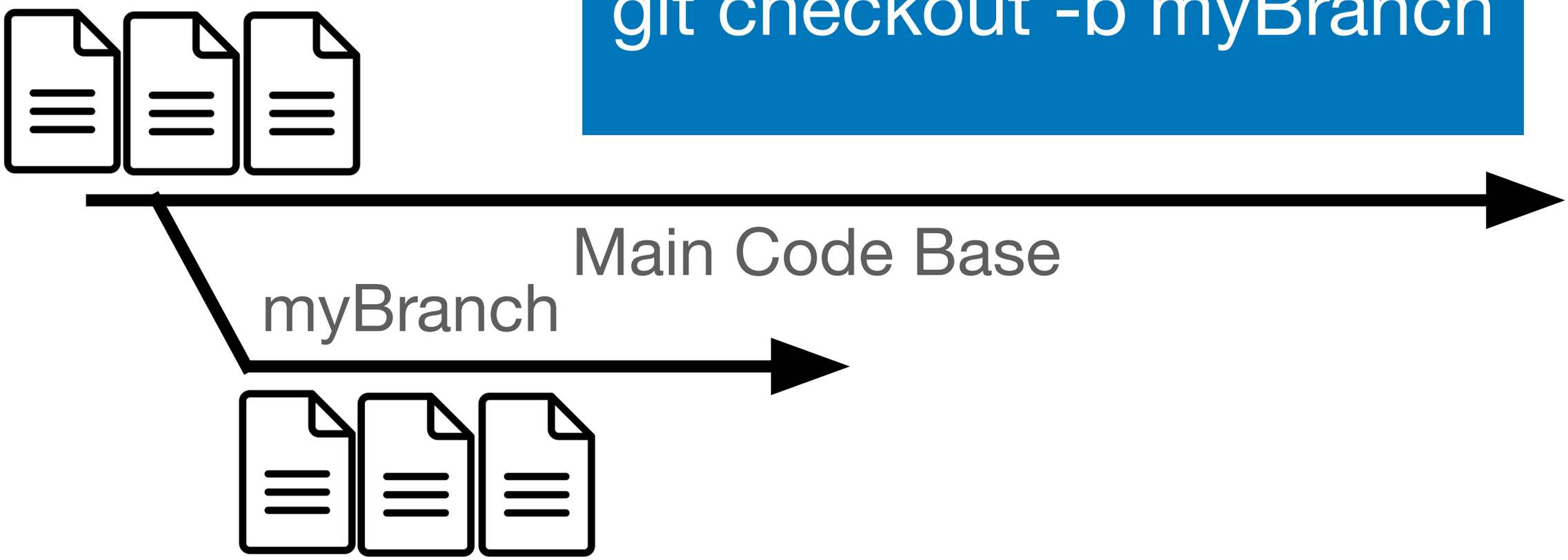
How does this tie into Git?

Creating a git repo

```
git clone SOME_GIT_REPO
```

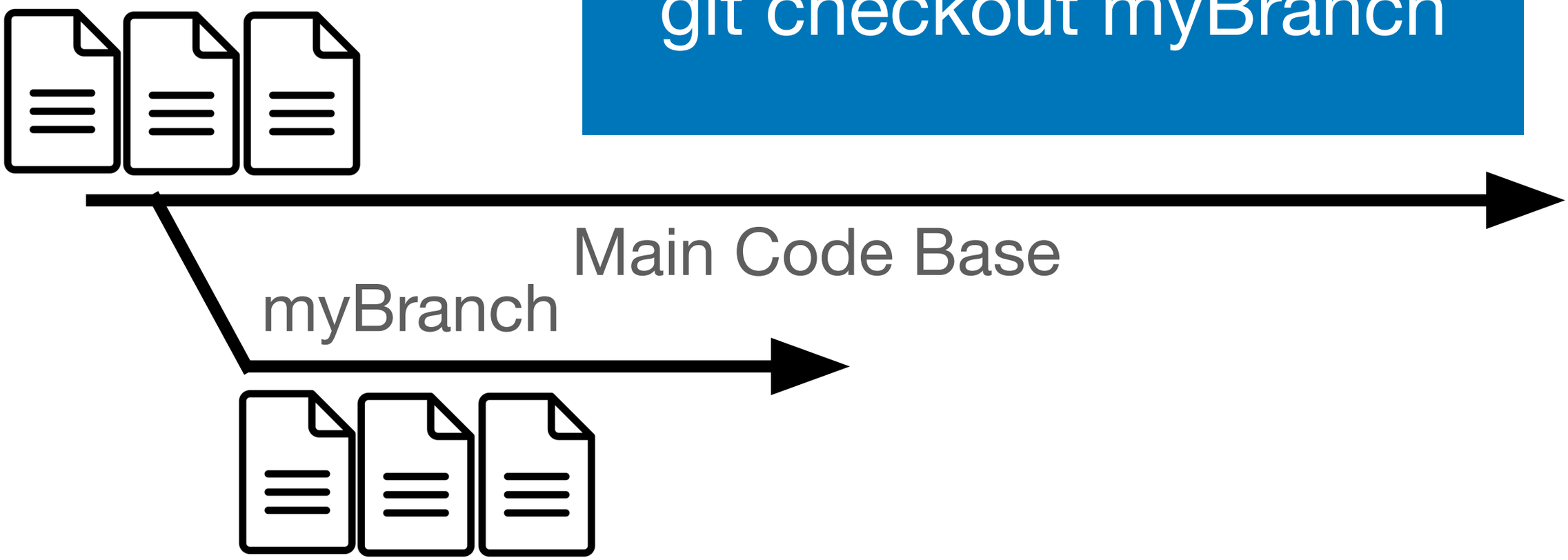
Creating a new branch

```
git checkout -b myBranch
```

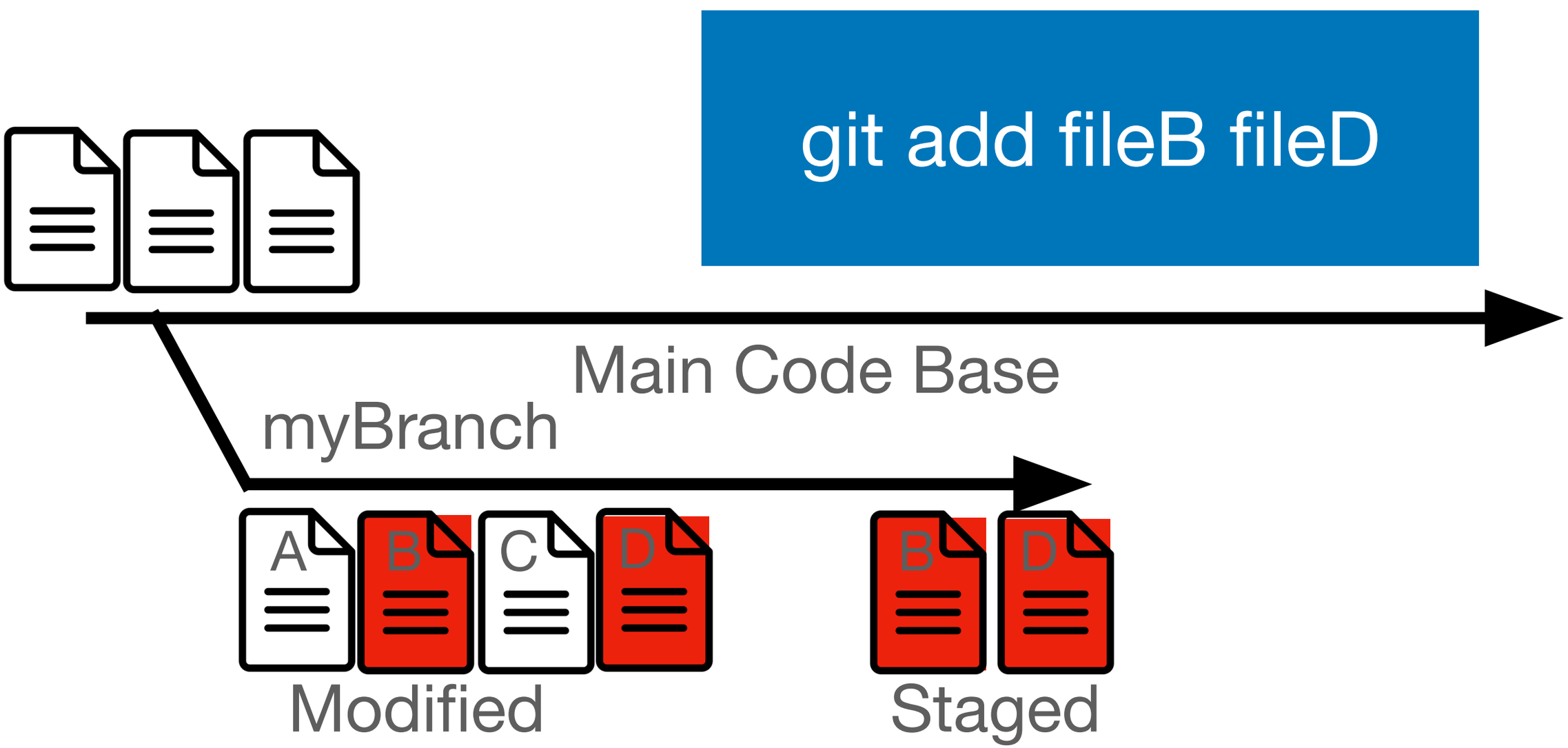


Switching to an existing branch

git checkout myBranch



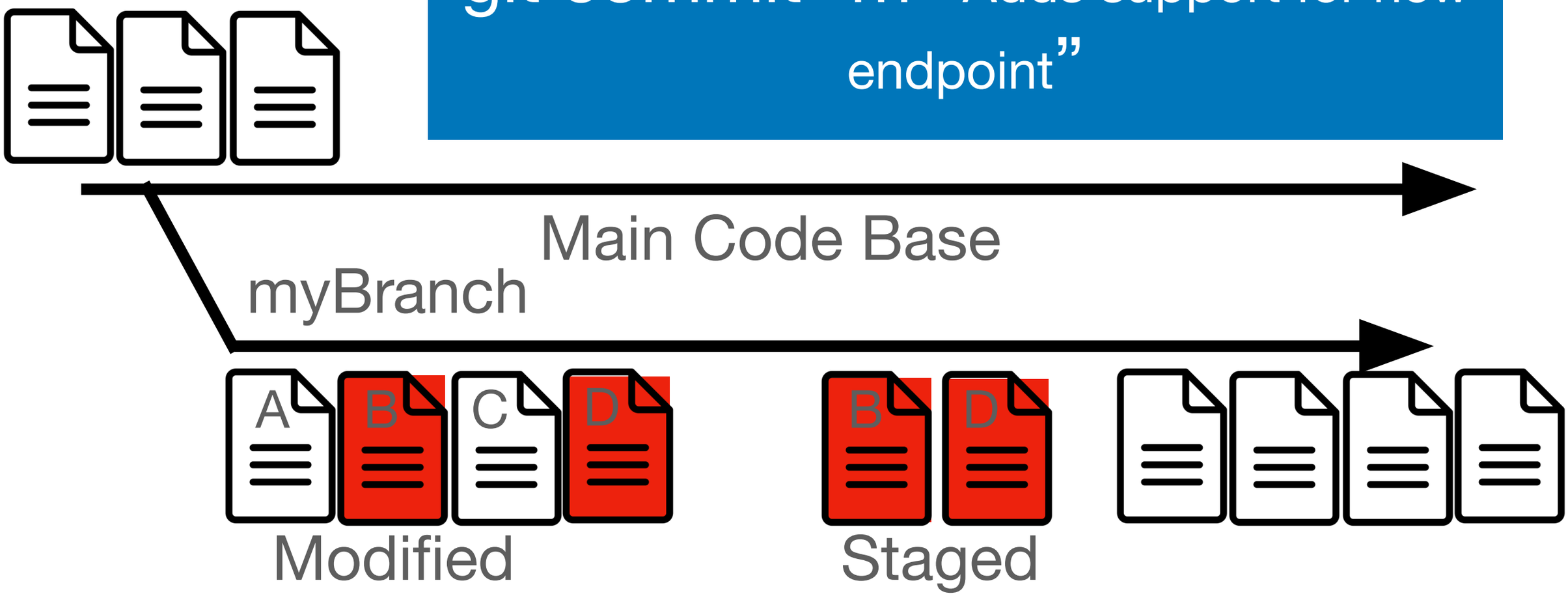
Entering the Staged State



Committing your changes

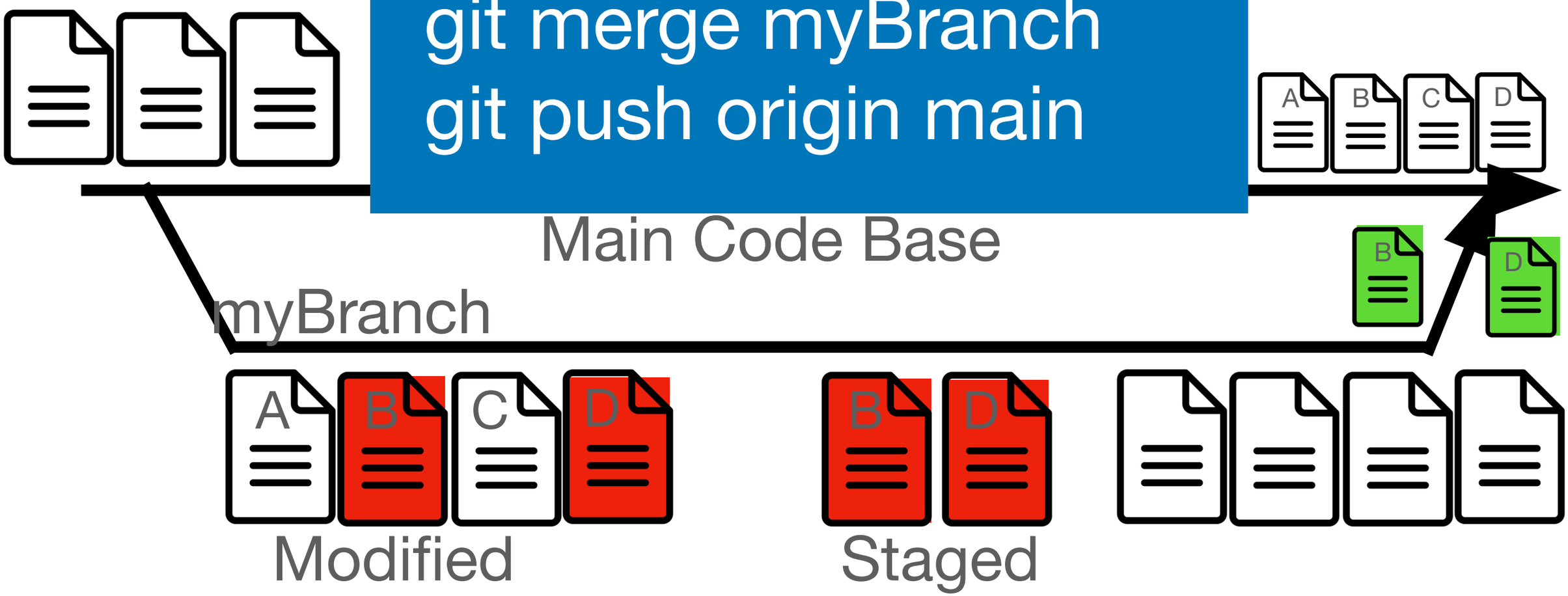
All commits need a human readable commit message

git commit -m “Adds support for new endpoint”



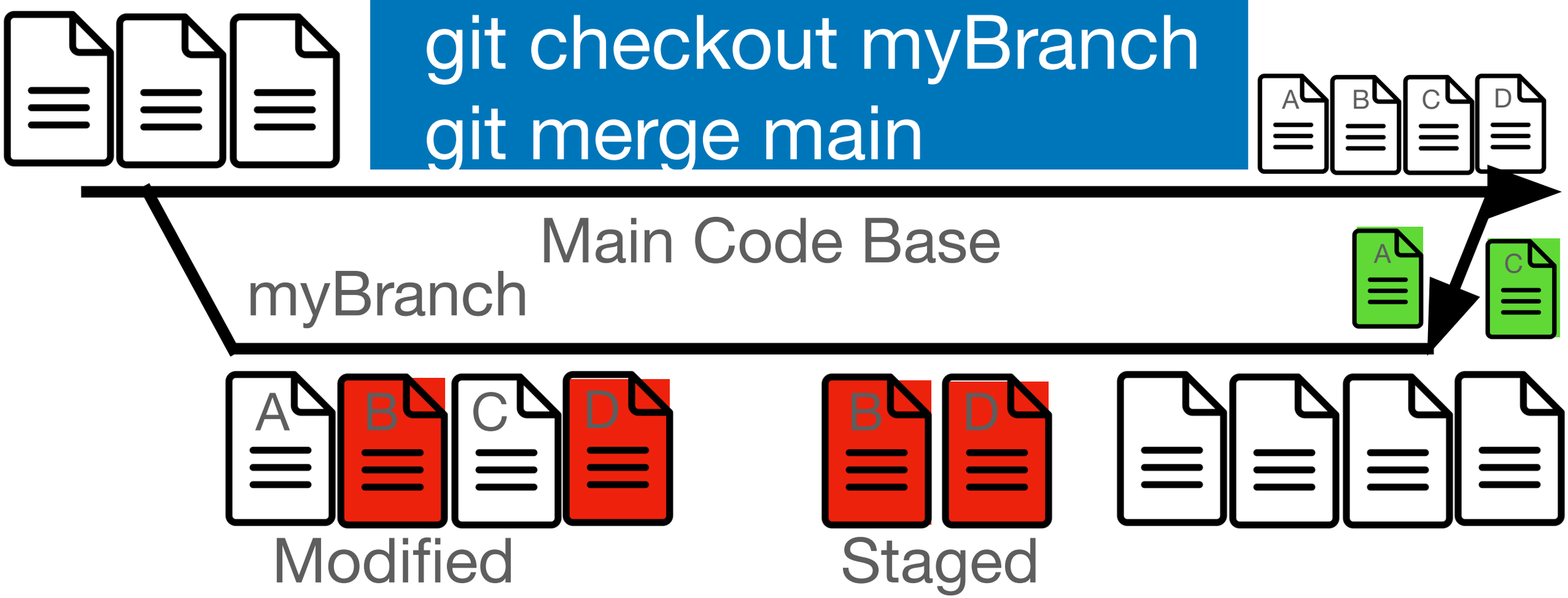
Merging your changes to main

```
git checkout main
git pull main
git merge myBranch
git push origin main
```



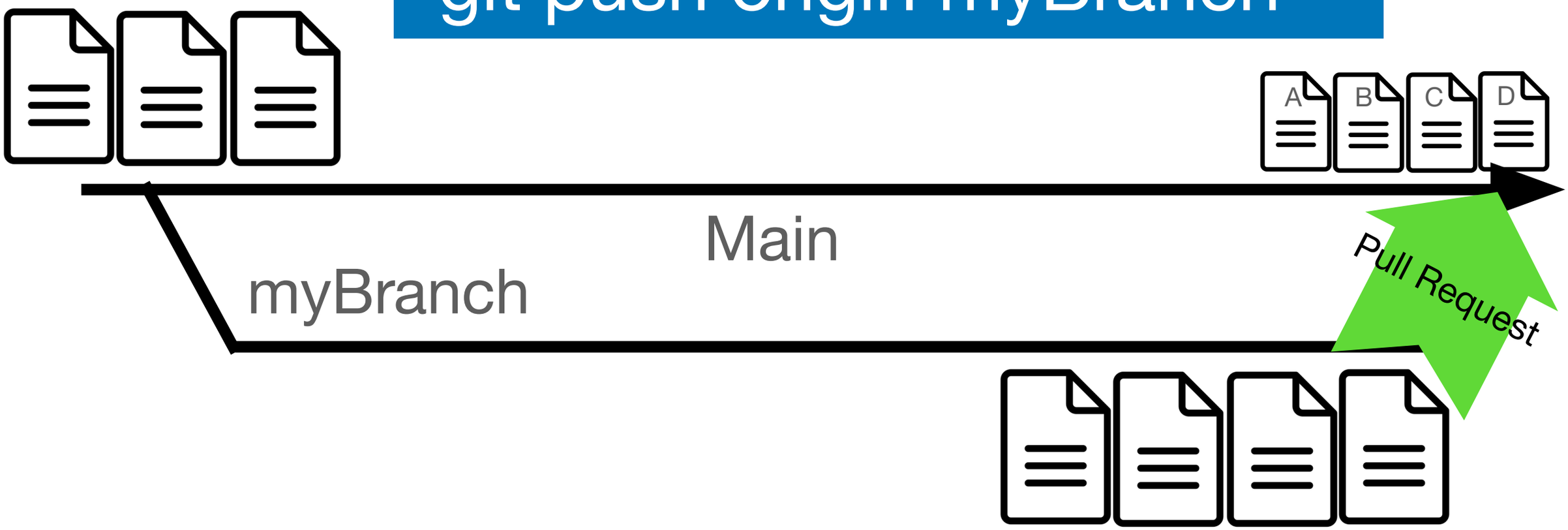
Bringing Mains changes back into your branch

```
git checkout main
git pull main
git checkout myBranch
git merge main
```

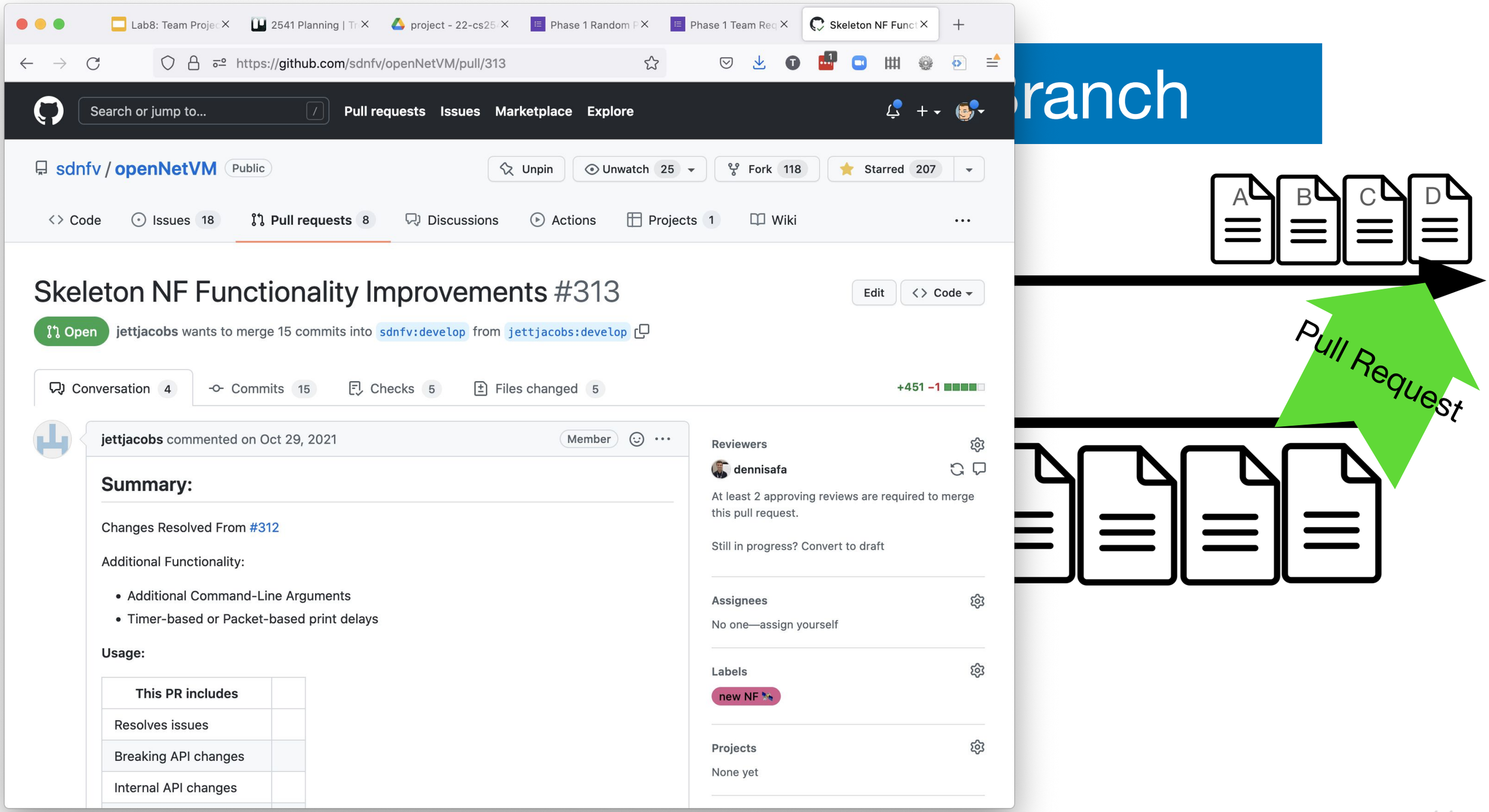


Getting your changes into Main with Pull Requests

```
git push origin myBranch
```



Getting your changes into Main with Pull Requests



Pull Requests

Pull Requests allow you to **inform others on your team** about a new features or code being added to the codebase.

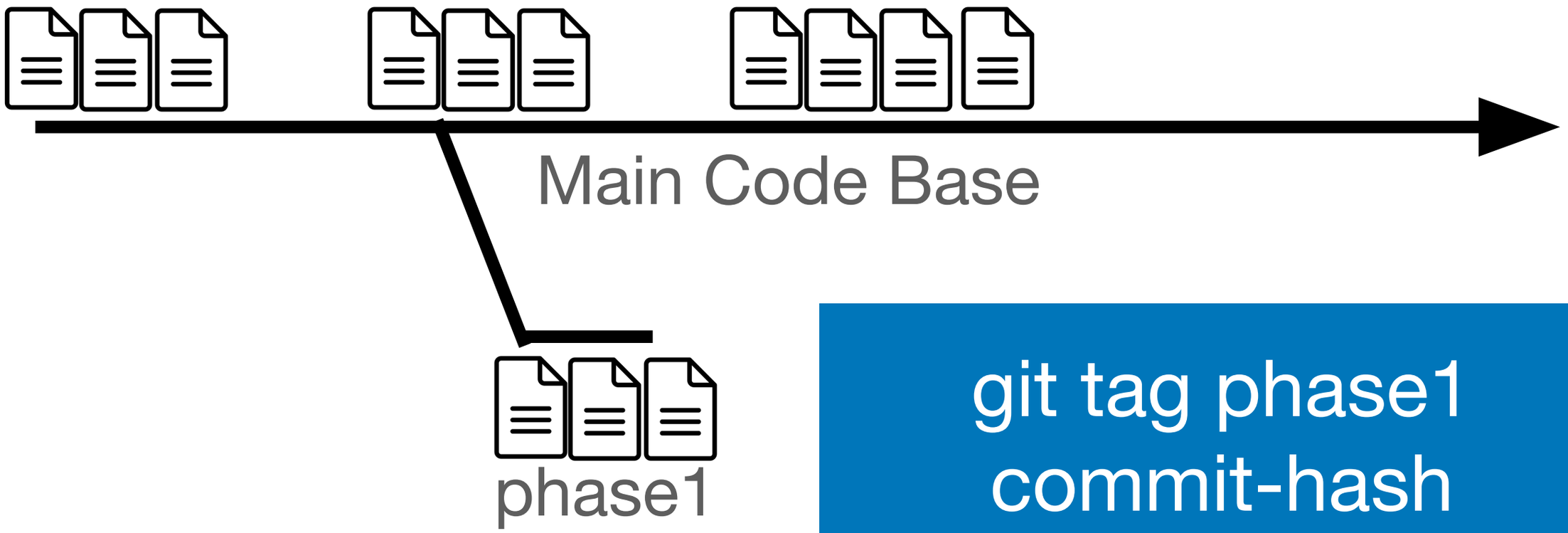
PRs have a URL: can be linked from Trello

They provide a way for teams to discuss changes being made and enable an easy way to do **code review**

Changes in a pull request display **what's been modified** and is to be merged into main if approved.

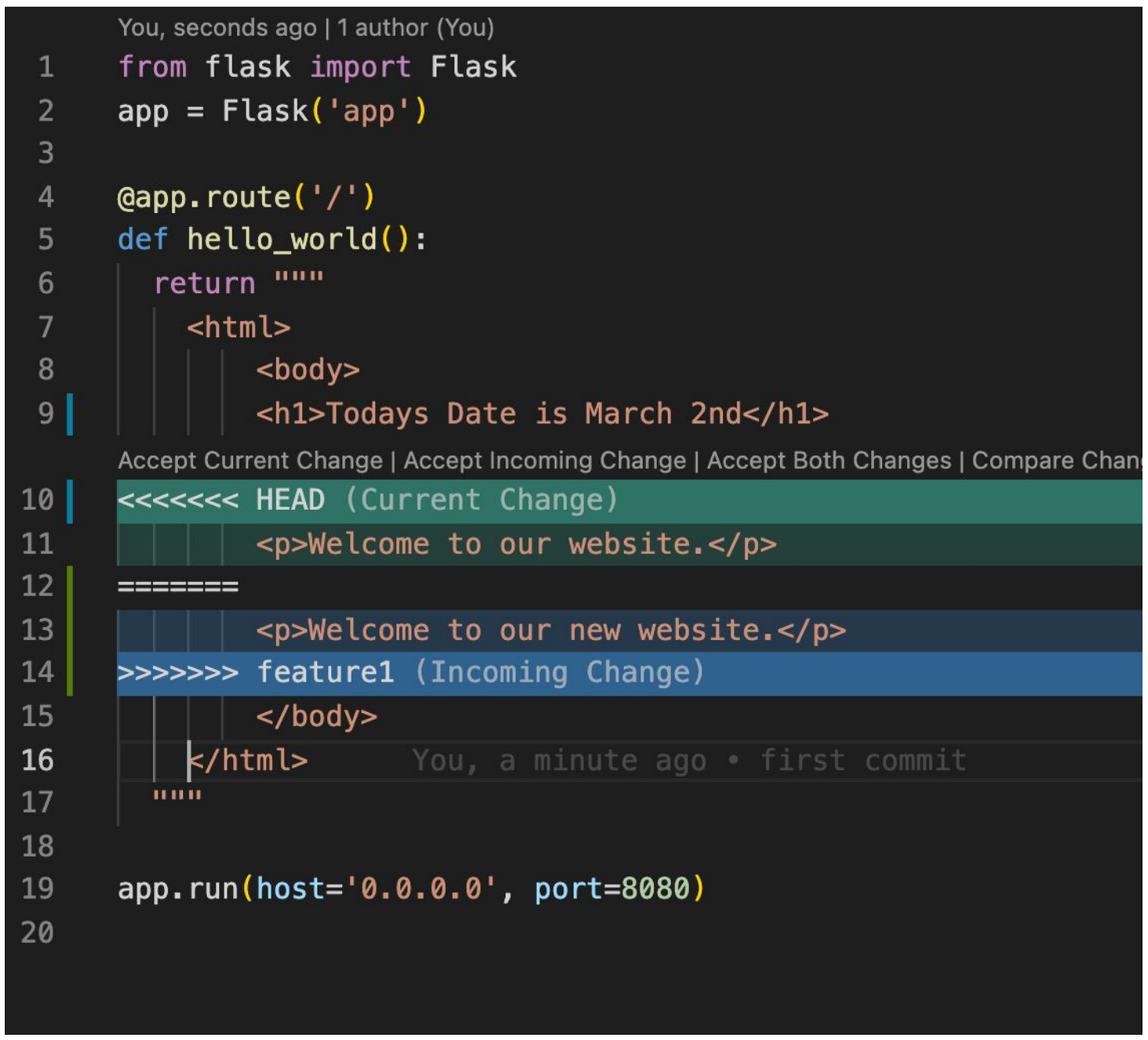
Once a *pull request is approved by reviewers*. **The code is merged into main** and becomes a part of the codebase.

Marking an official release of your code




```
git tag phase1
commit-hash
```

Merge Conflicts



Arise when two people edited the same line in a file.

Require manual intervention

You need to go into the file and decide which change should be persisted.

Delete the line you don’t want along with the added lines from git.

Commit changes and git merge again

Code Reviews

Code Review is the process by which team members review each others code for things like

- Bugs
- Style choices
- Dead code
- Security issues
- Design Decisions
- and much more

A good place to ask clarifying questions or act as knowledge transfer

Code Reviews normally take place right before merging a branch into main and is usually an iterative process.

Teams typically have rules that say a code change needs at least 1 review before merging

Sample Code

```
@app.route('/')
def hello_world():
  visitDate = "March 2rd 2020"
  x = """
   <html>
        <body>
        <h1>Todays Date is {0}</h1>
        <p>Welcome to our website.</p>
        </body>
    </html>
  """
  #print("DebuggCode")
  # x = 0
  return outputText.format(x)
```

```
@app.route('/endpoint2')
def endpoint2():
  visit_date = "March 3rd"
  print("DEBUGG, VISITED")
  output_text = """<html>
        "<body>"
        <h1>Todays Date is {1}</h1>
        <p>Welcome to our website.</p>
        </body>
    </html>
  """
  return output_text.format(visit_date)

app.run(host='0.0.0.0', port=8080)
```

```python
@app.route('/')
def hello_world():
  visitDate = "March 2rd 2020"
  x = """
   <html>
        <body>
        <h1>Todays Date is {0}</h1>
        <p>Welcome to our website.</p>
        </body>
    </html>
  """
  #print("DebuggCode")
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def endpoint2():
  visit_date = "March 3rd"
  print("DEBUGG, VISITED")
  output_text = """<html>
        "<body>"
        <h1>Todays Date is {1}</h1>
        Welcome to our website.
        </body>
    </html>
  """
  return
output_text.format(visit_date)

app.run(host='0.0.0.0', port=8080)
```

Variable naming style is not consistent, Date is incorrect

Use a descriptive variable name

Remove Dead code

Remove debug statements to keep code clean

This should be a zero instead of a 1

Should we wrap these in a paragraph tag?

A sample Code Review on Github

thelimeburner / demo-aws-app

Unwatch 1 | Star 0 | Fork 0

Code | Issues | Pull requests 1 | Actions | Projects | Wiki | Security | Insights | Settings

Feature Add New Paragraph #1

Edit | Open with

Open thelimeburner wants to merge 1 commit into `master` from `feature/new-paragraph`

Conversation 0 | Commits 1 | Checks 0 | Files changed 1 +3 −2

Changes from all commits | File filter... | Jump to... | 0 / 1 files viewed | Review changes

5 index.js Viewed

```
@@ -8,7 +8,8 @@ const color = "#"+((1<<24)*Math.random()|0).toString(16);
  app.get('/', (req, res) => {
      const ipaddr = ip.address();
-     let html = "<html><body bgcolor=\""+color+"\"><h1 align=\"center\">Hello from "+ipaddr+"</h1></body></html>";
+     let html = "<html><body bgcolor=\""+color+"\"><h1 align=\"center\">Hello from "+ipaddr+"</h1>
+     <p>This is a sample demo app that demonstrates how a load balancer works.</p></body></html>";
      res.send(html);
  });

@@ -47,4 +48,4 @@ app.get('/aws',async (req,res)=>{

- app.listen(port, () => console.log(`Example app listening at http://localhost:${port}`))
+ app.listen(port, () => console.log(`Example app listening at http://localhost:${port}`))
```

ProTip! Use `n` and `p` to navigate between commits in a pull request.

Tips for working with Distributed Version Control

Use branch protection rules to protect your main branch from being changed without code review

Always pull the latest changes before trying to merge to main.

Try to keep pull requests to small changes that are atomic. This simplifies code review.

Name new branches **feature/new-feature** or **bugfix/fixing-bad-logic** to make it easy to understand what a branch does.

Use git tags (e.g. demo) to mark official releases that never change.

Incorporate Peer Review into your git workflow.