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The first Hub for Developers

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Version Control Systems - Git

Code.Learn Program:
React

How developers work?

- Work in a team, probably on particular components?
- Integrate your code together.
- Make copies of your files in case something you lose them. (Not really?)

So what's version control?

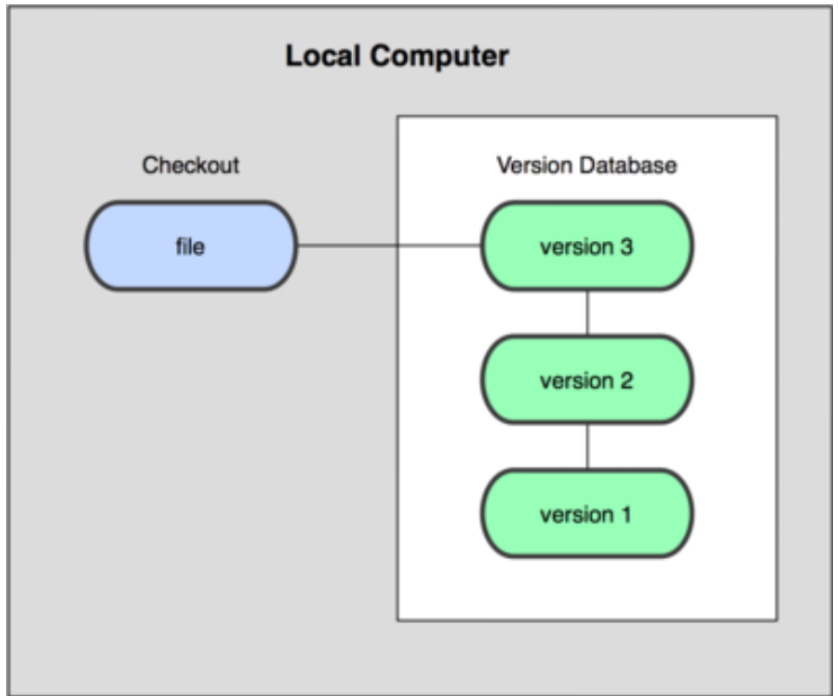
- Version control is the management of changes to documents, primarily computer programs.
- Also known as revision control or source control.
- Examples: git, mercurial, subversion

Why version control?

- Makes working in a team easy!
  1. Code without interference.
  2. Go back to a previous version
  3. Integrate code of multiple developer's easily.
  4. Know who did what, when.

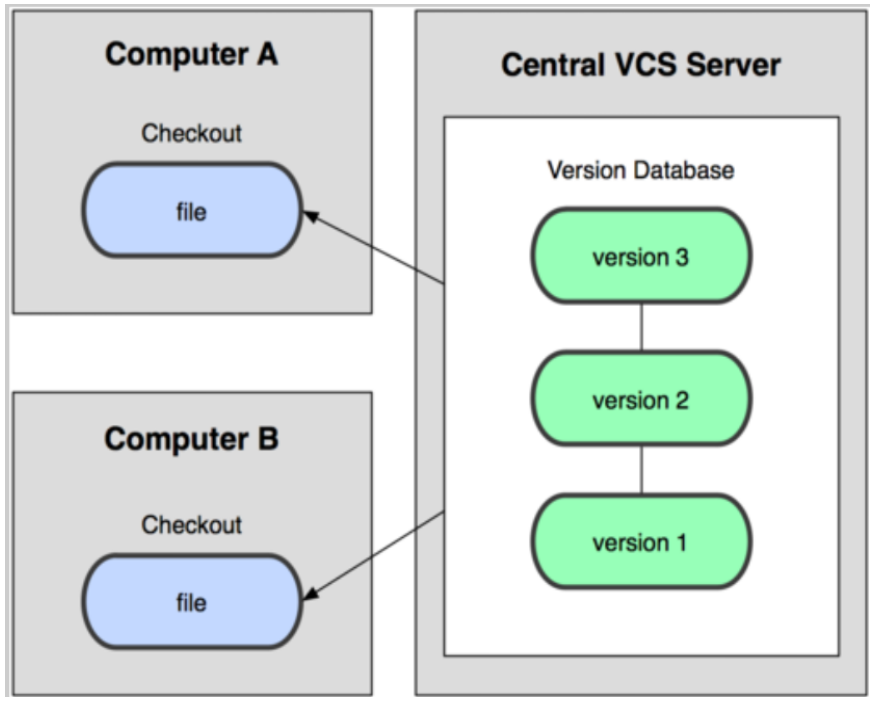
- Keep your code secure.

Version Control Systems (VCS)



- Very simple
- No cooperation between devs
- Not online

Version Control Systems (VCS)



- Ability to work online
- Source code in one place
- Difficult to cooperate
- No offline working
- Prone to errors on merging
- Downtime on server is a huge problem

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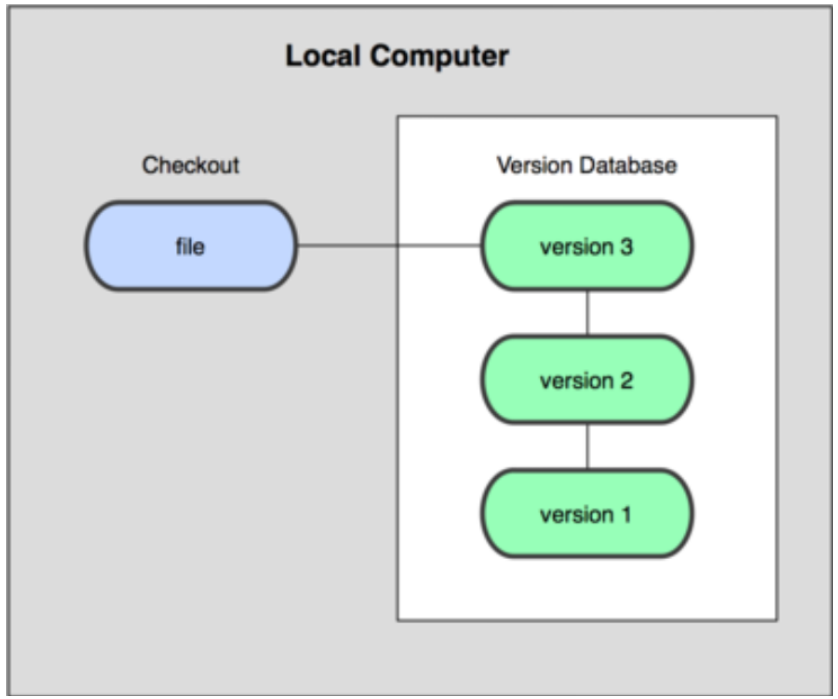
Version Control Systems (VCS)



- Clients fully mirror the Repository
- If Server or Clients die, source code still exists on other Clients / Servers
- Much faster than older VCS
- Ability to work offline
- Way better when cooperating

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Git

- an amazing revision control system for any type of document-based projects
- trackes changes in source code during software development
- is designed for coordinating work among programmers
- its goals include speed, data integrity, and support for distributed, non-linear workflows
- is free and open-source software

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Why Git and not other VCS?

- Git's the most popular version control system in the industry, by far.
- A proper and detailed understanding of Git will allow you to make a transition to any other distributed VCS easily.
- Most popular VCS are similar to Git

How GIT works

- Git thinks of data like snapshots of a file system
- Each commit is a snapshot of the current state of the repository and has a unique name (SHA-1)
- Every commit represents a set of changes
- Most of the work (commands) is done locally
- Git has integrity (no change is made in a git folder that git doesn't know about it, except if we explicitly tell it to ignore it)

Installing Git

- Things you'll need:
  1. You need Git installed on your system, and you can access it in a UNIX Terminal, either the Terminal on the Mac or Git Bash on Windows.
  2. Download Git from the following link: https://git-scm.com/downloads

Version Control Terminology

- Version Control System (VCS) or (SCM)
- Repository
- Commit
- SHA
- Working Directory
- Checkout
- Staging Area/Index
- Branch

Version Control Terminology

- Version Control System :
  A VCS allows you to: revert files back to a previous state, revert the entire project back to a previous state, review changes made over time, see who last modified something that might be causing a problem, who introduced an issue and when, and more.

- Repository:
  A directory that contains your project work which are used to communicate with Git. Repositories can exist either locally on your computer or as a remote copy on another computer

Version Control Terminology

- Commit
  Git thinks of its data like a set of snapshots of a mini file system.
  Think of it as a save point during a video game.

- SHA
  A SHA is basically an ID number for each commit.
  Ex. E2adf8ae3e2e4ed40add75cc44cf9d0a869afeb6

Version Control Terminology

- Working Directory
  The files that you see in your computer's file system. When you open your project files up on a code editor, you're working with files in the Working Directory.

- Checkout
  When content in the repository has been copied to the Working Directory. It is possible to checkout many things from a repository; a file, a commit, a branch, etc.

Version Control Terminology

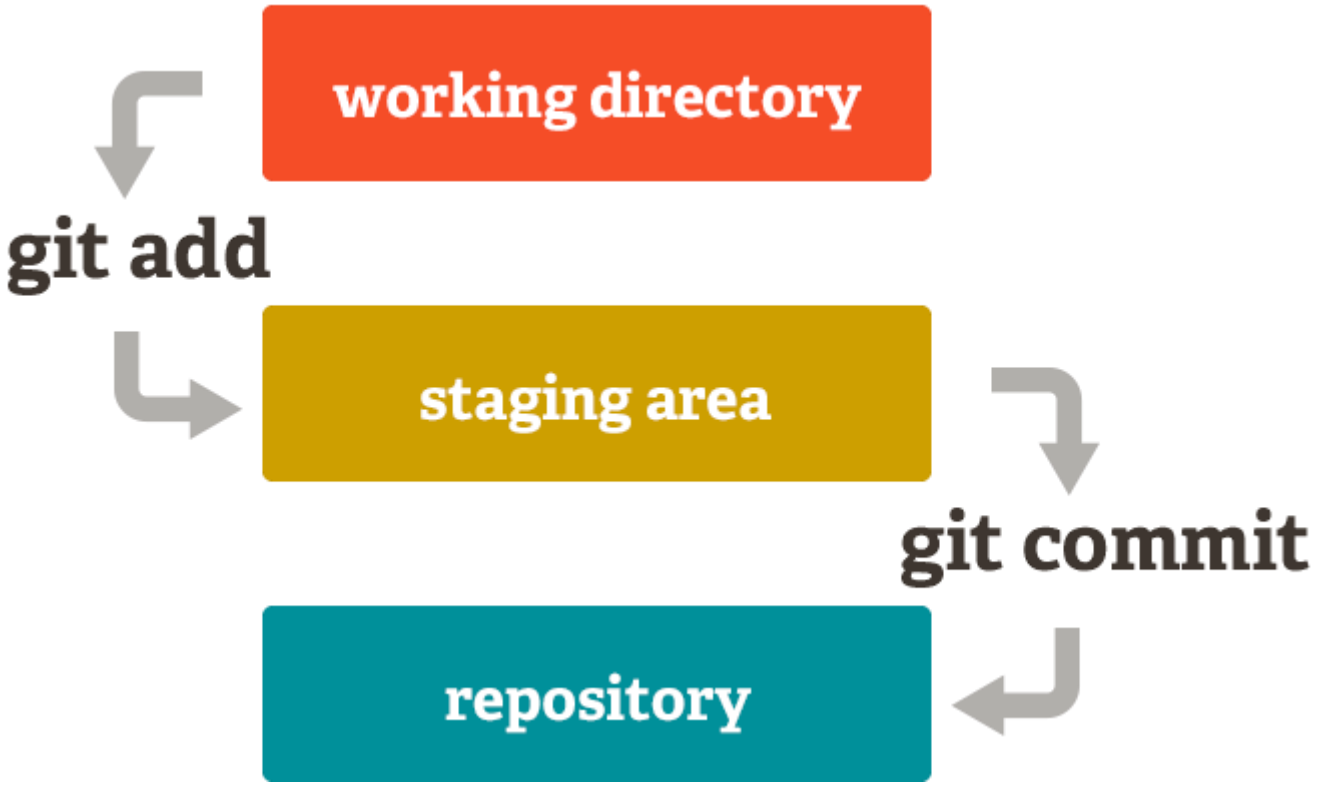
- Staging Area
  You can think of the staging area as a prep table where Git will take the next commit. Files on the Staging Index are poised to be added to the repository.

- Branch
  A branch is when a new line of development is created that diverges from the main line of development. This alternative line of development can continue without altering the main line.

Basic Git Commands

- git init
- git status
- git add <filename> / git add .
- git commit / git commit -m “commit message”
- git log -oneline / git log —stat
- git clone
- Other commands like git show, git ignore, git diff etc.

Basic Git model locally



Basic Git Commands

- git init – Initialize a Git repository/working directory
- git status – Status of your working directory
- git add <filename> or git add . (for all files in your working directory)
- git commit – Stash changes in your working directory
- git log –oneline – View your commit history
- git clone – Create an identical copy

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Working with a remote repository

- Remote?
  - It's the place where your code is stored.
  - By default, remote name is origin and default branch is master.

- Certain things that come to play, namely collaboration.
  - How are we going to handle that with Git.

So here comes, push, pull, branching, merging, forking.

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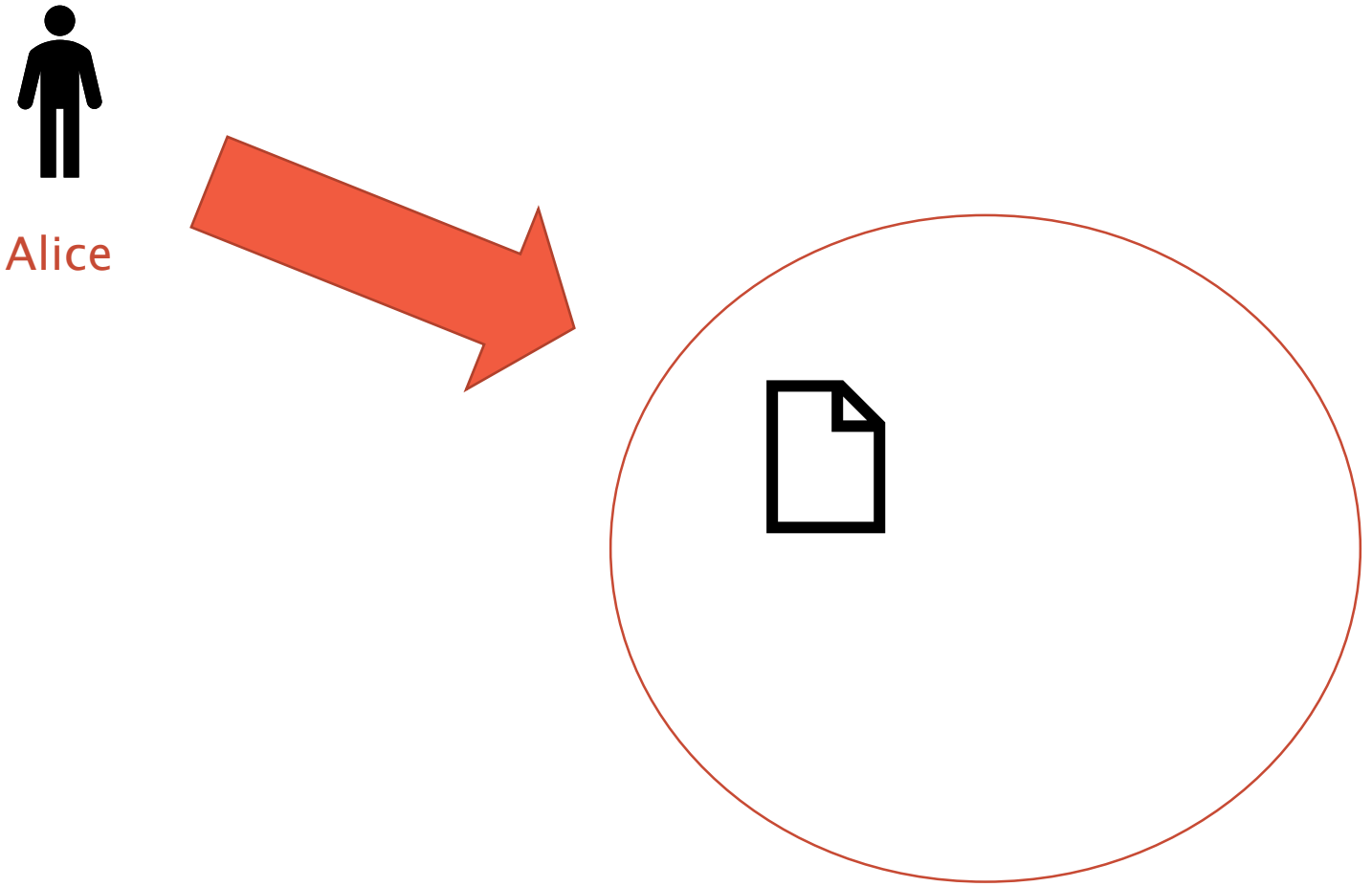
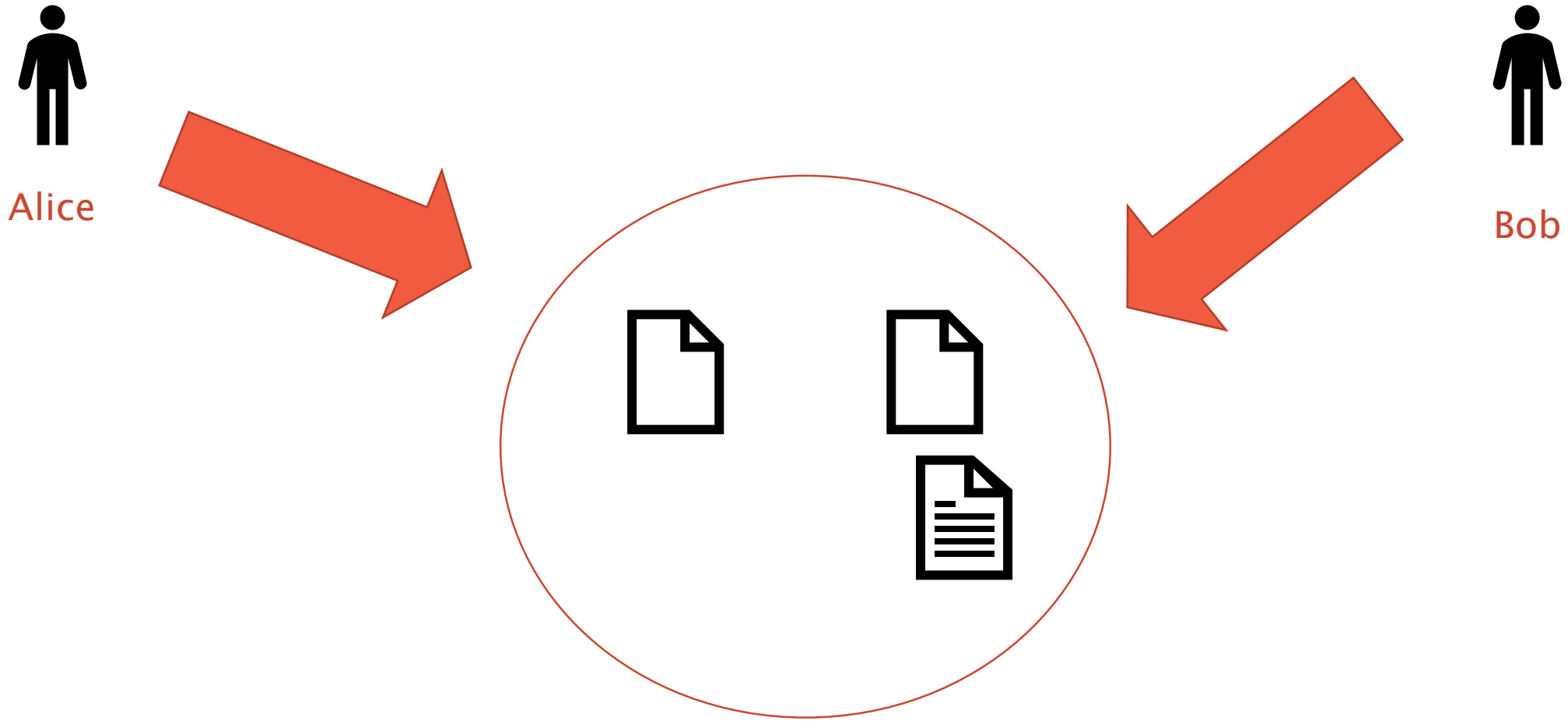
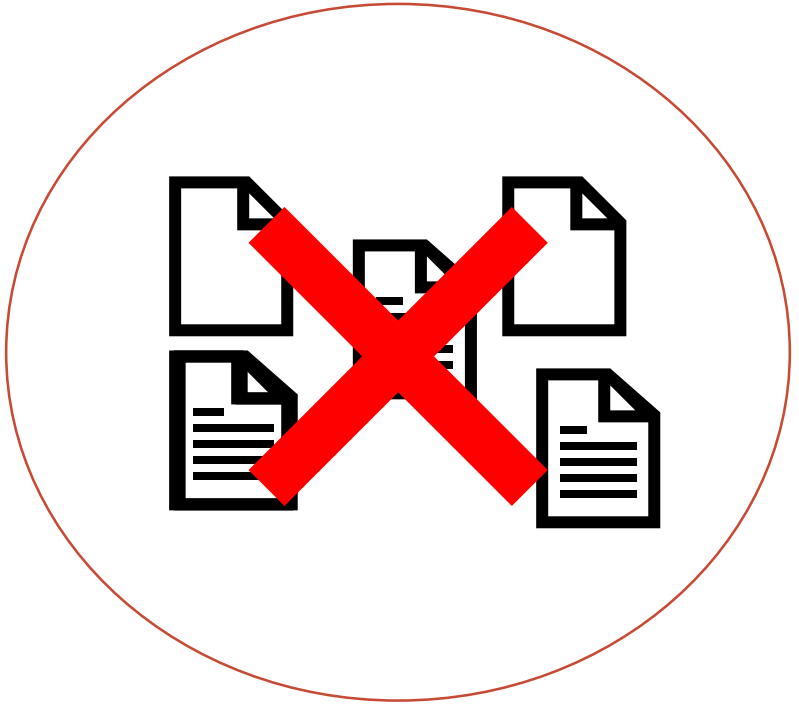

Alice


Alice
Bob


Alice
Joe
Bob

Alice

Joe



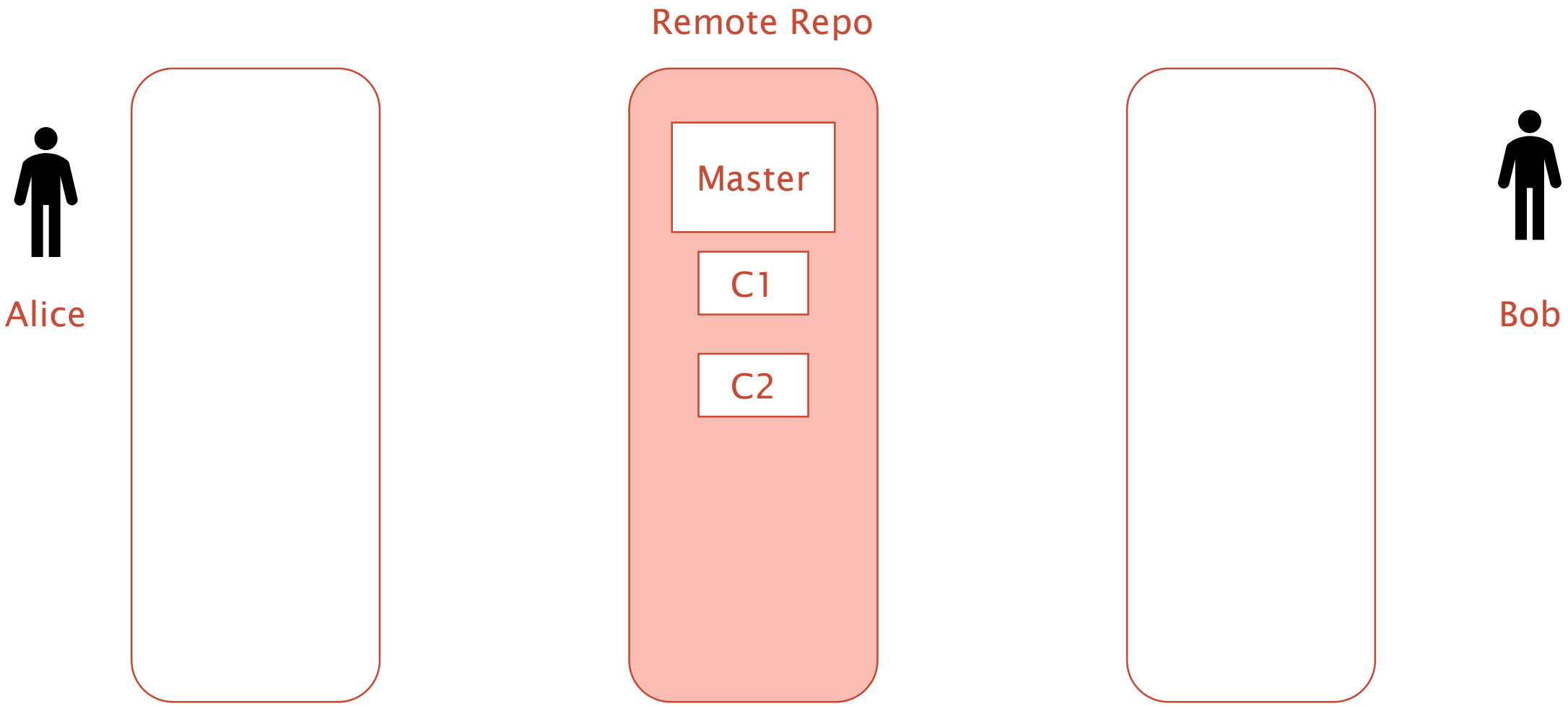
Who replaced the files? When ?

Bob

More Git commands

- git push – push your changes into the remote repository
- git pull – pull your latest changes from the remote repository
- git branch – view branches in your repository
- git branch <branchname> - create a branch
- git checkout <branchname> - move to that branch
- git merge <branchname> - merge into that branch
- git revert <commit sha>

Collaborate



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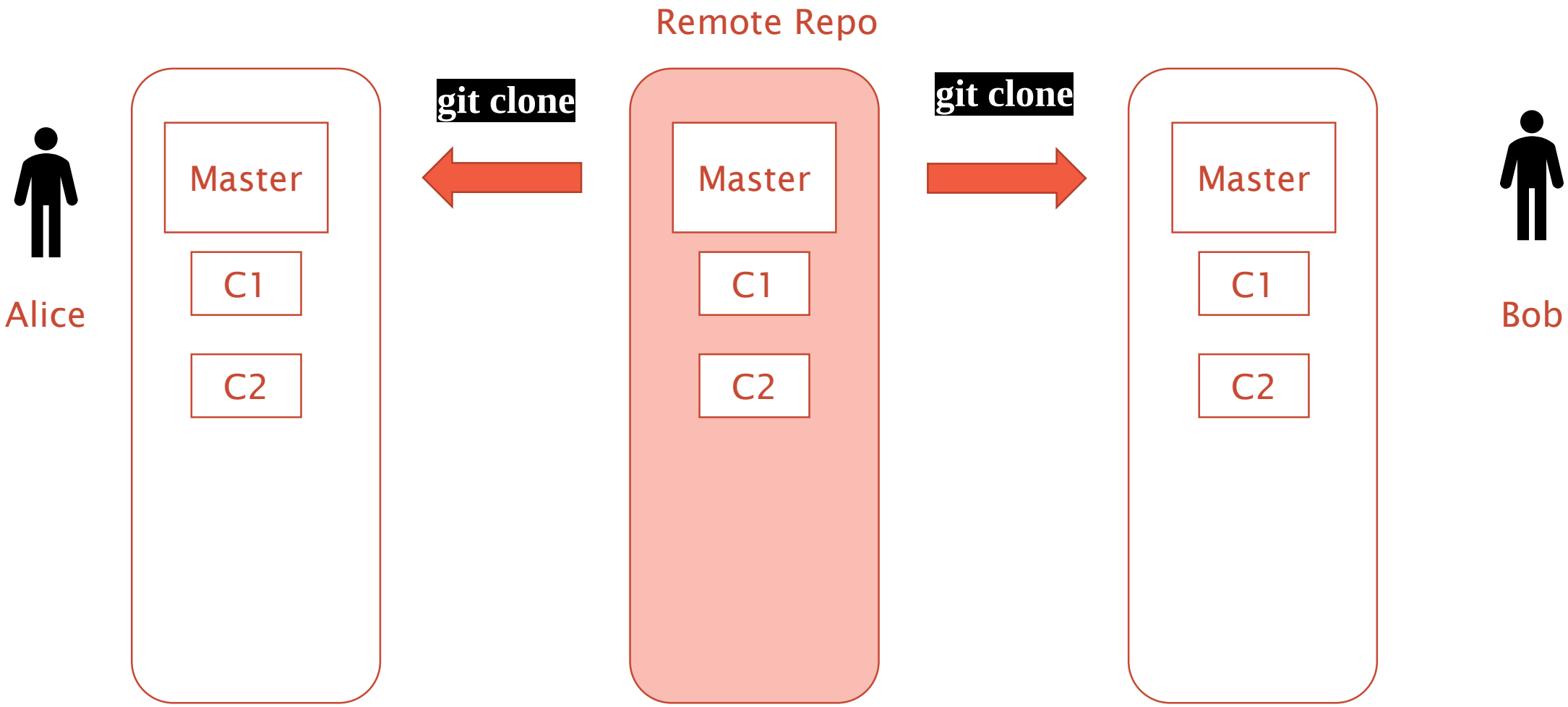

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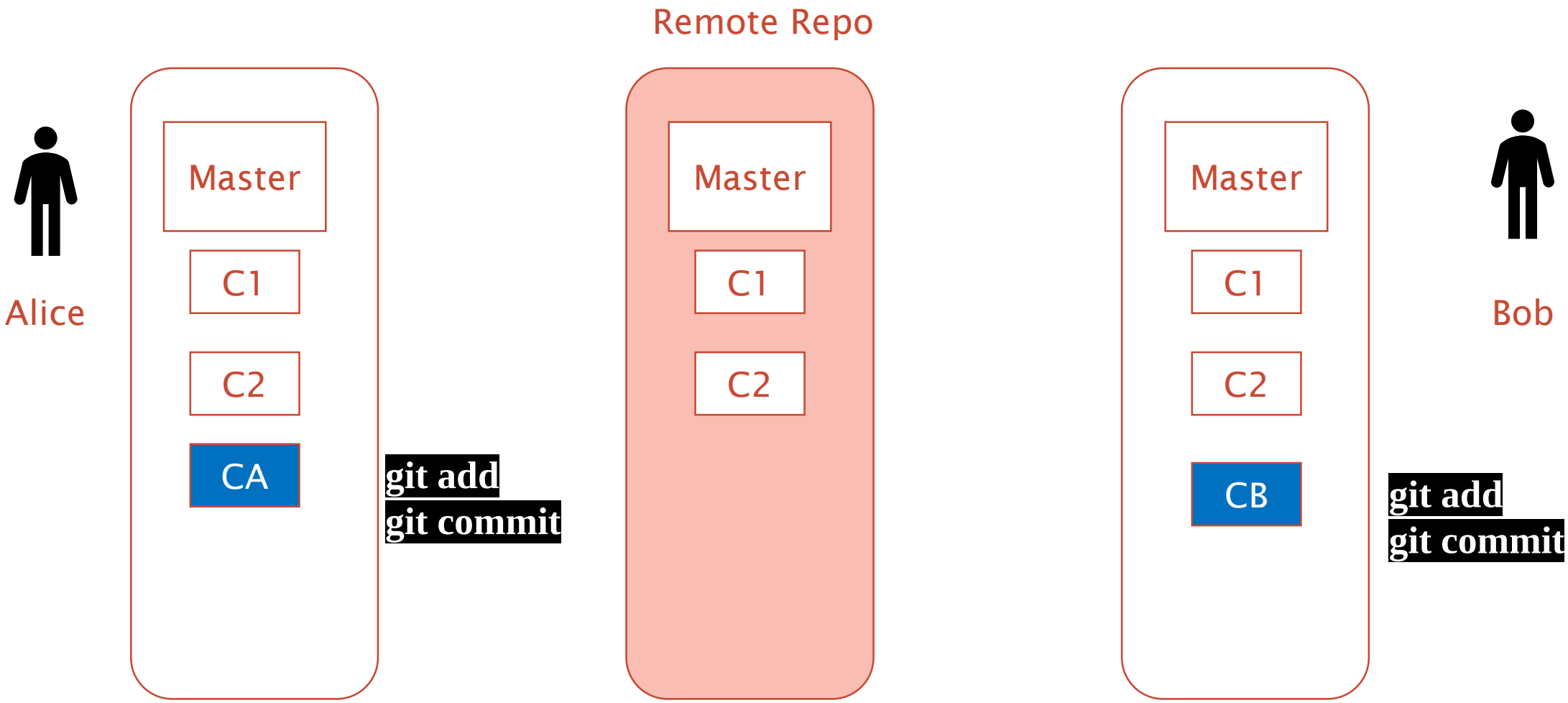

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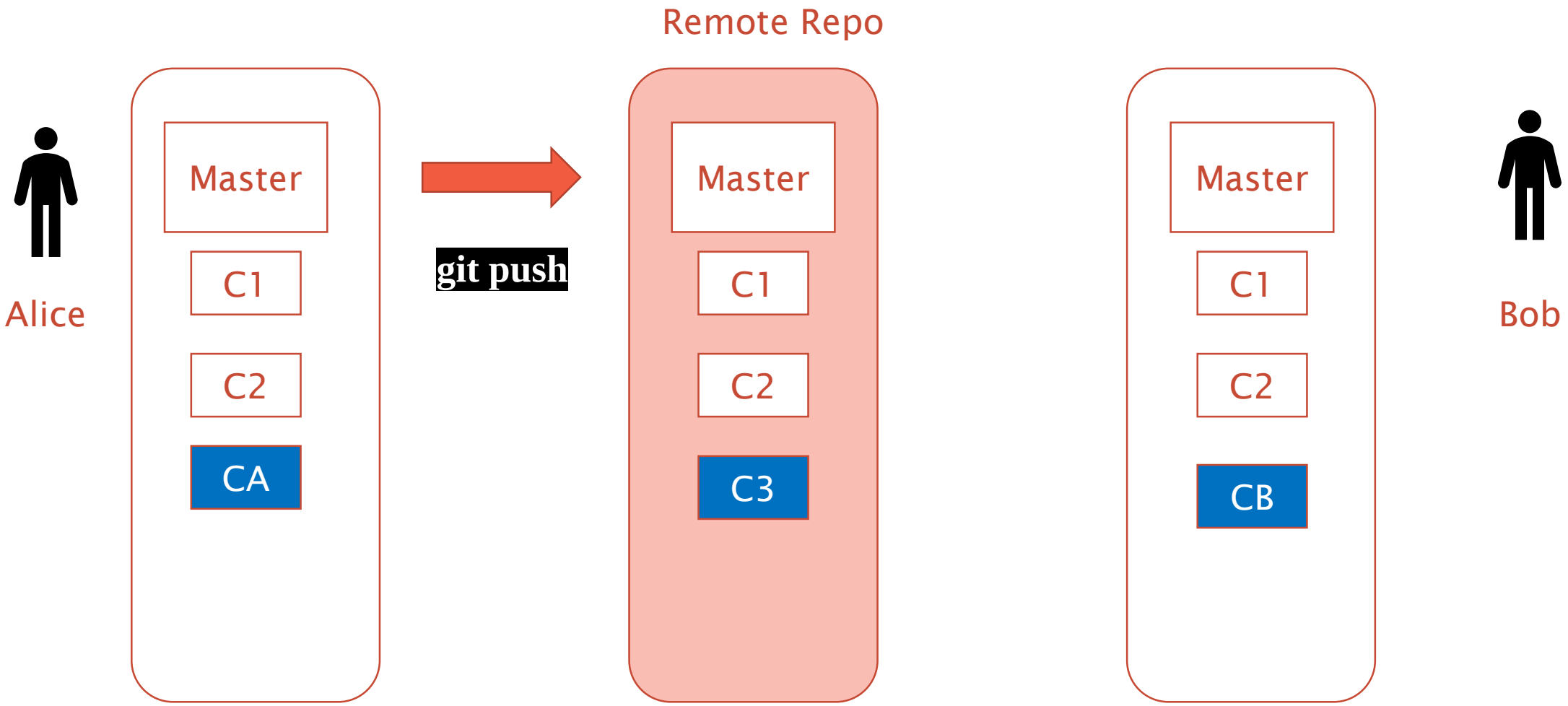

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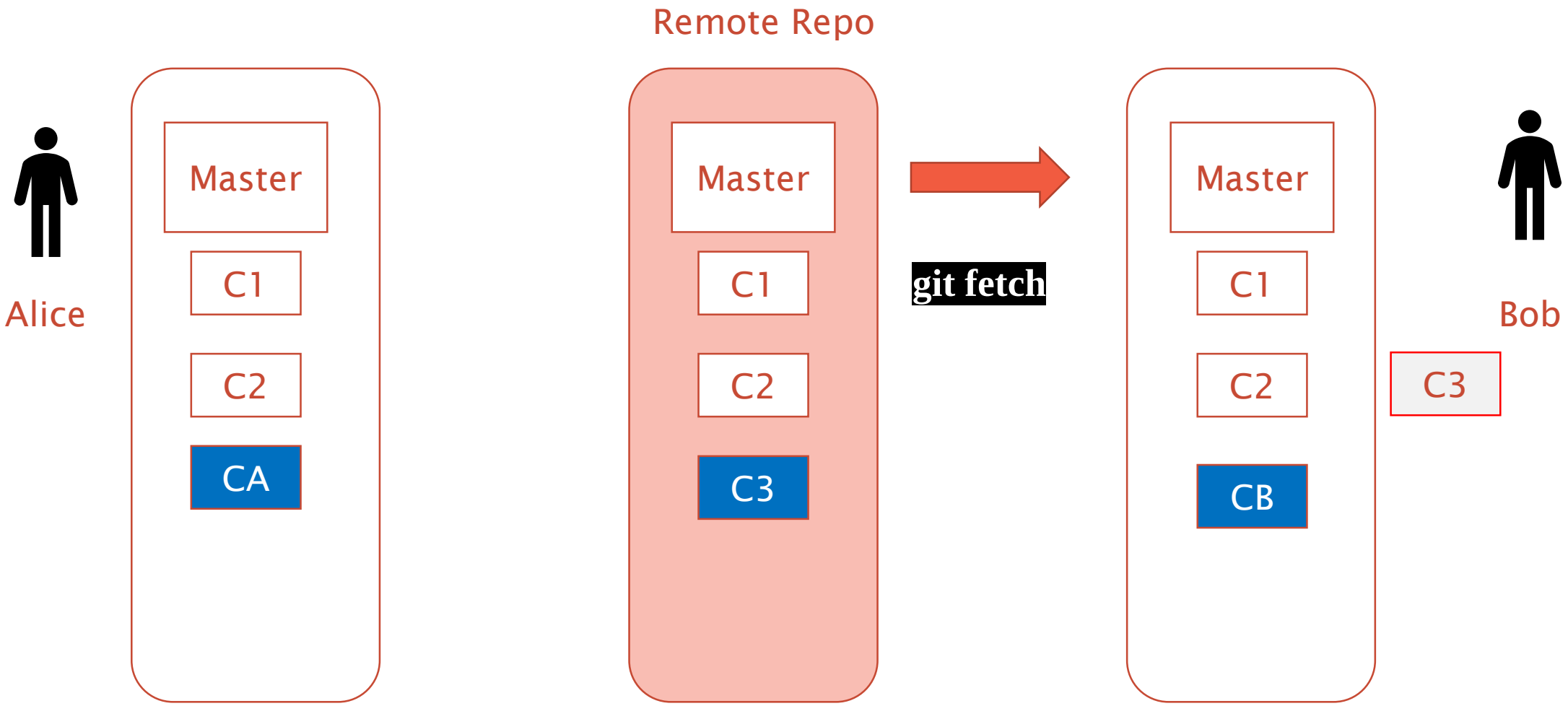

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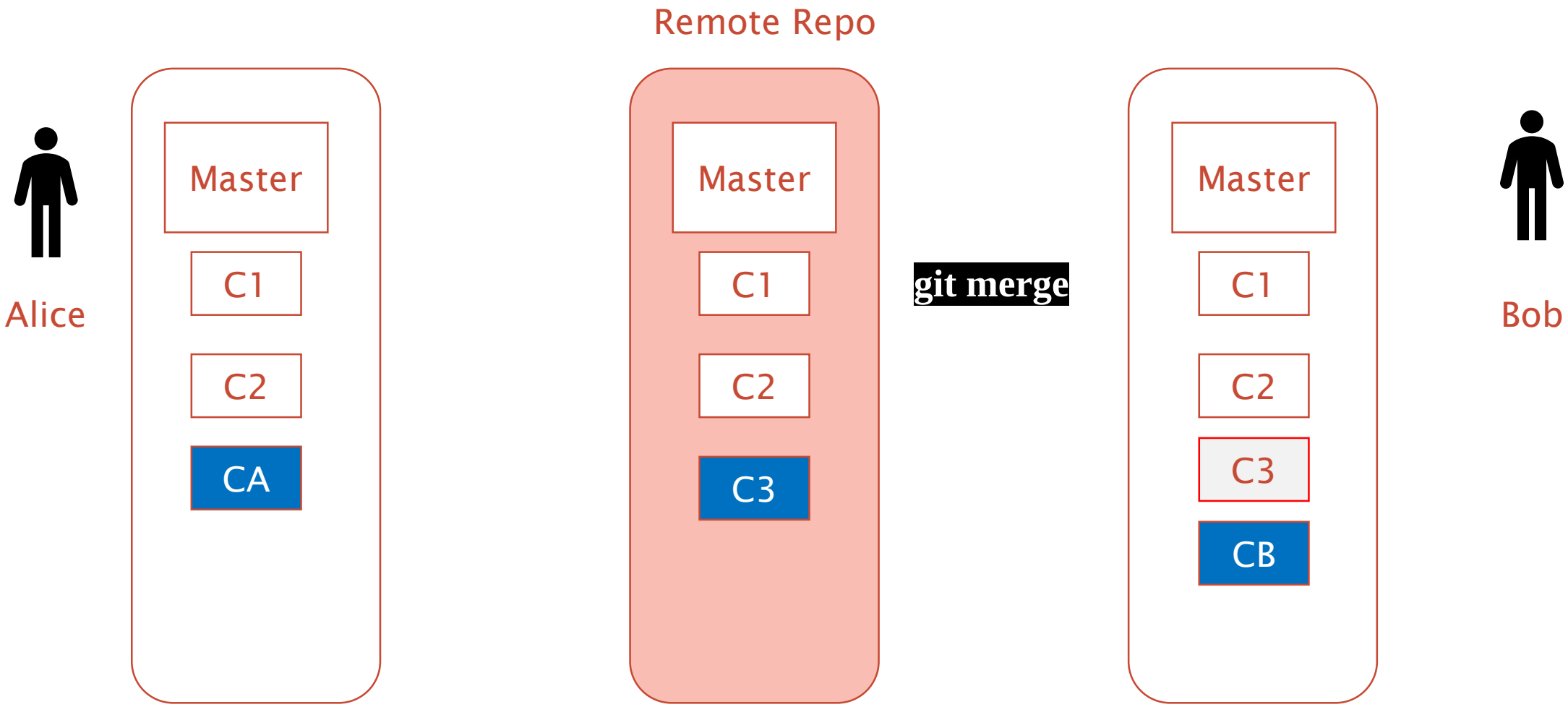

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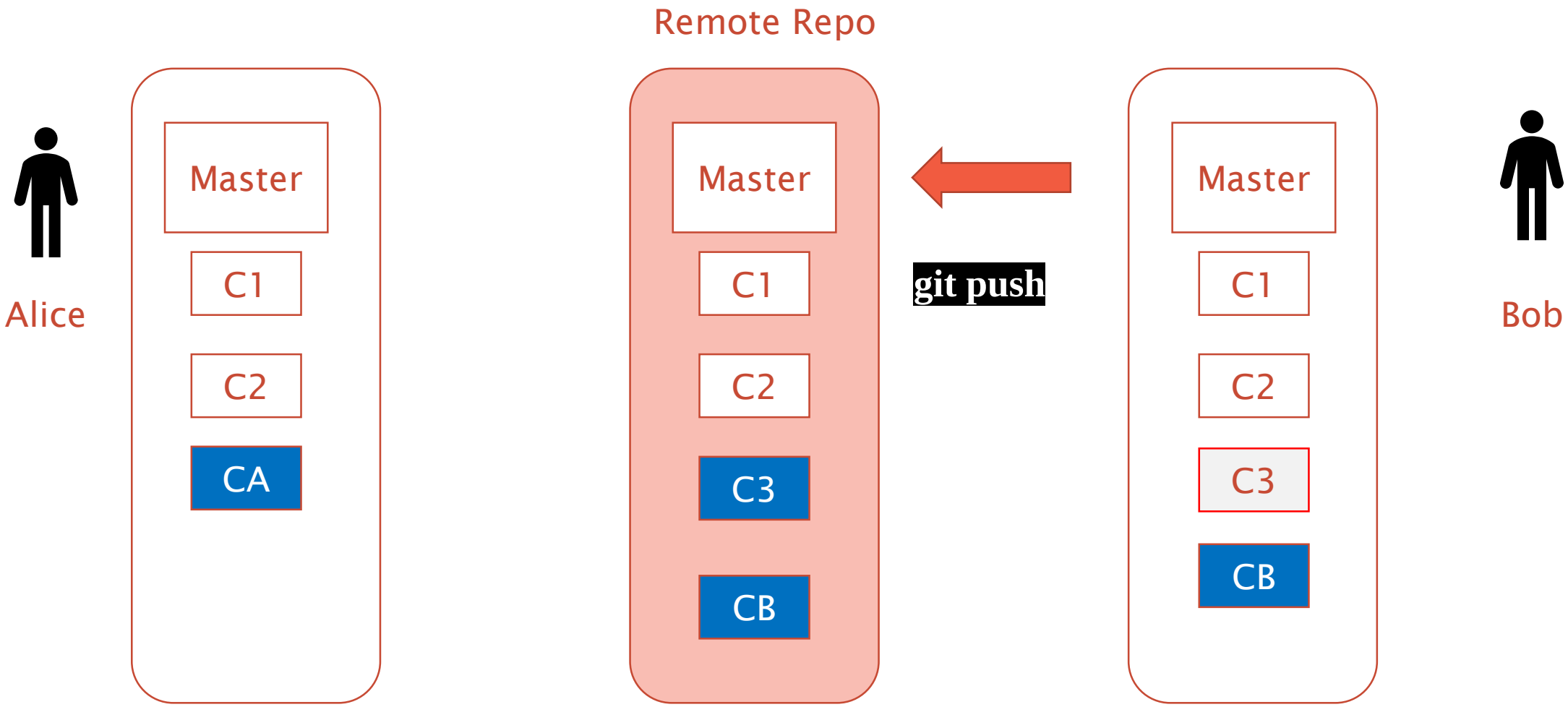

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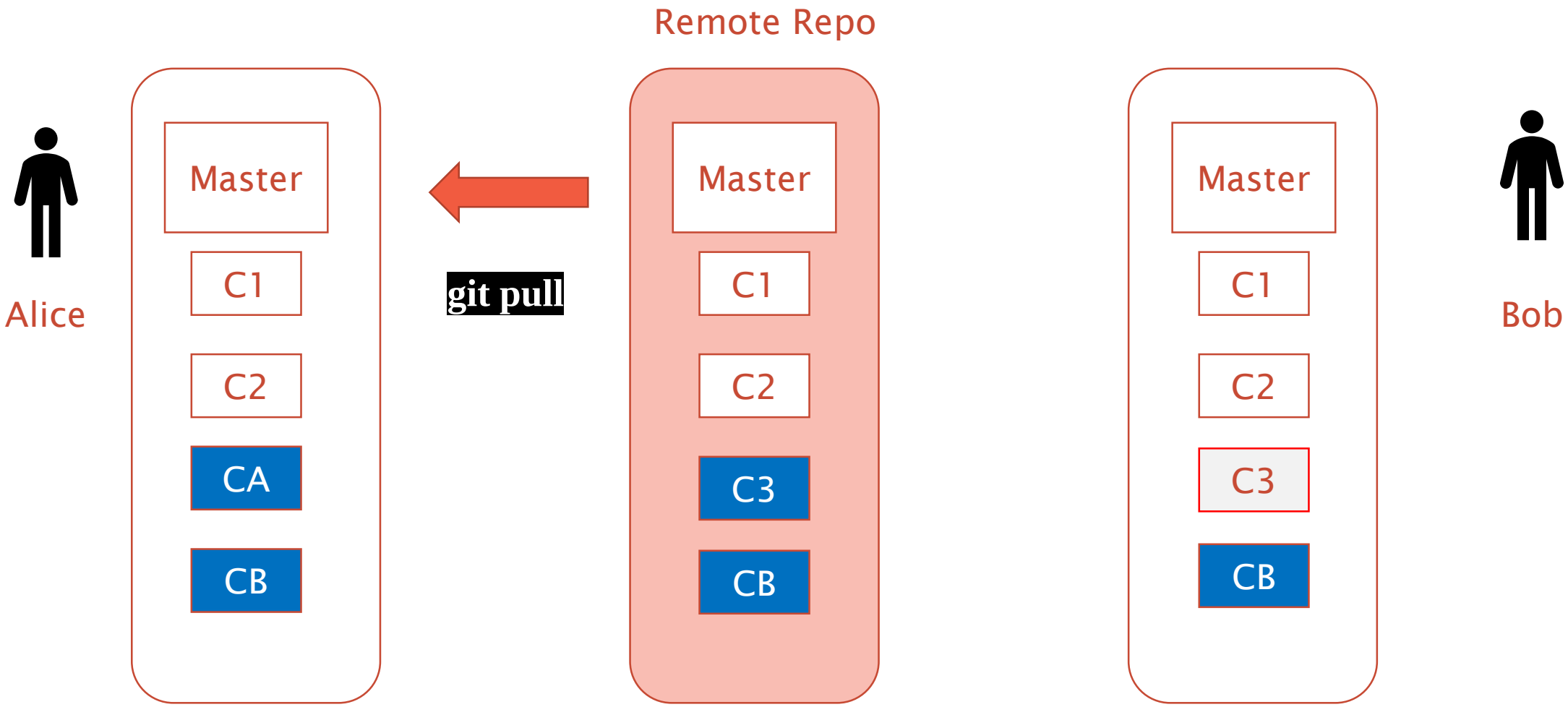


Dealing with Merge Conflicts

- Two typical cases of merge conflicts
  - Normal merge where you're a collaborator
  - Pull request (handled by the repository owner)

Merge conflicts

- The conflicting file will contain <<< and >>> sections to indicate where Git was unable to resolve a

```
<<<<<<< HEAD:index.html
<div id="footer">todo: message here</div>
=======
<div id="footer">
  thanks for visiting our site
</div>
>>>>>>> SpecialBranch:index.html
```

branch 1's version

branch 2's version

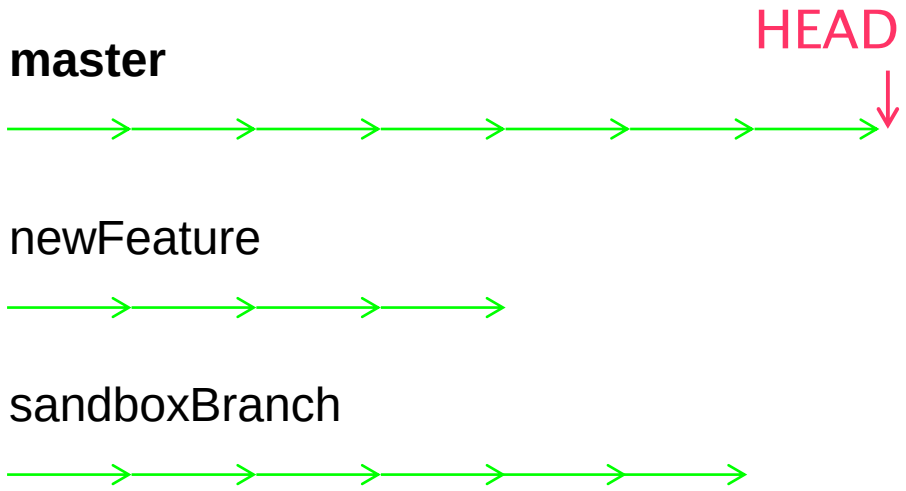
- Find all such sections, and edit them to the proper state (whichever of the two versions is newer / better / more correct).

Branches in Git

- All this time we were working on our main branch. (master)
- We can actually have many branches and each one can hold different features and changes.

Branches in Git

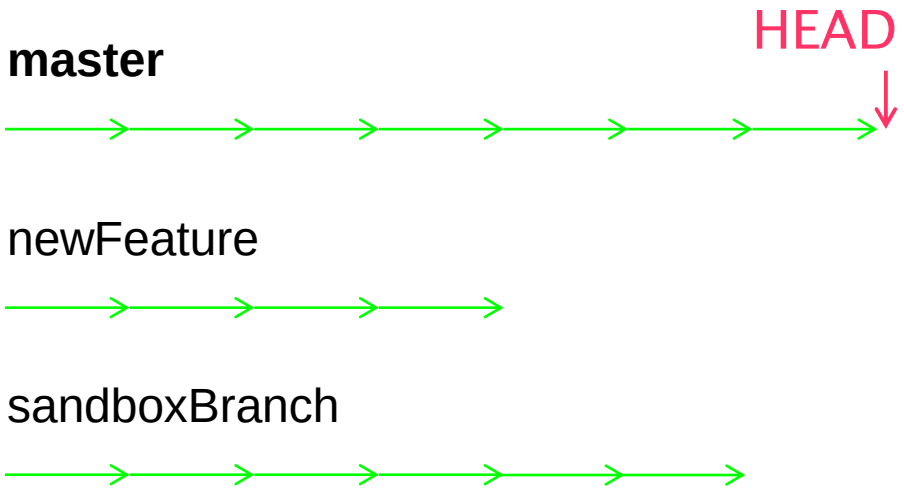
- **git branch** command will show all local branches



Branches in Git

- To move between branches just use the **git checkout <branch_name>** command

- So: **git checkout newFeature**



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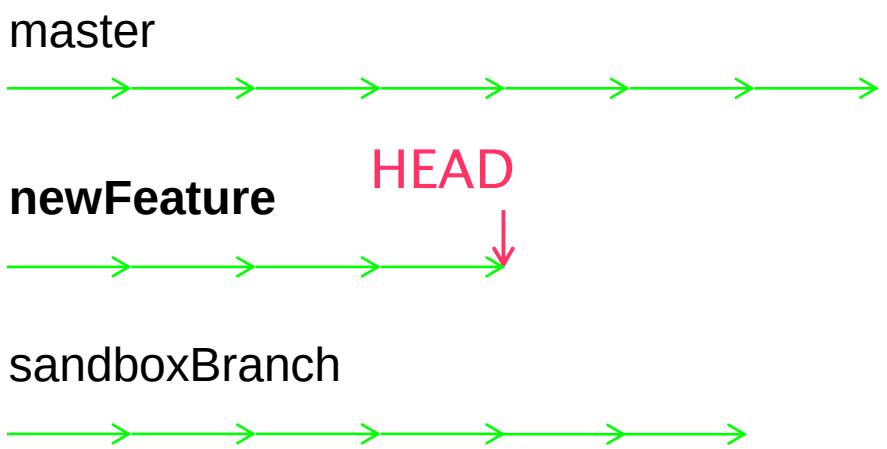
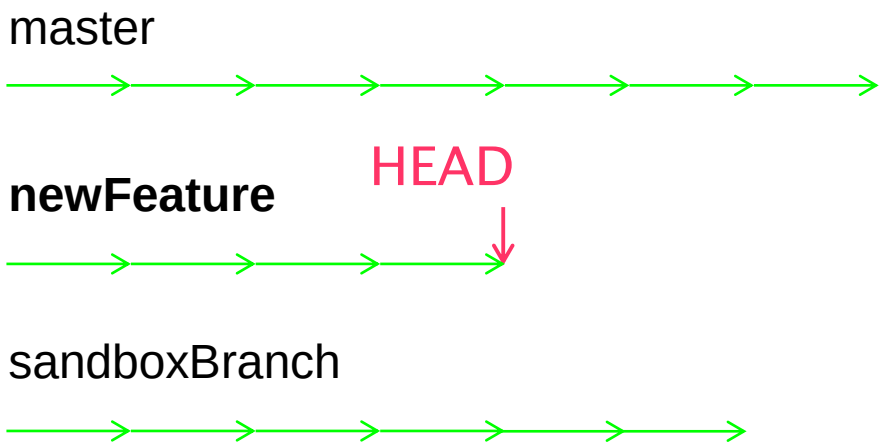


Branches in Git

- Think of HEAD as the recording module of a tape recorder. It is the edge of the branch. It is where the new commits you will create will be added.
- So, when checking out a different branch HEAD actually points to a different commit.



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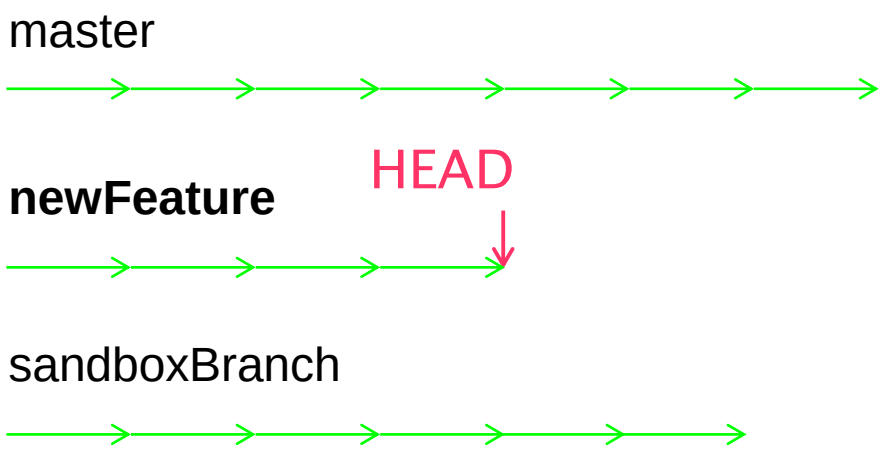
Branches in Git

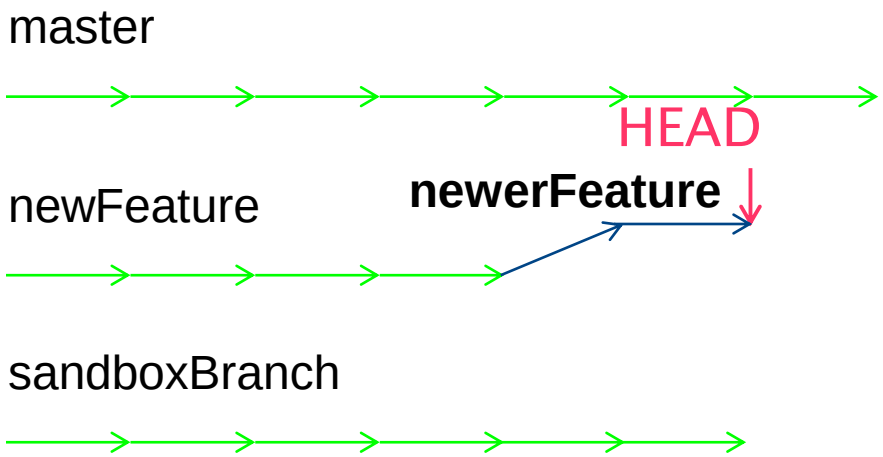
- But if we want to create a new one we use:
  git checkout -b “newerFeature”



Branches in Git

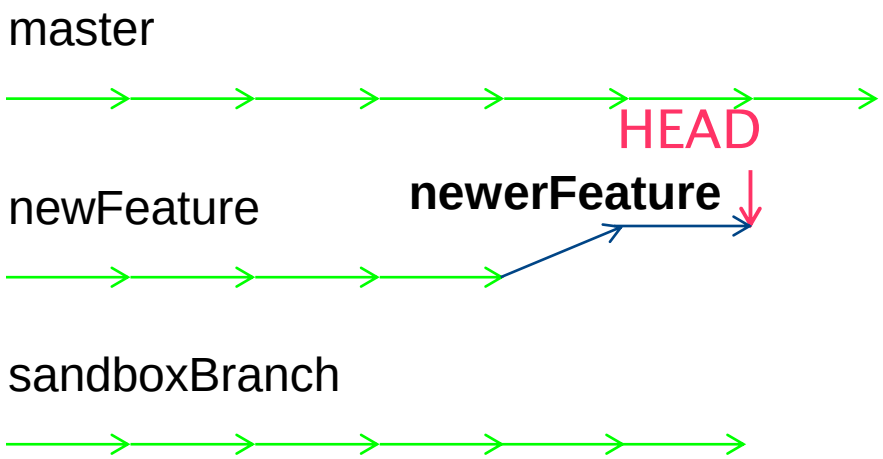
- The commit history of our new branch called “newerFeature” will be the same as newFeature since we created the new branch while HEAD was pointing that branch.

- And we add 2 new commits to that branch.



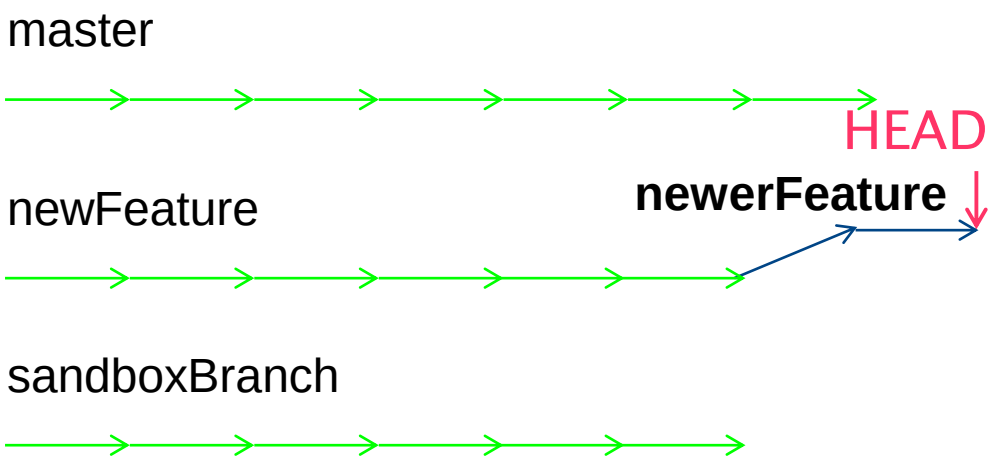
Branches in Git

- Let's suppose that newFeature branch has 2 new commits
- How do I get my newerFeature branch updated?



Branches in Git

- **git rebase newFeature**
- "Rebasing will actually fetch all new commits and place them right behind our commits on the current branch"



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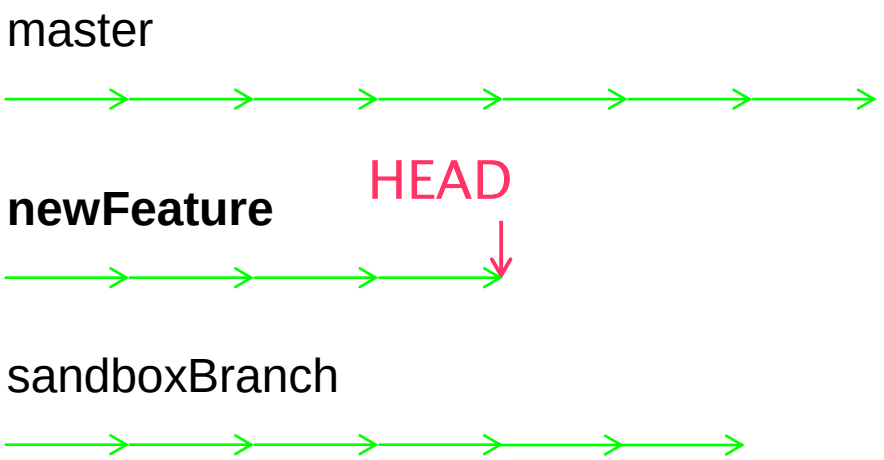
Branches in Git

- How do I push all my commits/branches in server?

- There is a command just for that and it is:
- **git push** (for pushing only commits)
  OR
- **git push origin newFeature -u** (for pushing branches)



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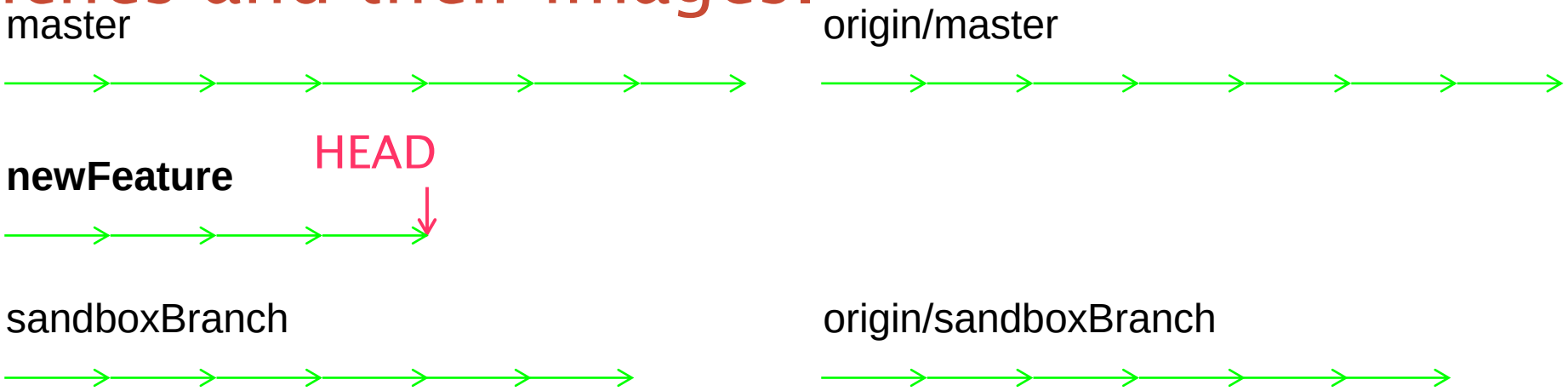
Branches in Git

- And what is **Origin**?
- Think of Origin as a **local image of the Repository** that exists somewhere in a git repository host (like Github, Bitbucket etc.)

Branches in Git

- So besides your local braches you actually posses an image of all branches your coworkers have pushed in Origin.
- But let's focus on our own for the time being. Our own branches and their images.



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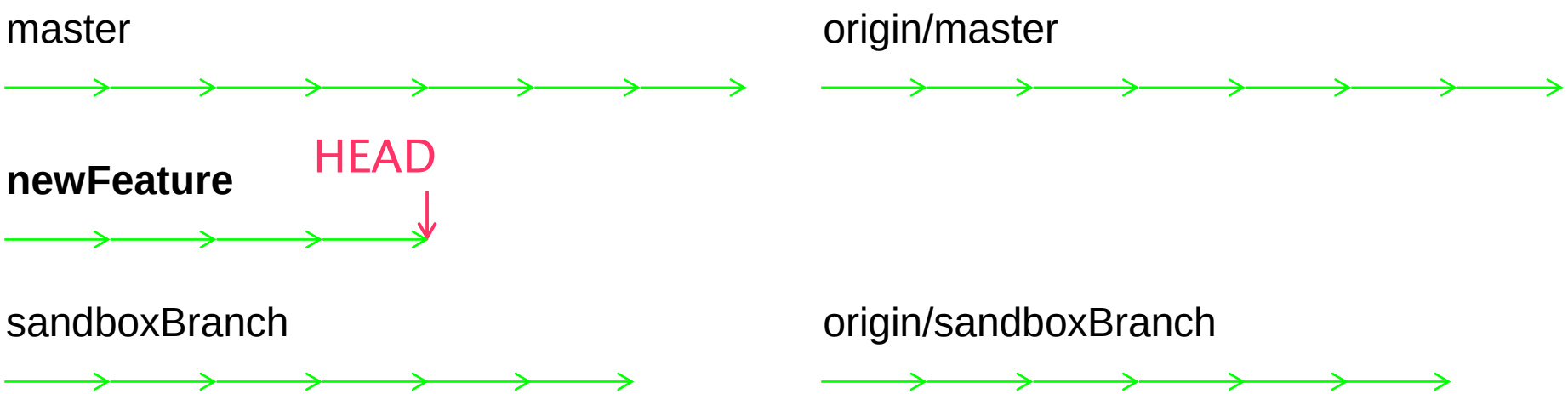
Branches in Git

- Let's push the newFeature branch in Origin.
- **git push origin newFeature -u**



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Branches in Git

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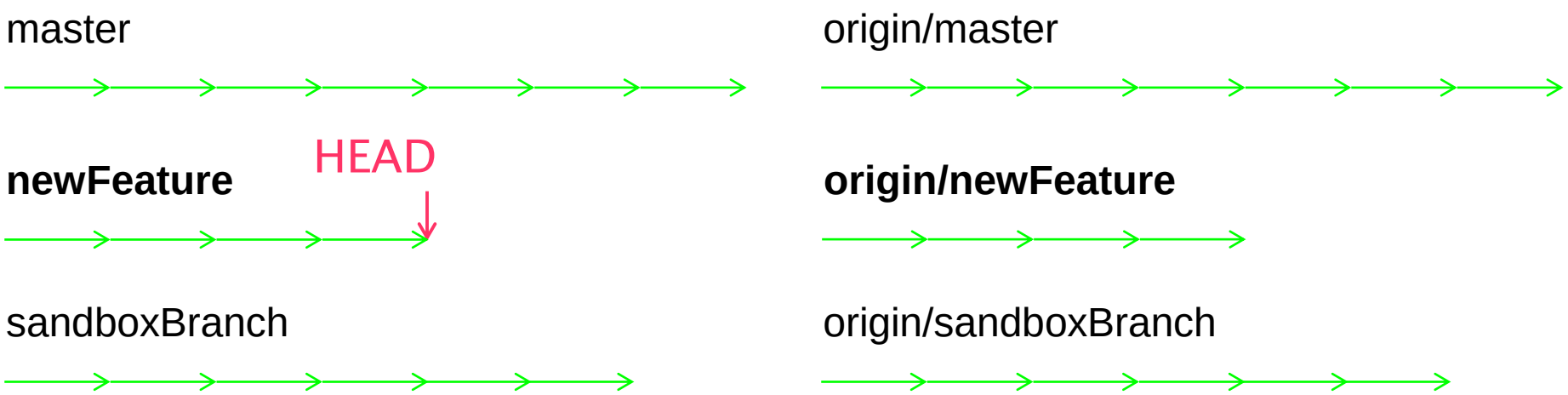
- **git push origin newFeature -u**



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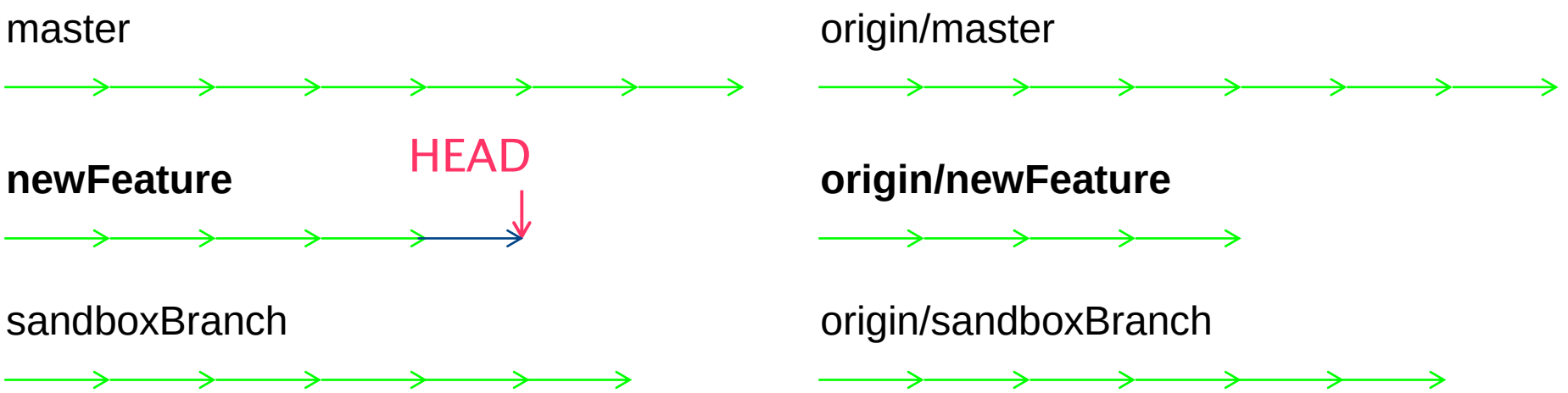
Branches in Git

- Now we create a new commit in our newFeature branch
- origin/newFeature still hasn't got the new commit



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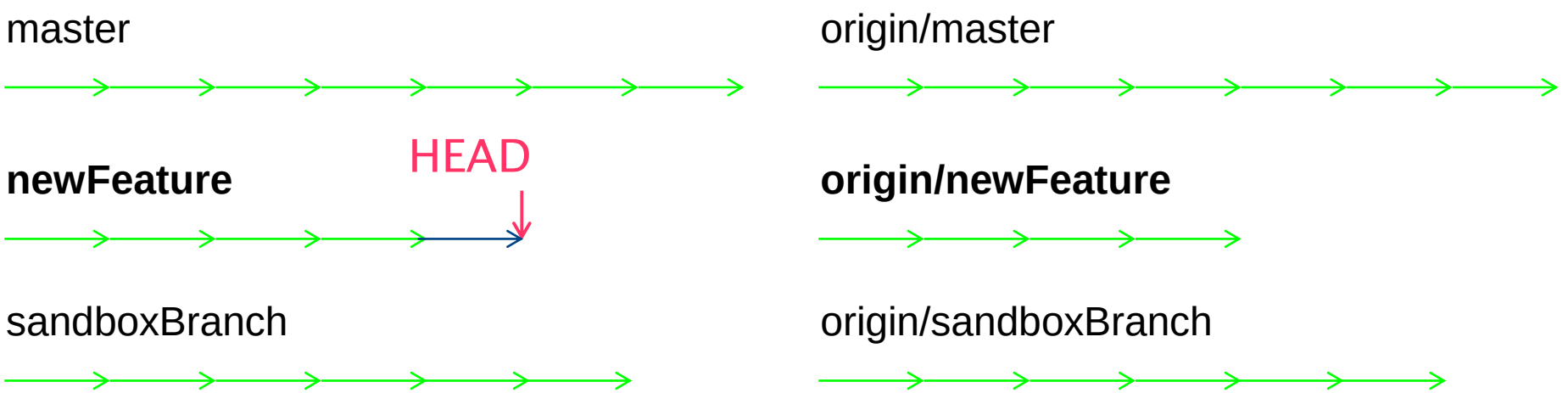
Branches in Git

- We hit **git push**



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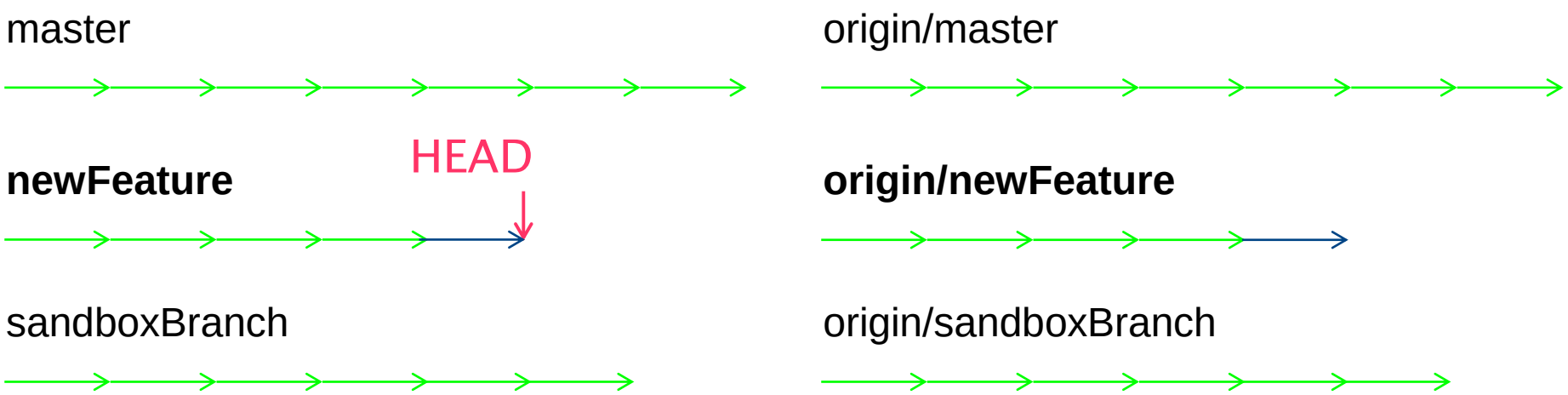
Branches in Git

- Now origin/newFeature is updated along with the server.



Branches in Git

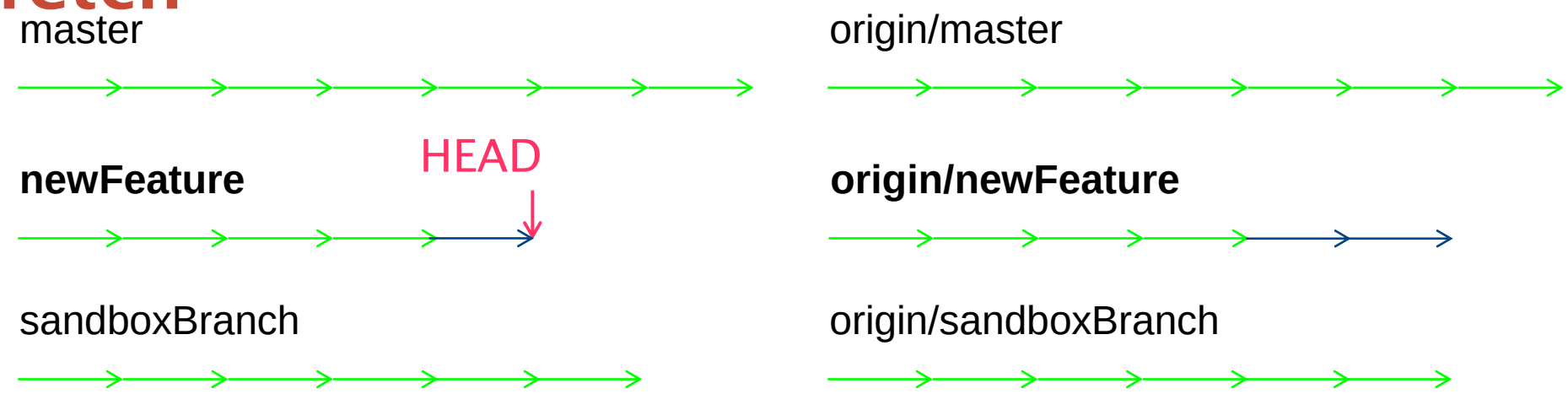
- Finally, let's say that our co worker want's to join the fun and get our branch to work on his own and commit his/her changes.

- The only commands that he/she would have to use are:
- **git fetch** (updates origin with changes that happened to branches)
- **git checkout newFeature** (go to that branch – create it if you go for the first time)

Branches in Git

- So our co-worker checkout our branch and committed 1 new commit and pushed it.

- Now we have to fetch and rebase our branch with the new changes.
- **git fetch**



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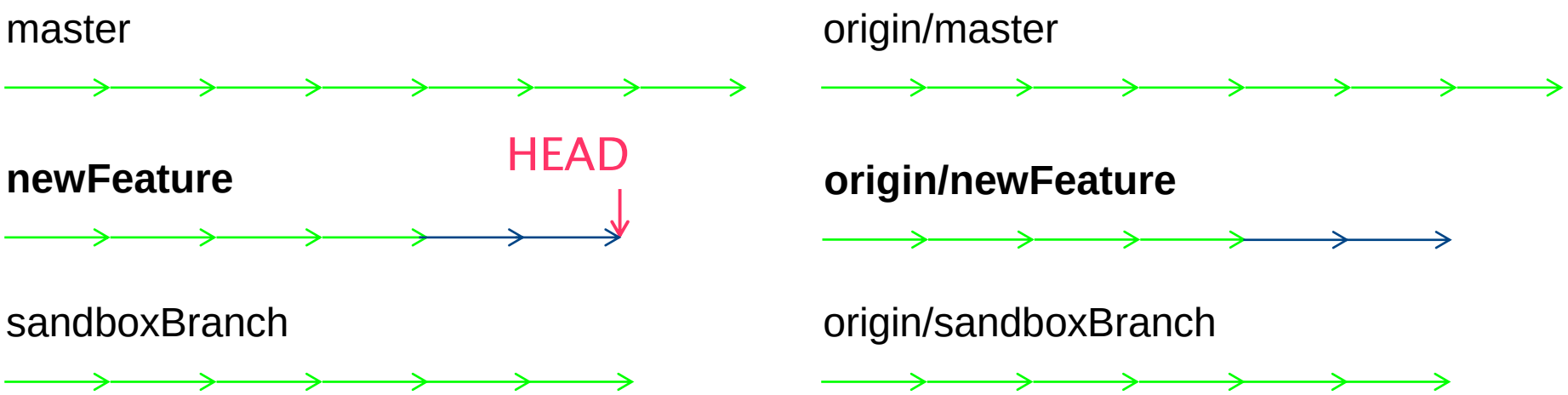
Branches in Git

- So our co-worker checkout our branch and committed 1 new commit and pushed it.
- Now we have to fetch and rebase our branch with the new changes.
- **git fetch**
- **git rebase origin/newFeature** OR **git pull -- rebase**



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Branches in Git

- And If I want to know all the branches that exist out there in our application just use the same command as you use to see local branches but with -r param

- **git branch -r**

Git Commands

- git branch
- git branch -r
- git checkout -b <new_branch>
- git checkout <different_branch>
- git fetch
- git rebase <branch_name>
- git pull --rebase
- git push
- git push origin <branch_name> -u

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Github

- a web-based version of git
- provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project
- is a subsidiary of Microsoft, which acquired the company in 2018 for $7.5 billion
- offers unlimited private repositories to all plans, including free accounts
- the largest host of source code in the world