Why Git{,Hub} is cool

Daniel Halperin

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What is Git?

- "Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency."
  - Website: [1] http://git-scm.com/
- Replacement for SVN, CVS, SCCS, ...

Reason #1

- Git is completely distributed
- Works perfectly well with no network
- Works perfectly well with no server configuration
- (Actually, everything is a server ;)

Demo #1

- Use git to do revision control for any little tiny project you work on

```
git init
touch file.txt
git add file.txt
git commit -s
<write a good shortlog and log>
```

Demo #2

- Run this command: `svn log`

  `<ping server>`
  `<communicate with server>`
  `<wait>`

- Oh, it worked. Finally.

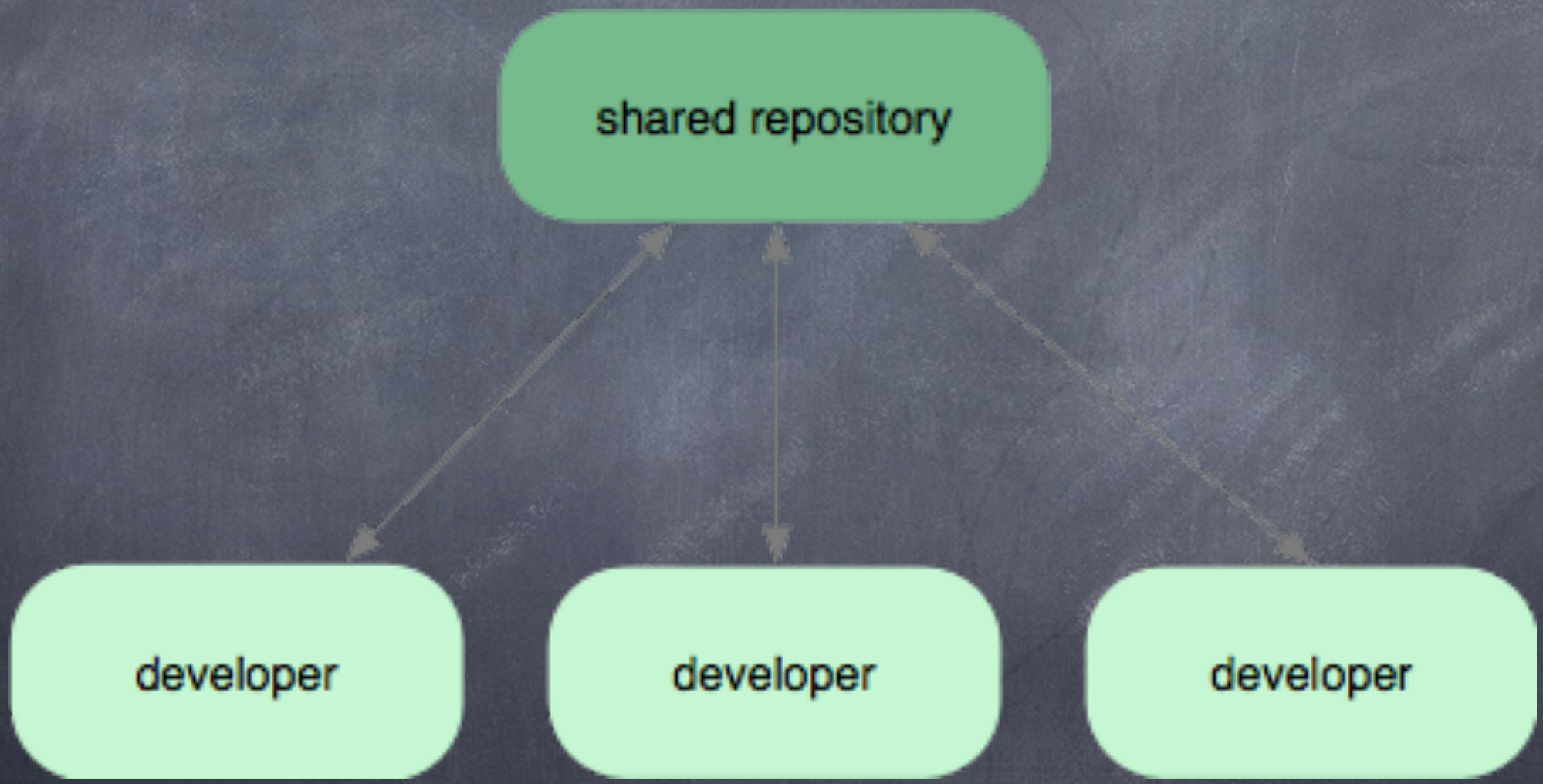
- This is always "instantaneous": `git log`

Reason #2

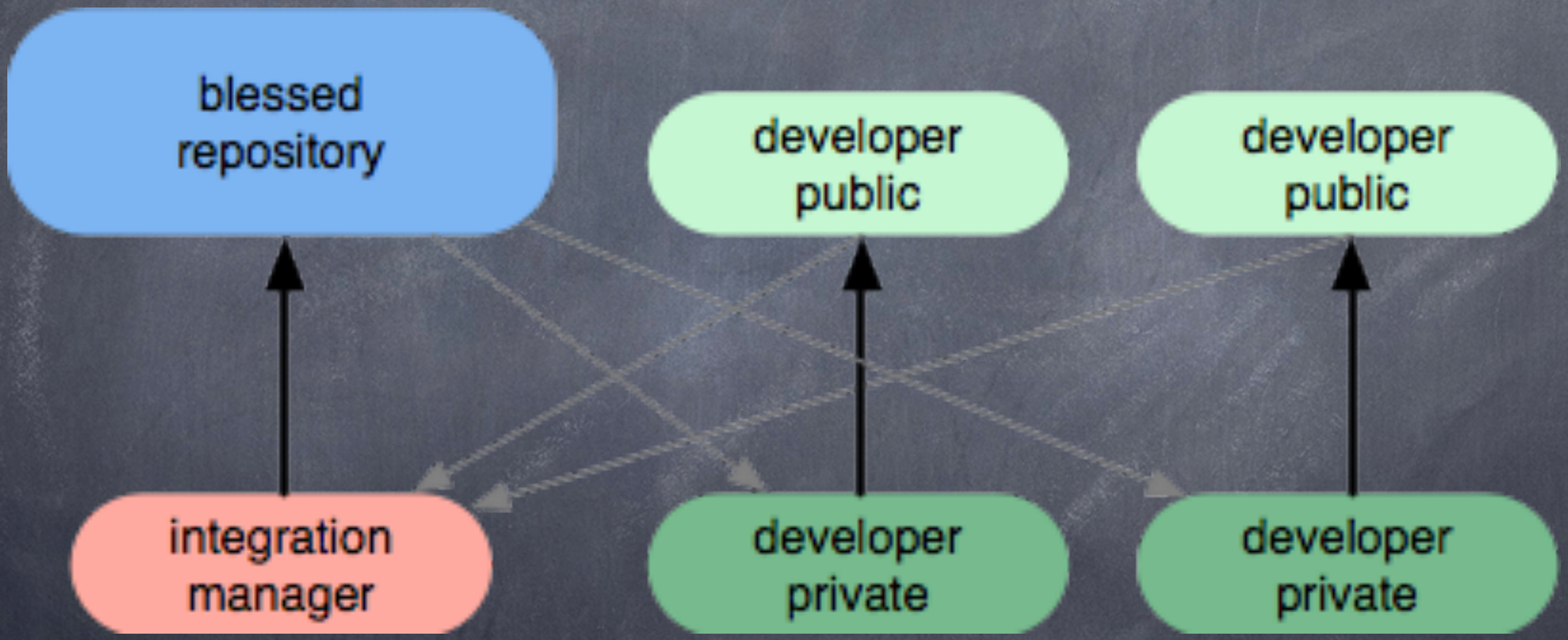
- GitHub is awesome
  - None of us, ever, have to administer anything
  - Lots of great features
  - We all have 100% of state on our computers, so trivial FT in emergencies
- Demo #3: let's go look at it

Basic workflow: Branching and Merging [1]

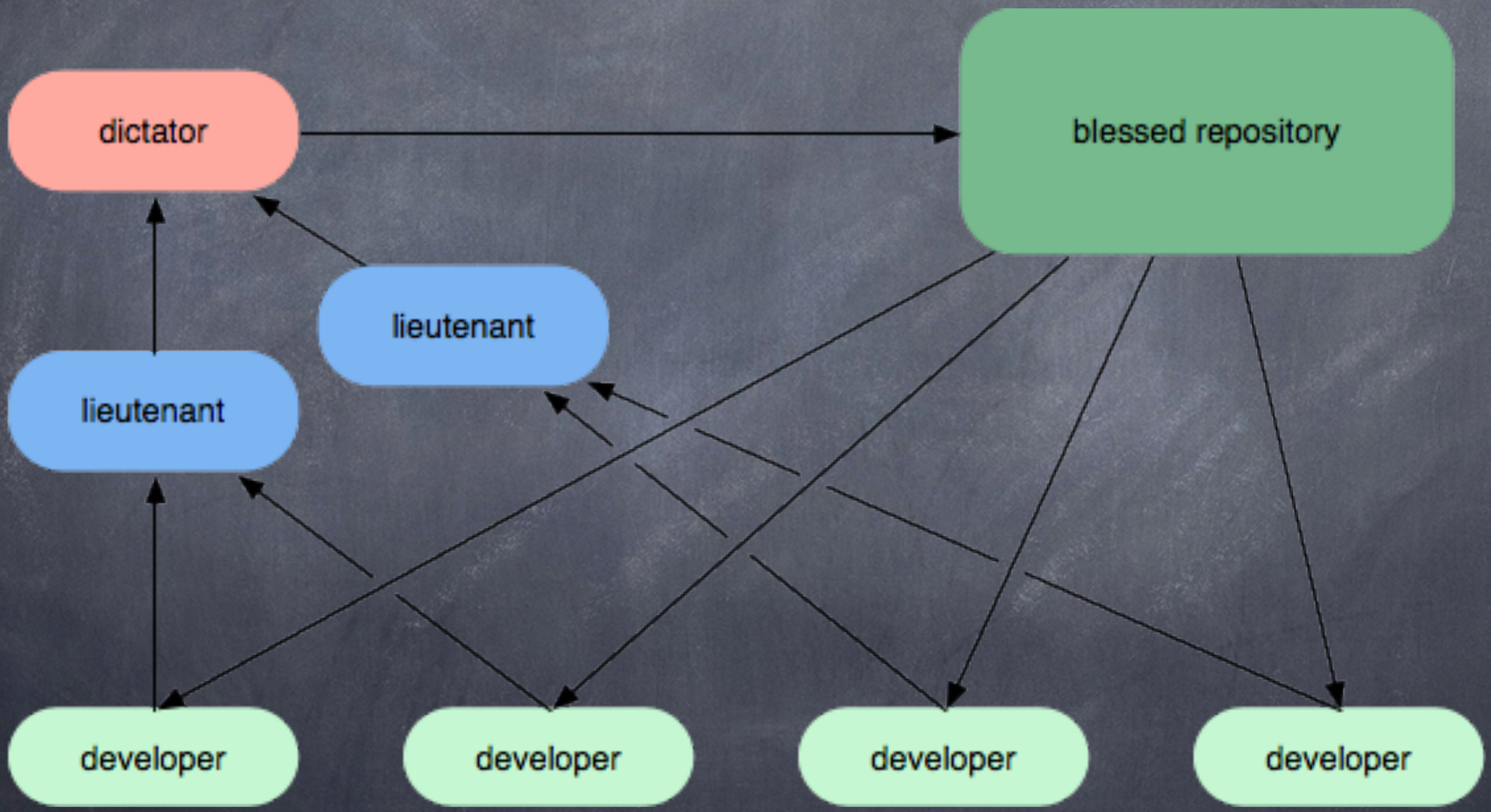
More workflows [1]: SVN-style (centralized)



More workflows [1]: Integration Manager



More workflows [1]: Dictator and Lieutenants



Case Study: Adding a feature

- Usually, this includes many steps:

  1. Refactoring some existing code to make room
  2. Implementing the core
  3. (e.g.) Making some user interface changes
  4. Adding documentation
  5. Adding tests

- SVN-style: code everything up and then commit a huge patch!

Issues with SVN-style

- SVN-style: code everything up and then commit a huge patch!
  - Hard for developer to separate changes from different steps
  - Instead, create partial-commits that may not compile and affect everyone.
  - If you introduce a bug, hard to find because `svn diff` gives ENTIRE delta.
- Impossible to properly review

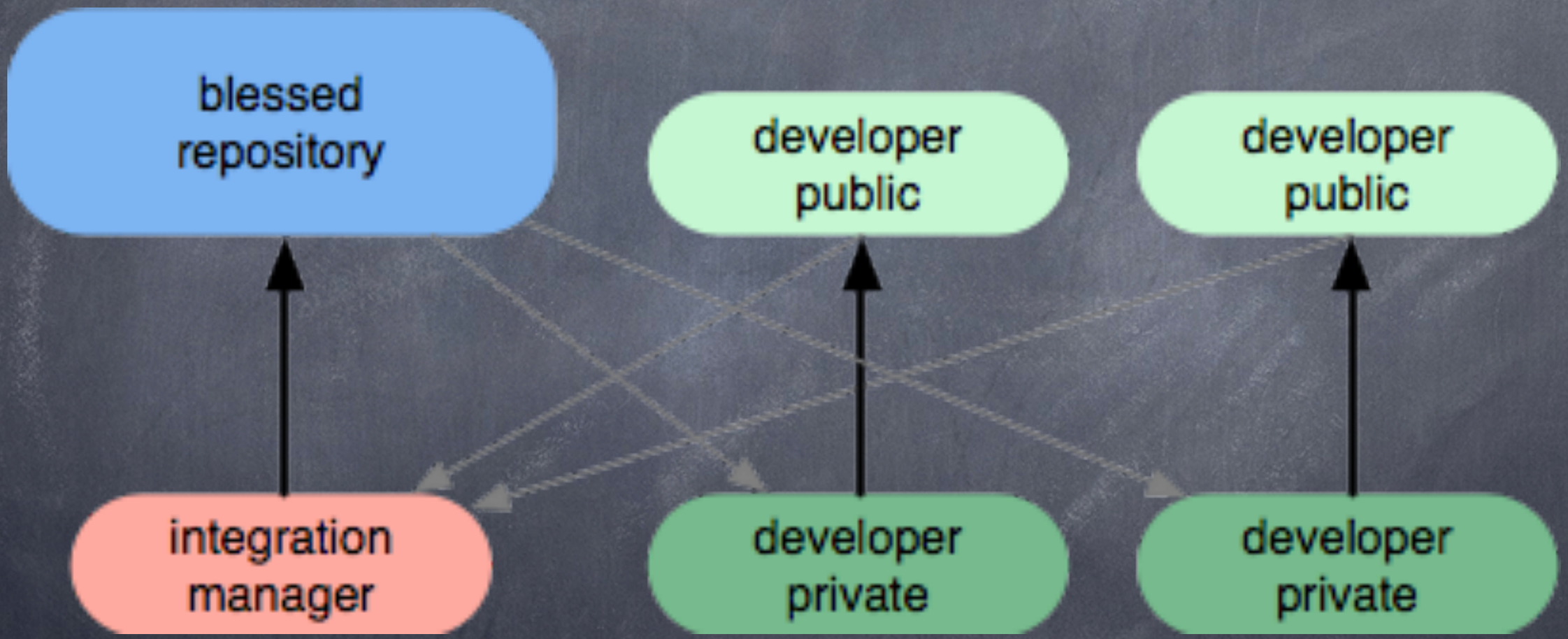
Git-style

- A commit should include one "logical change"
- The project should compile and pass all tests before and after every commit
- A feature comprises many commits, batch-submitted via a single "pull request"
- Project collaborators review and comment on the commit
- The commit is eventually merged once it "LGTM"s

Demo #4: Development branch and pull request

- I updated some comments.
- Make a new branch, commit locally.
- Push this new branch to the server.
- Submit a pull request.
- Get comments, eventually merge it to master.

Integration Manager workflow [1]



"Small Lab" workflow

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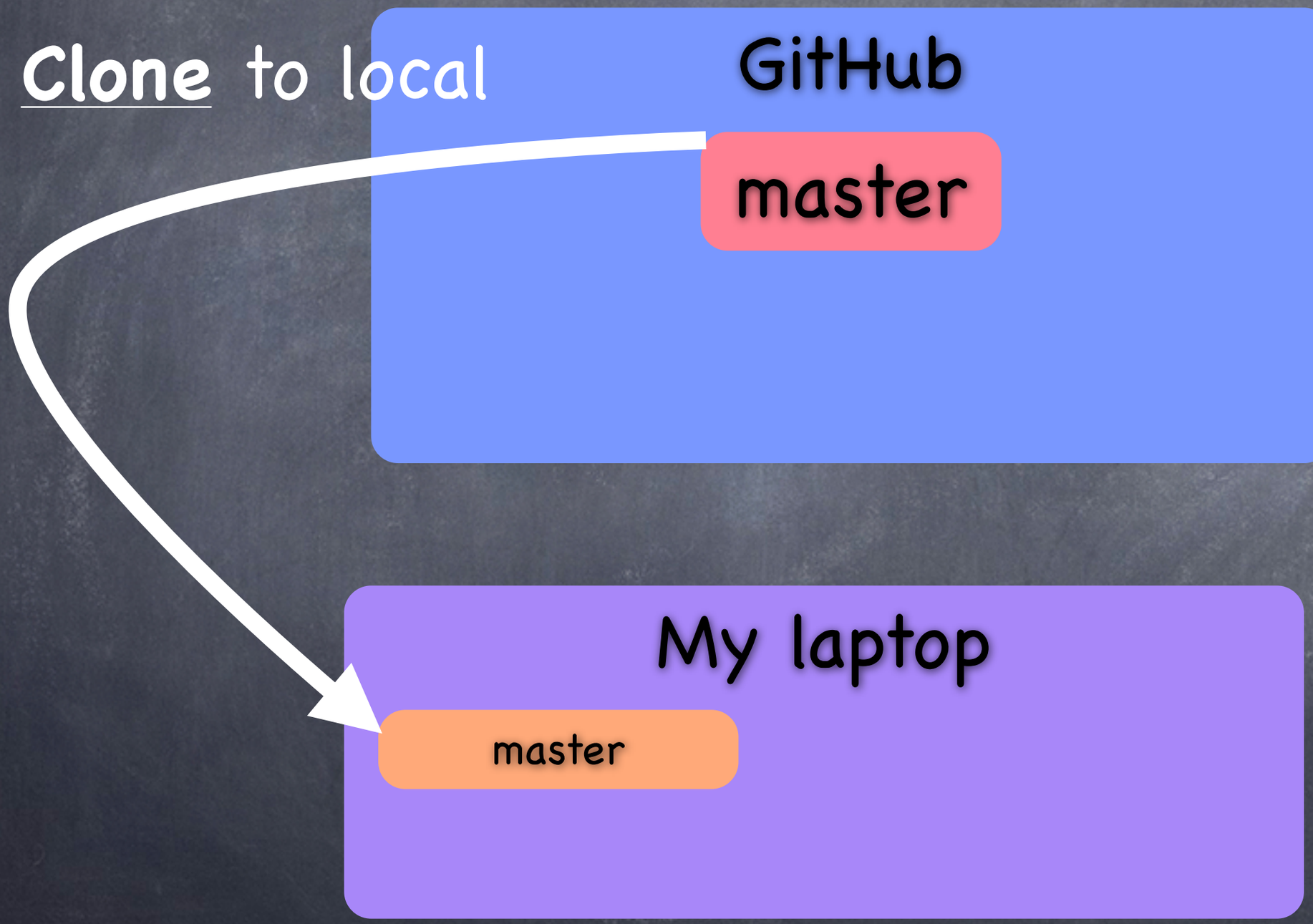

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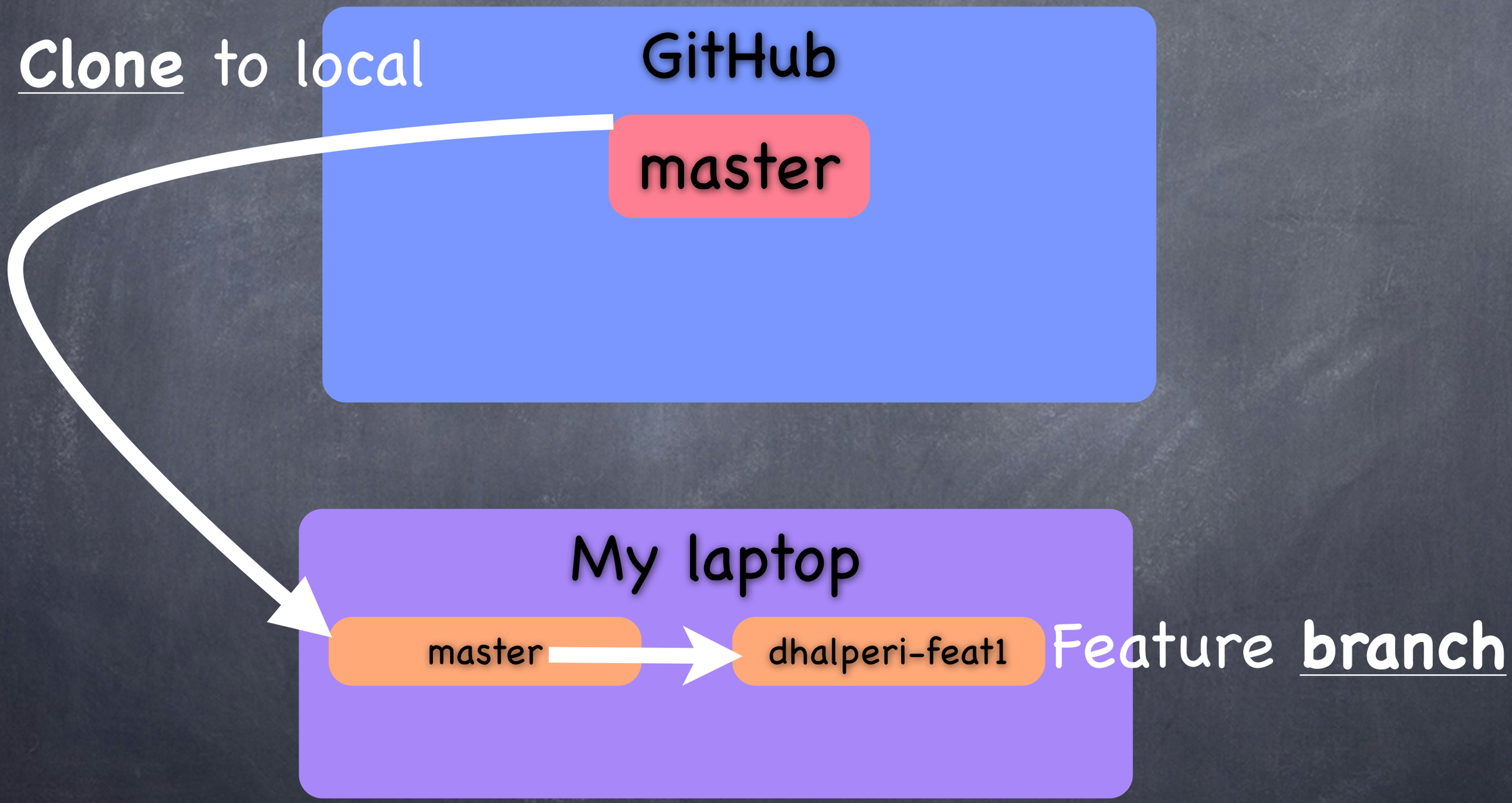

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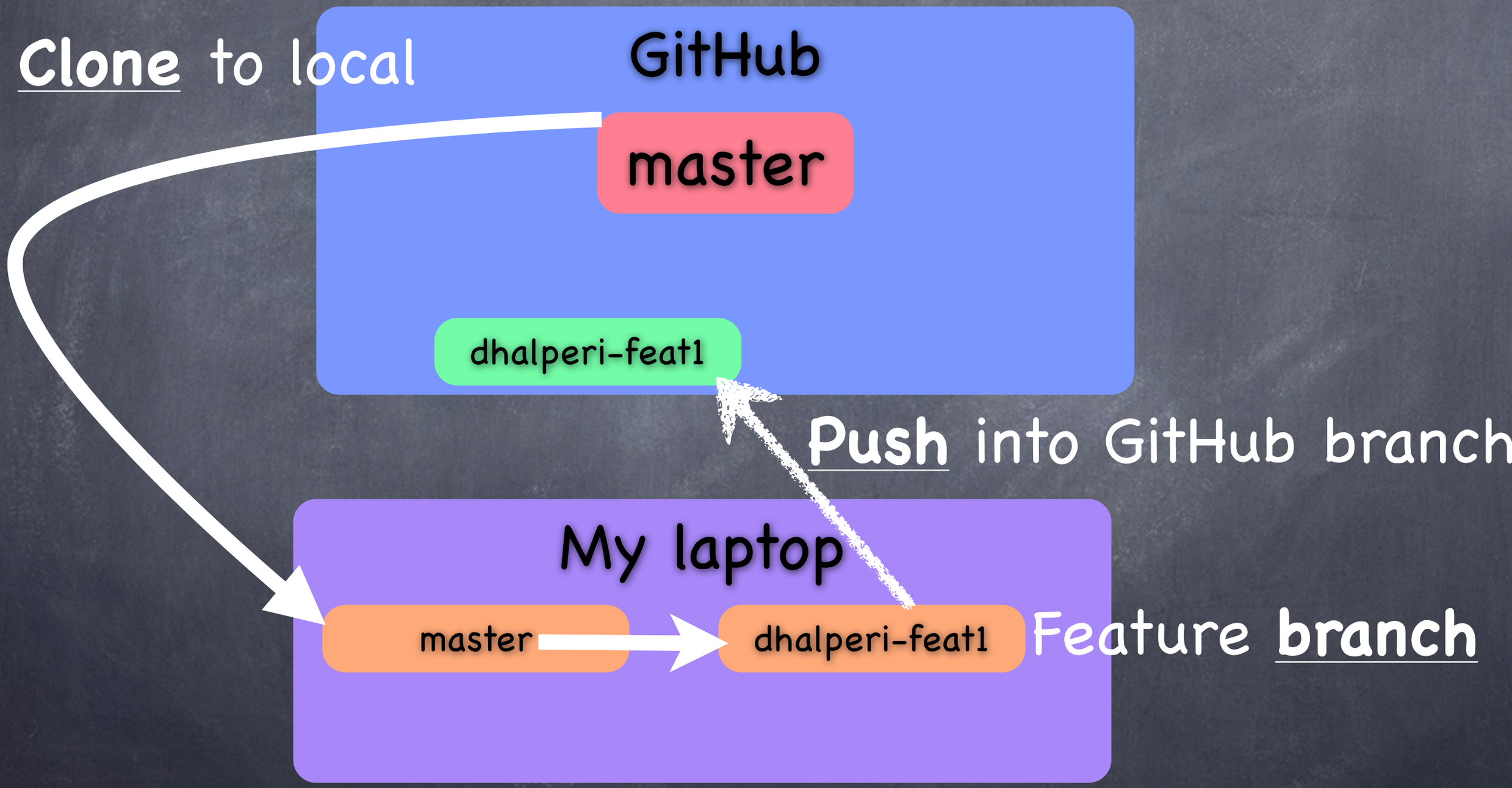

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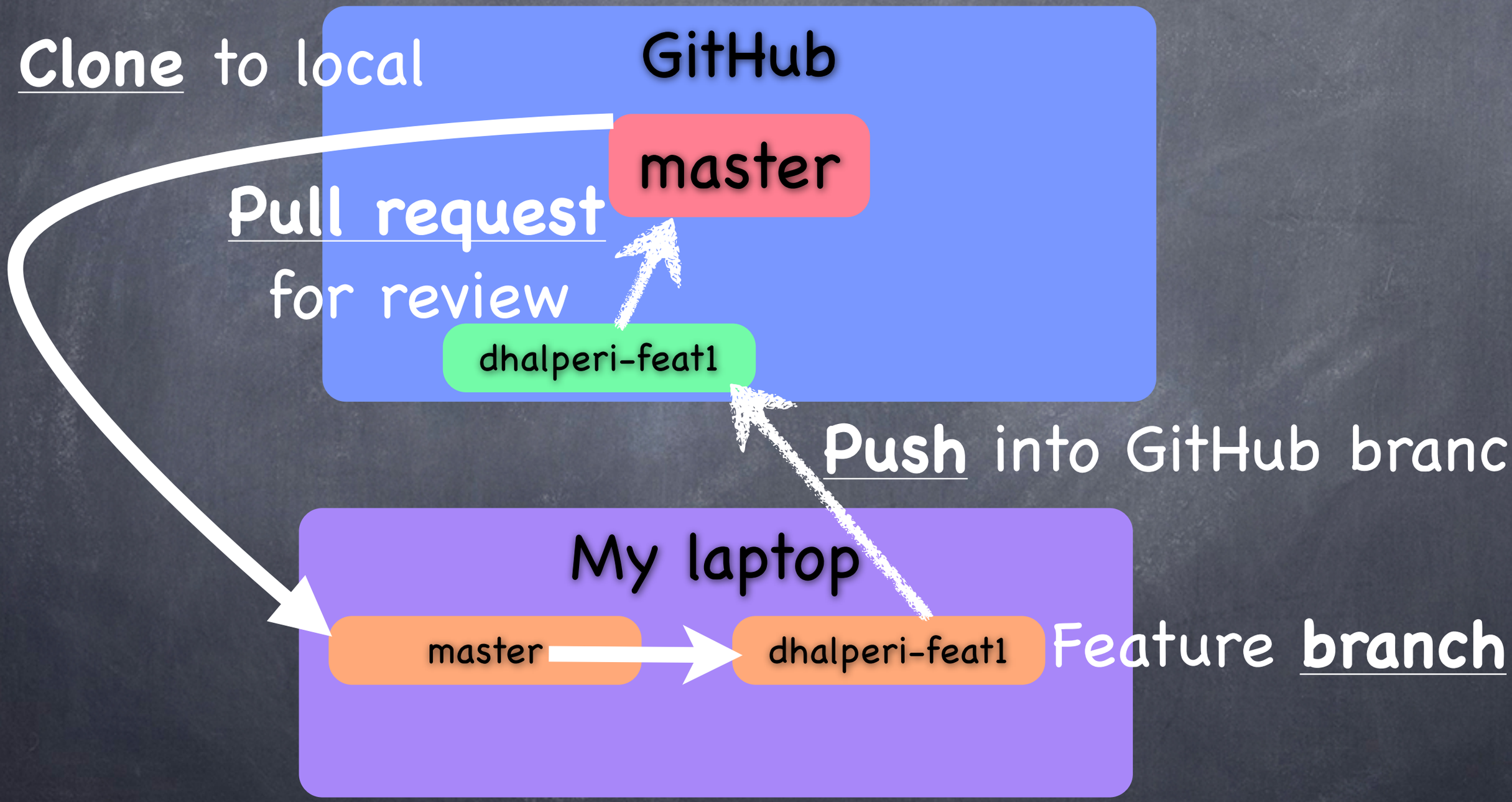

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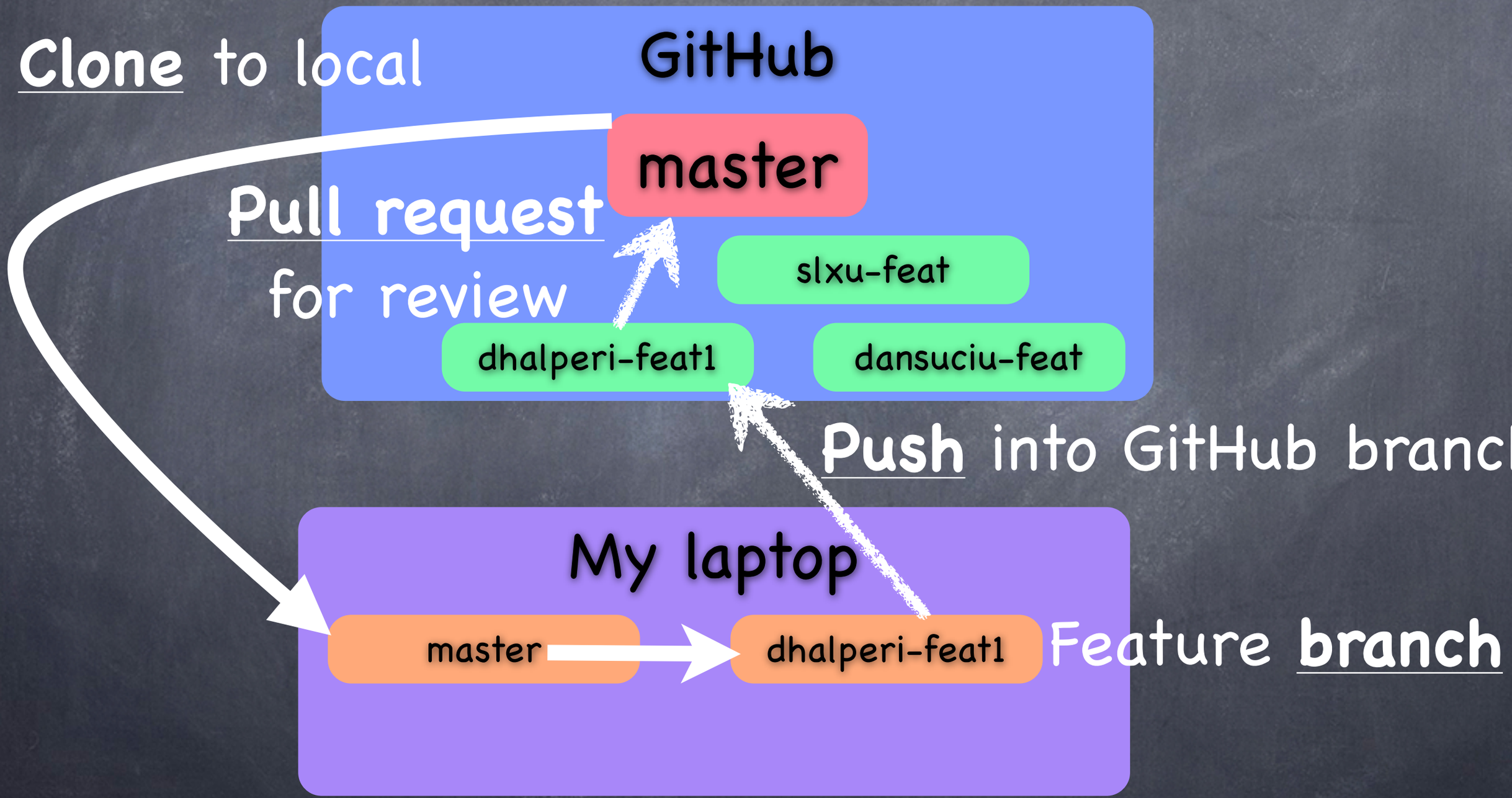

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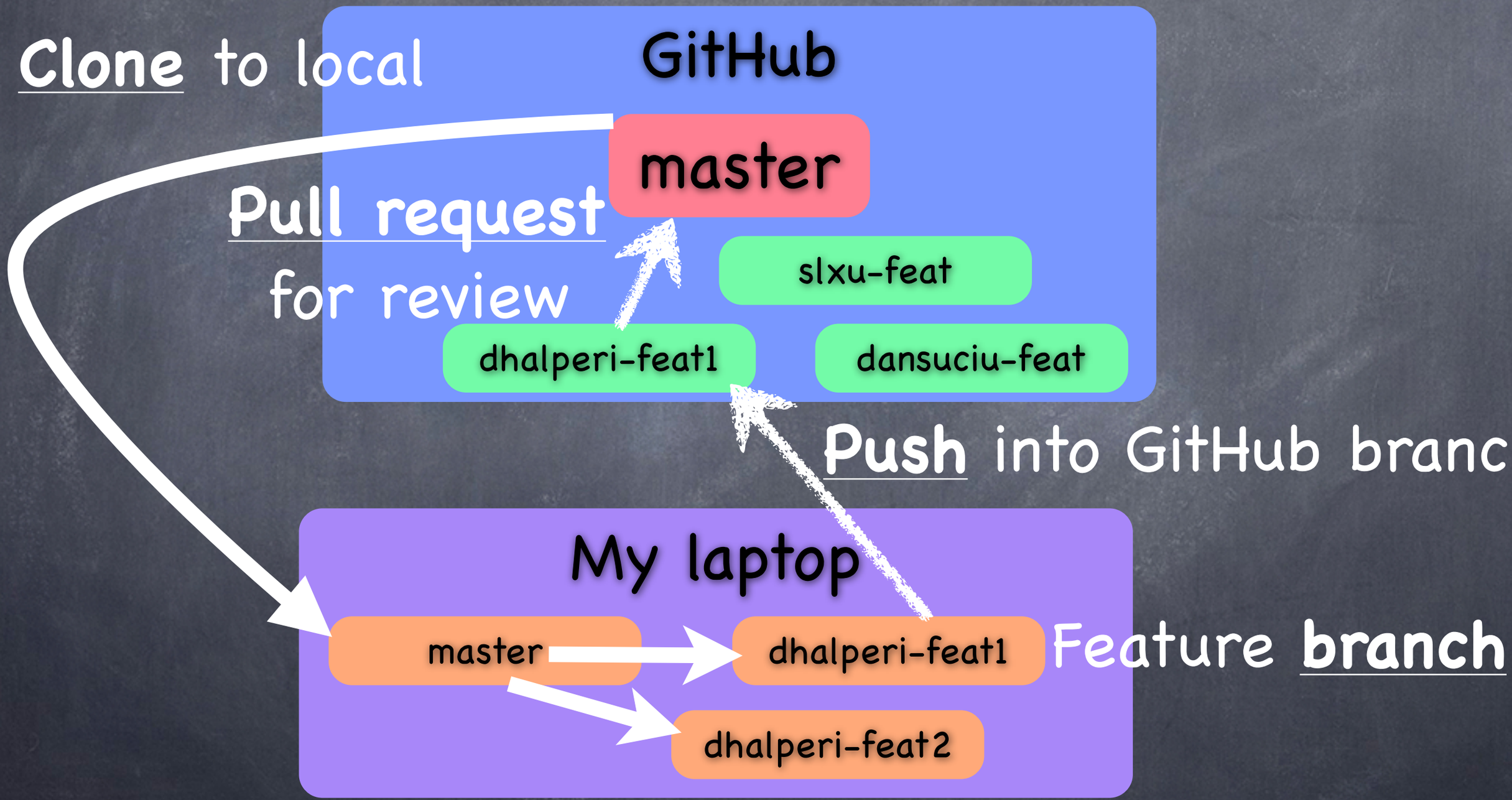

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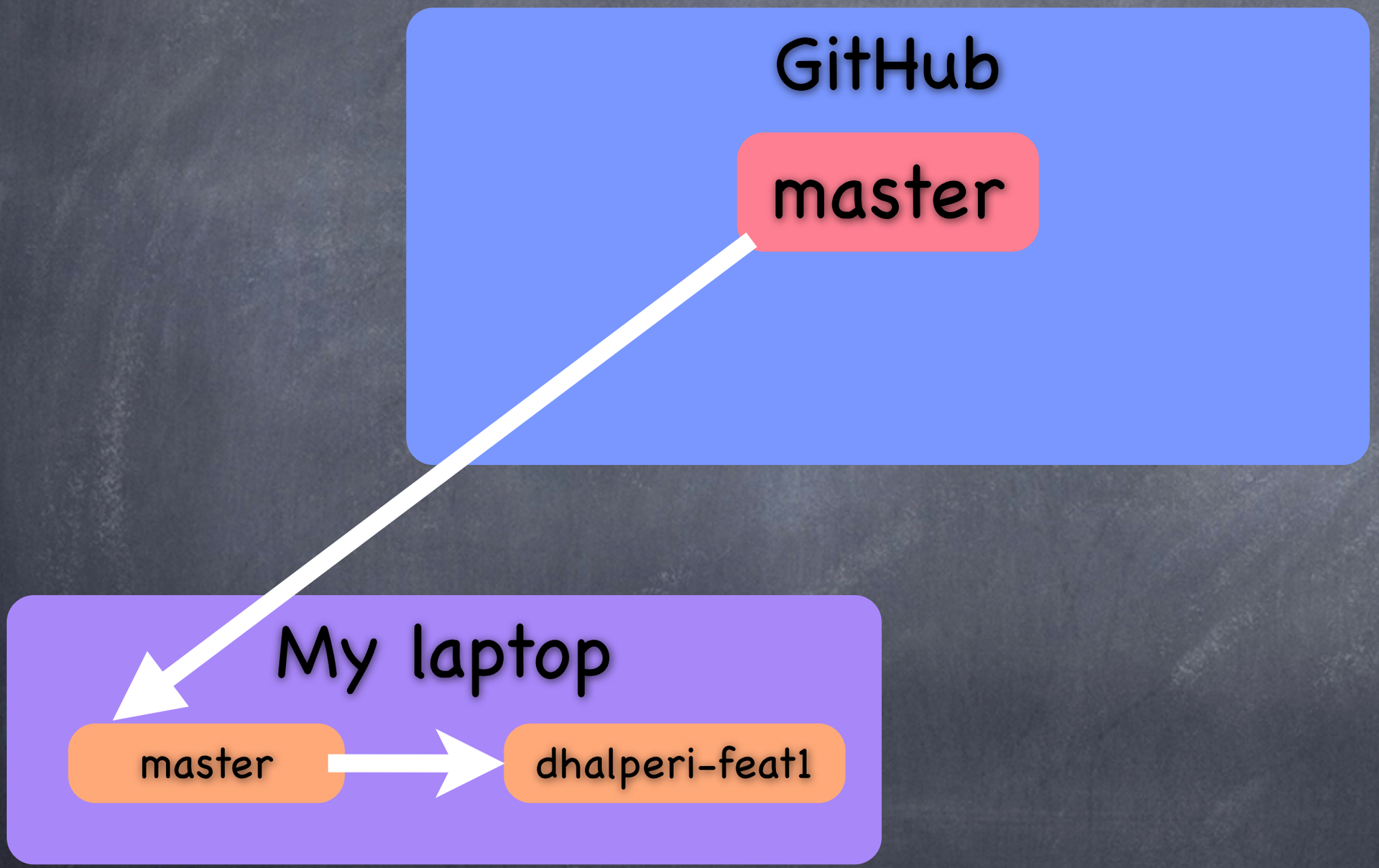

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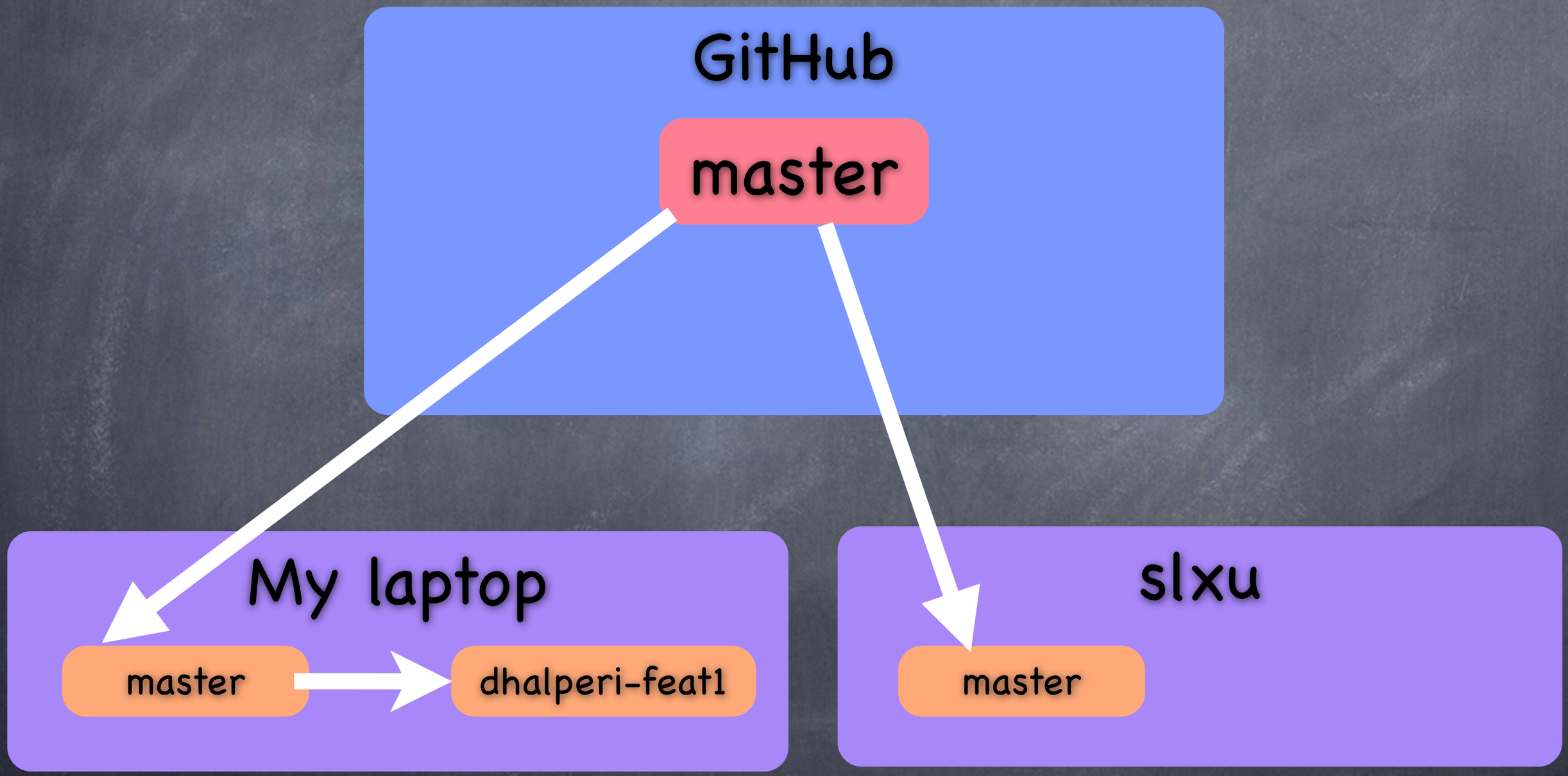

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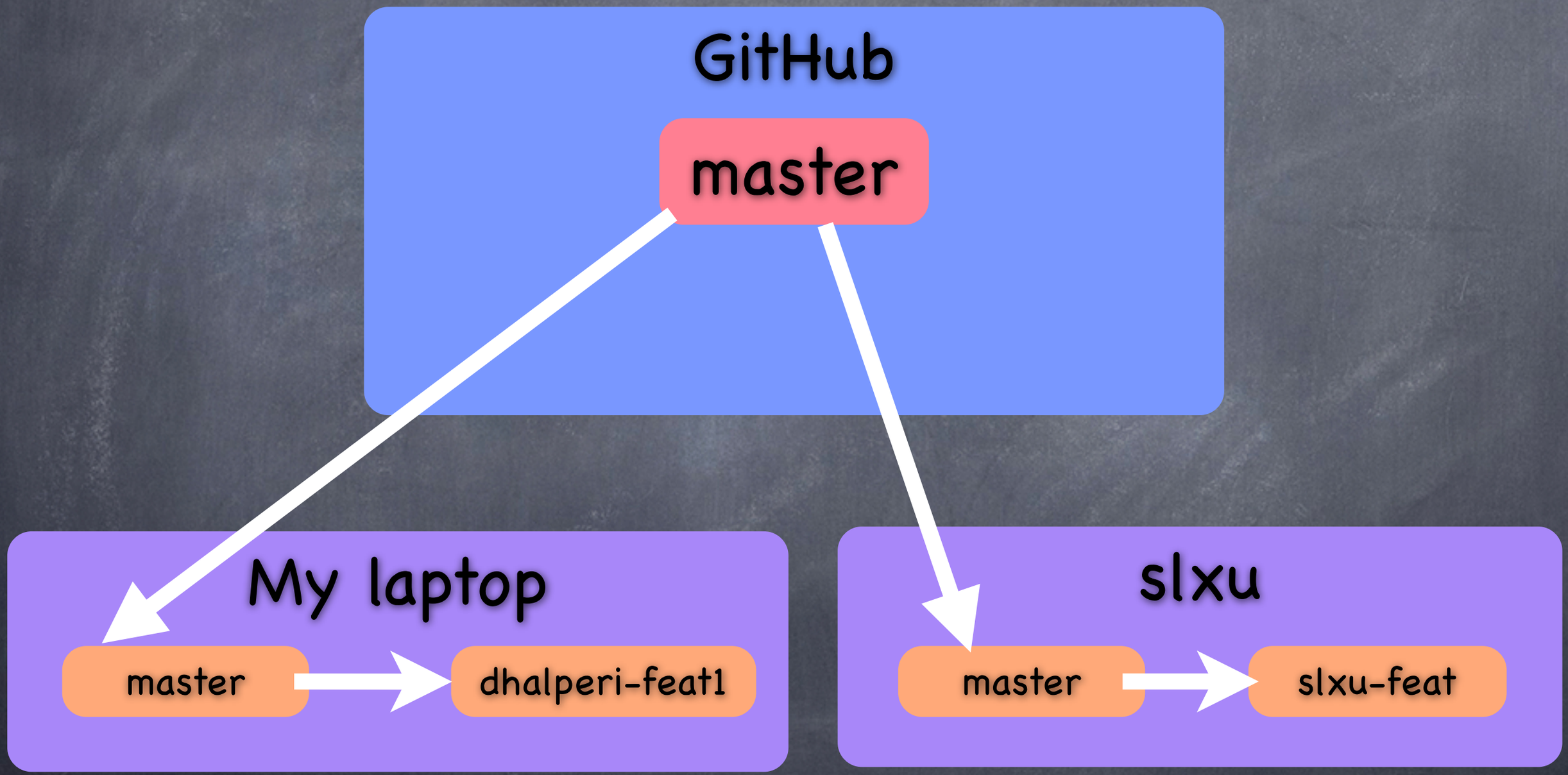

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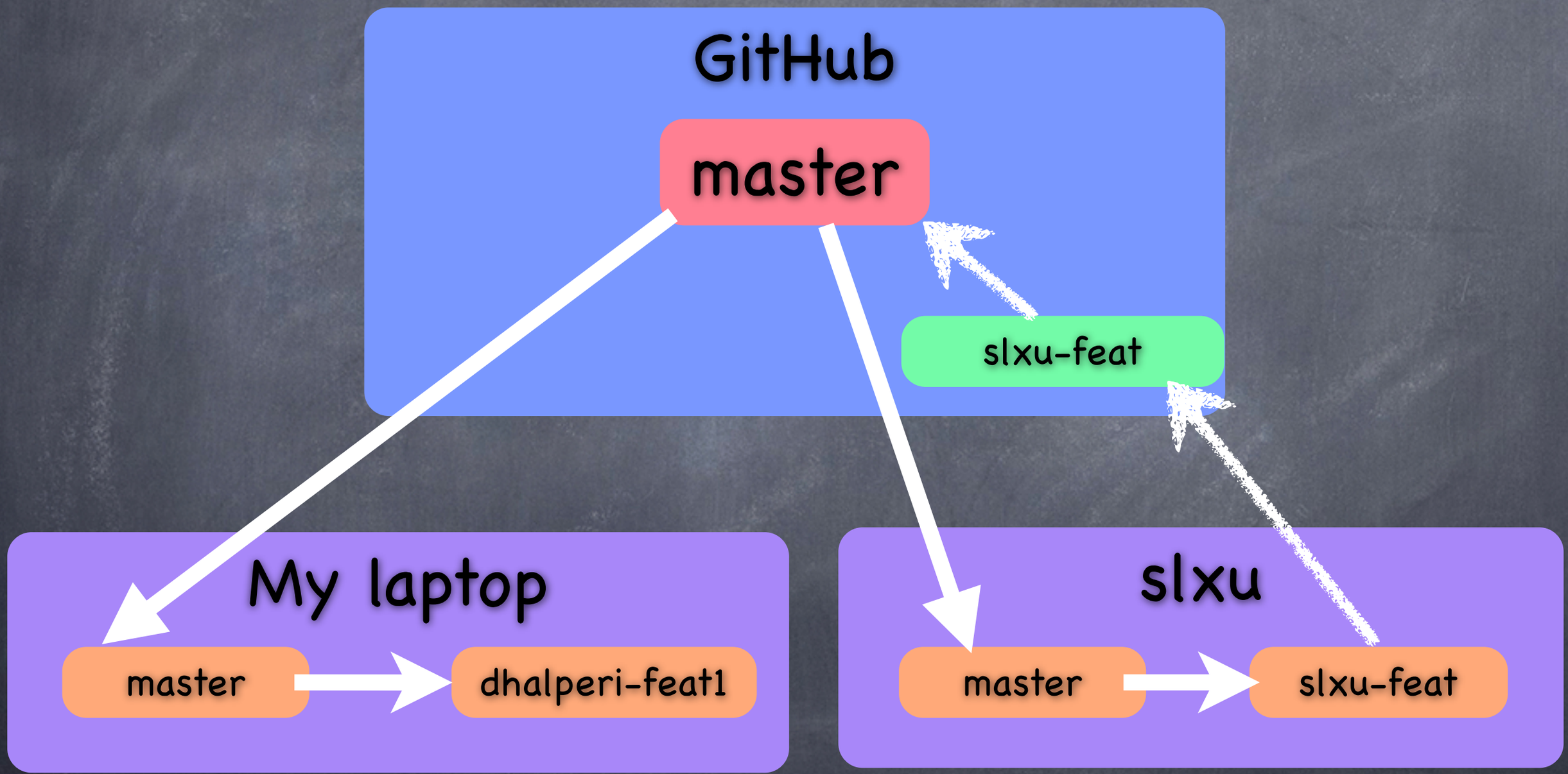

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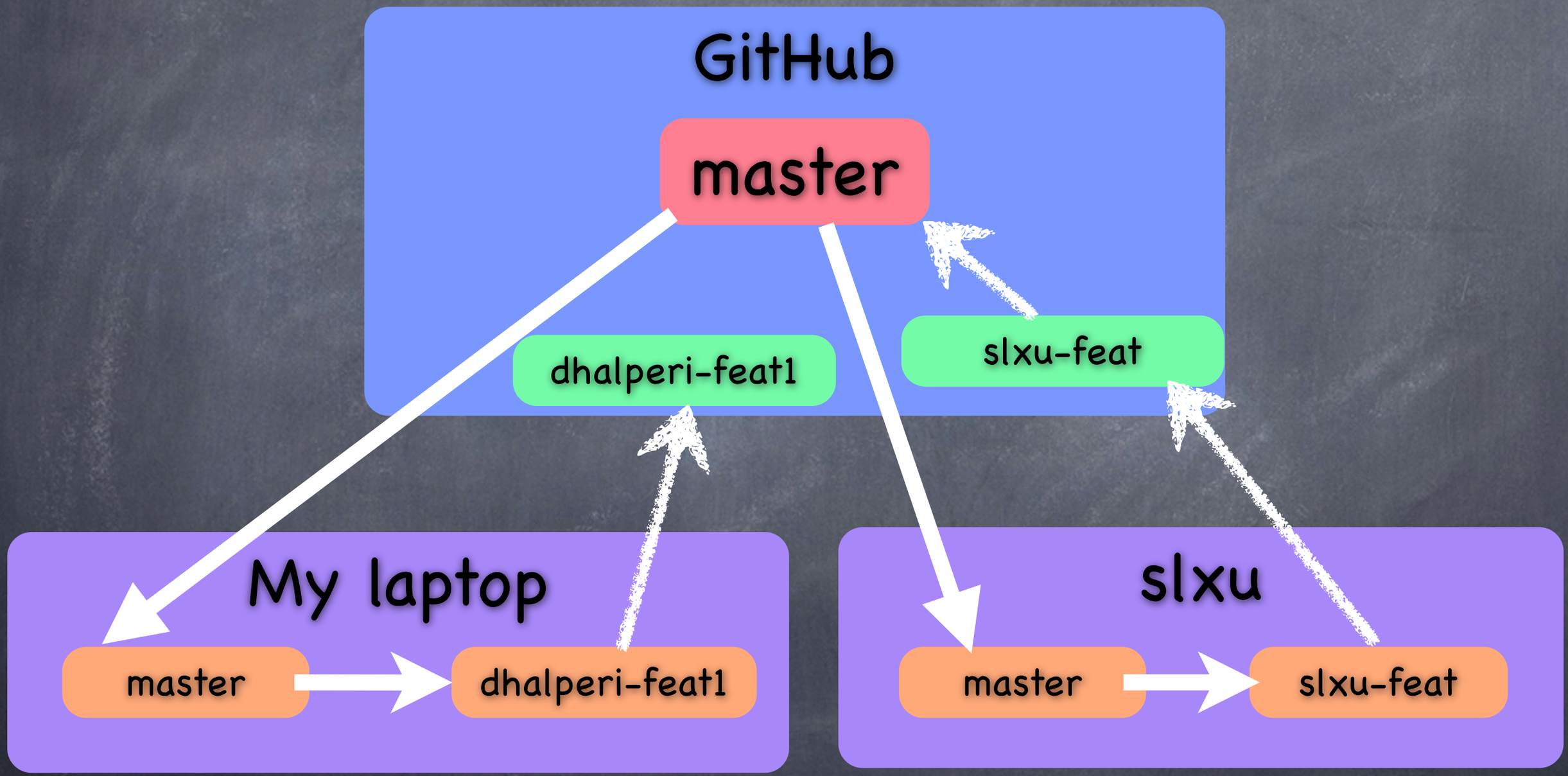

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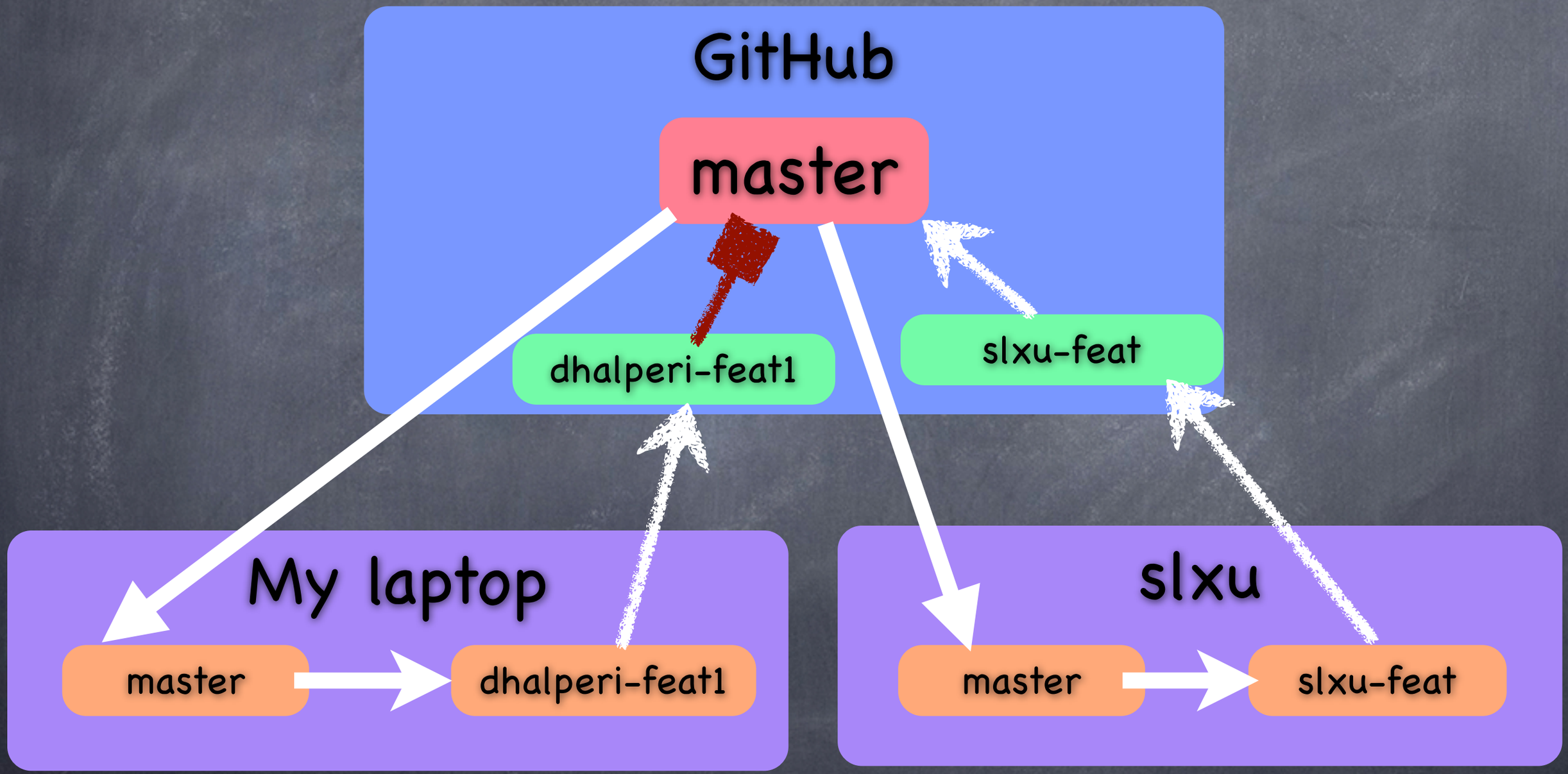

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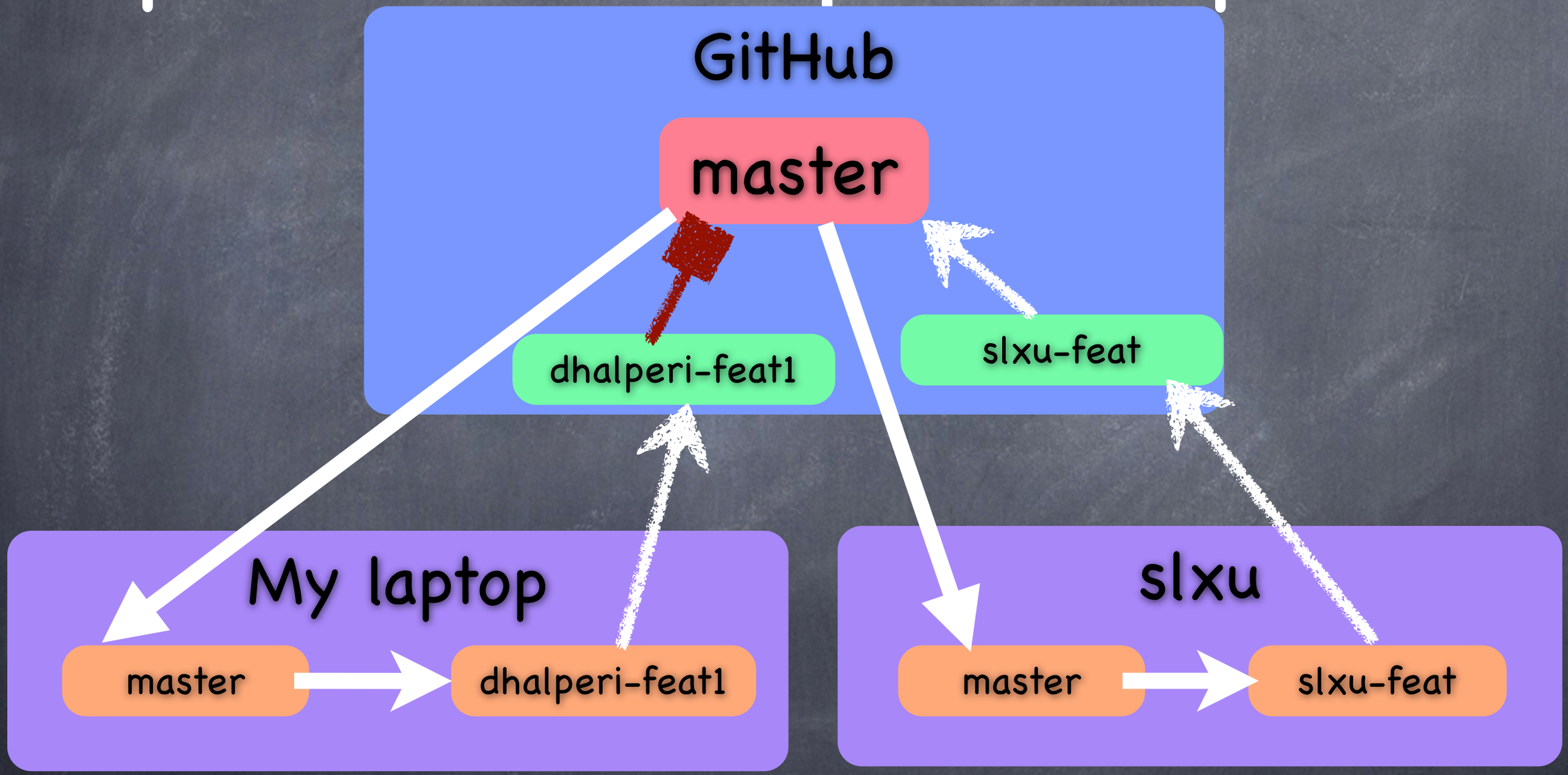

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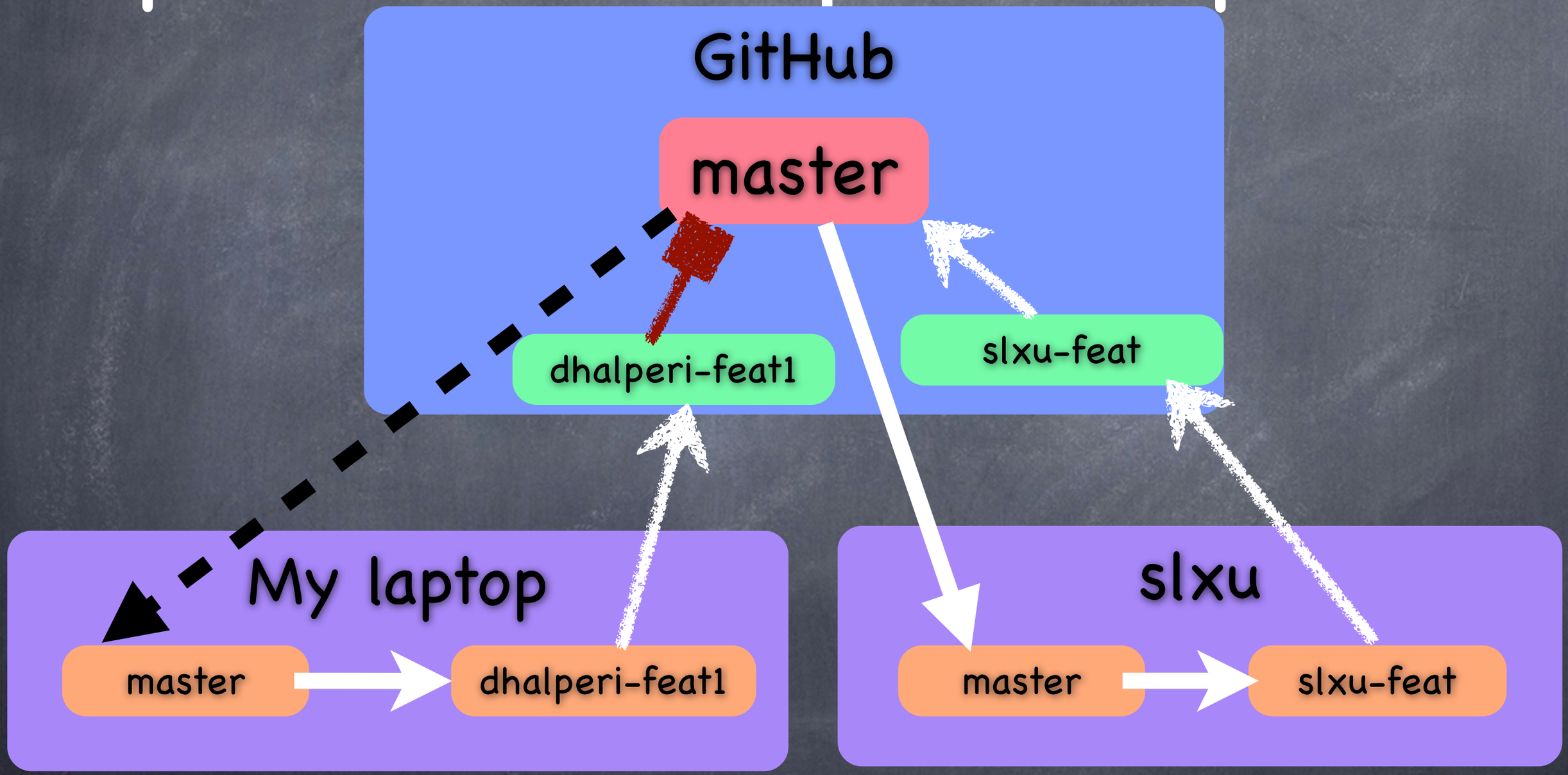

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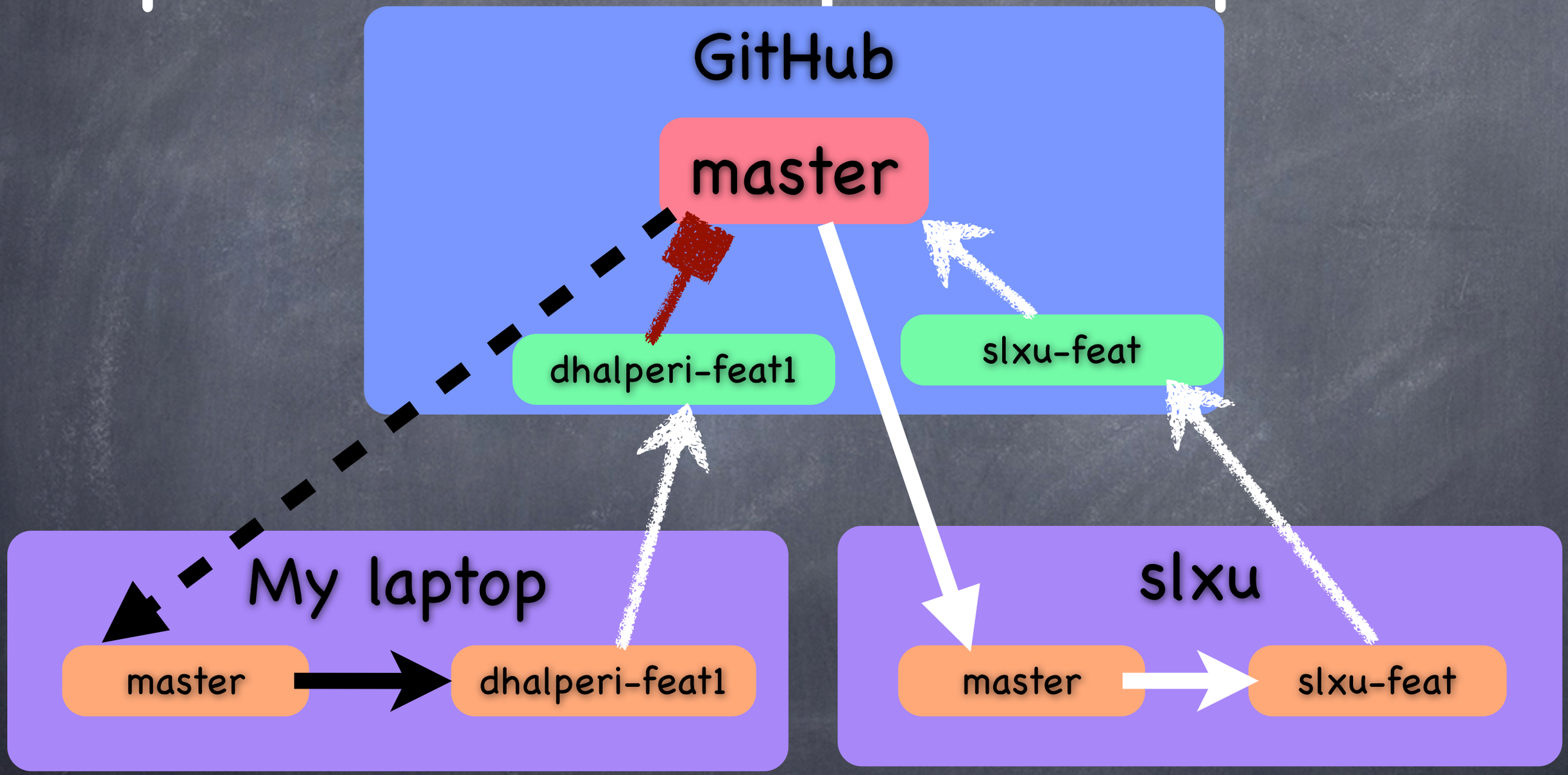

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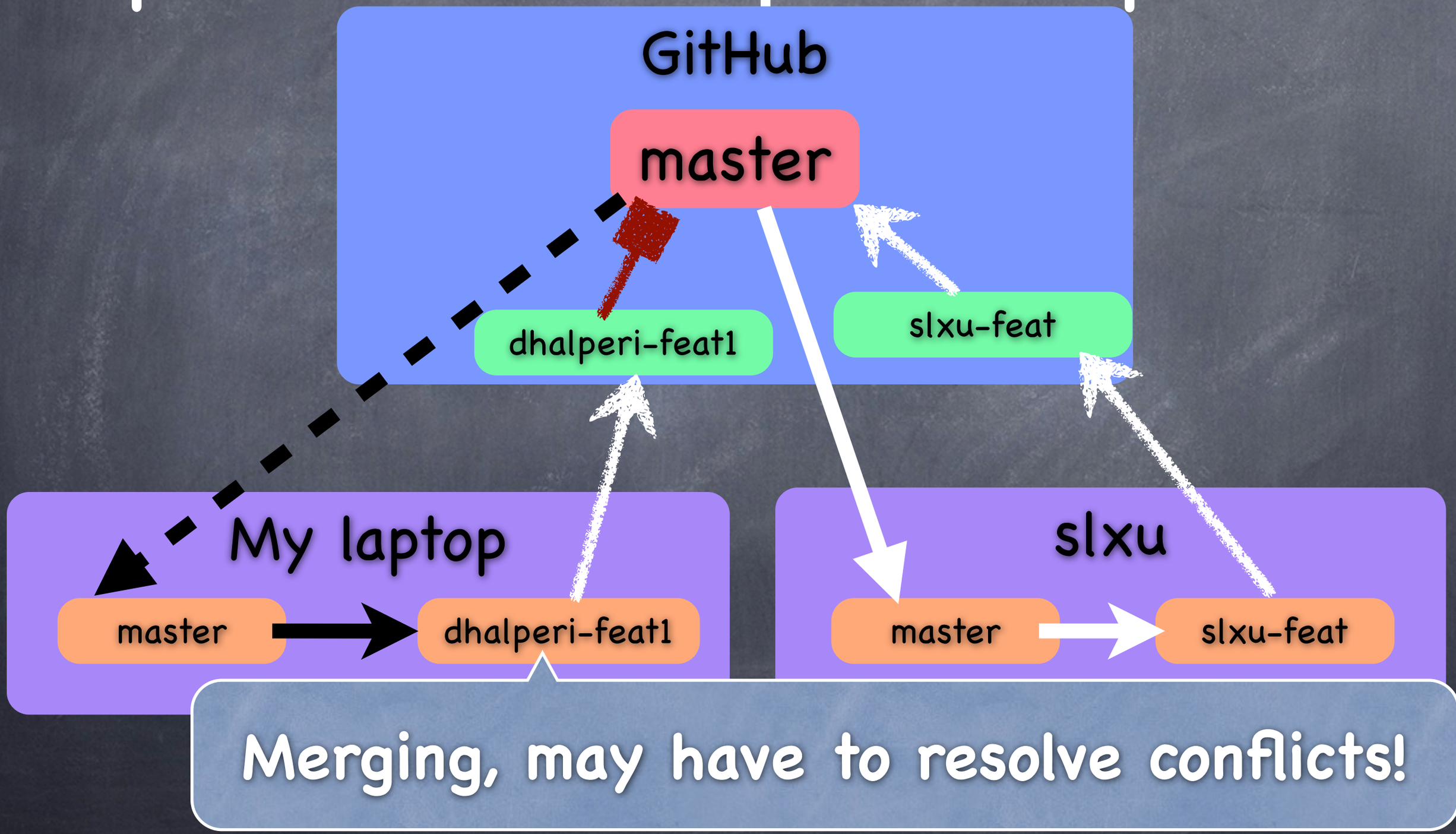

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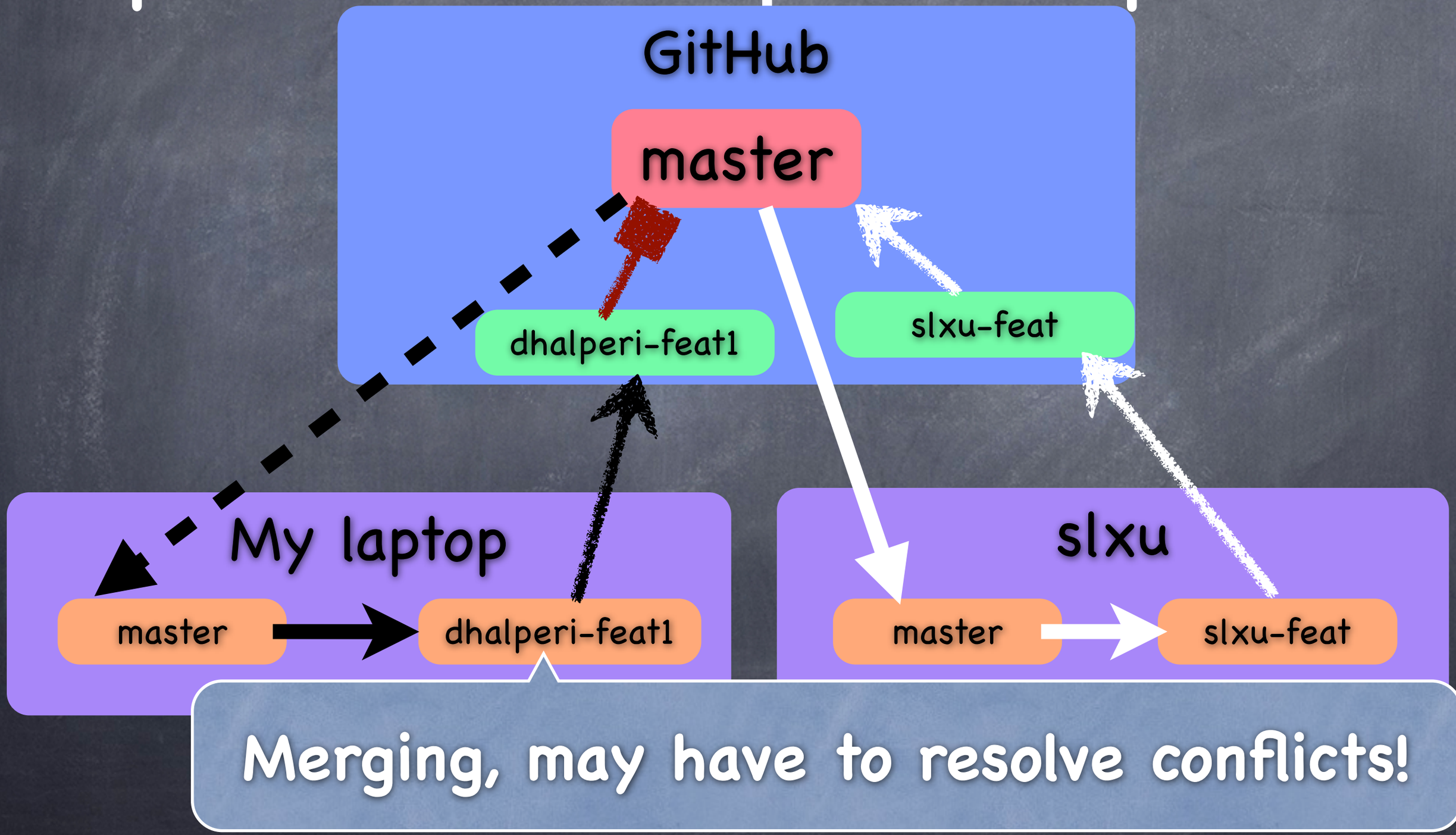

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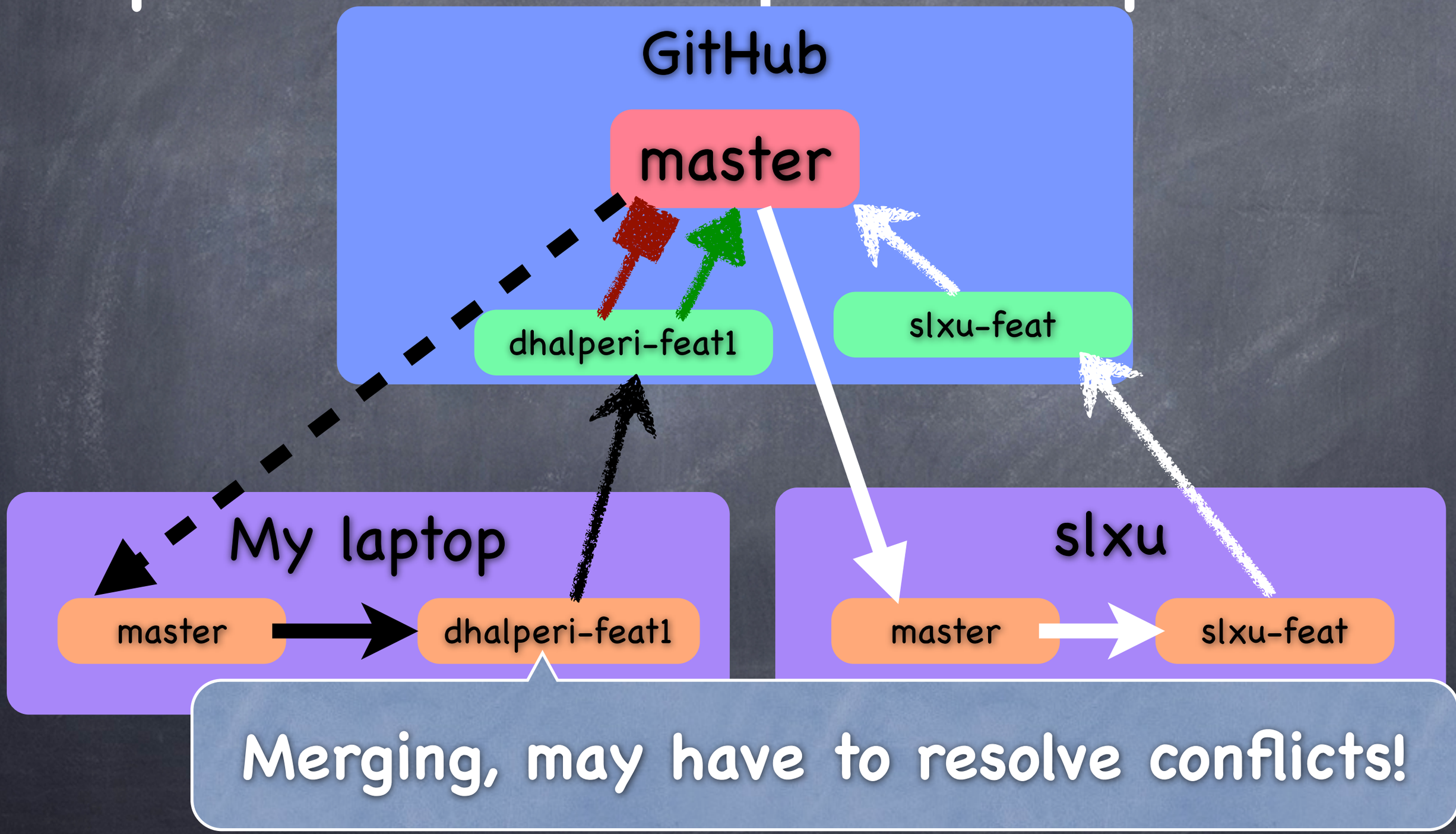

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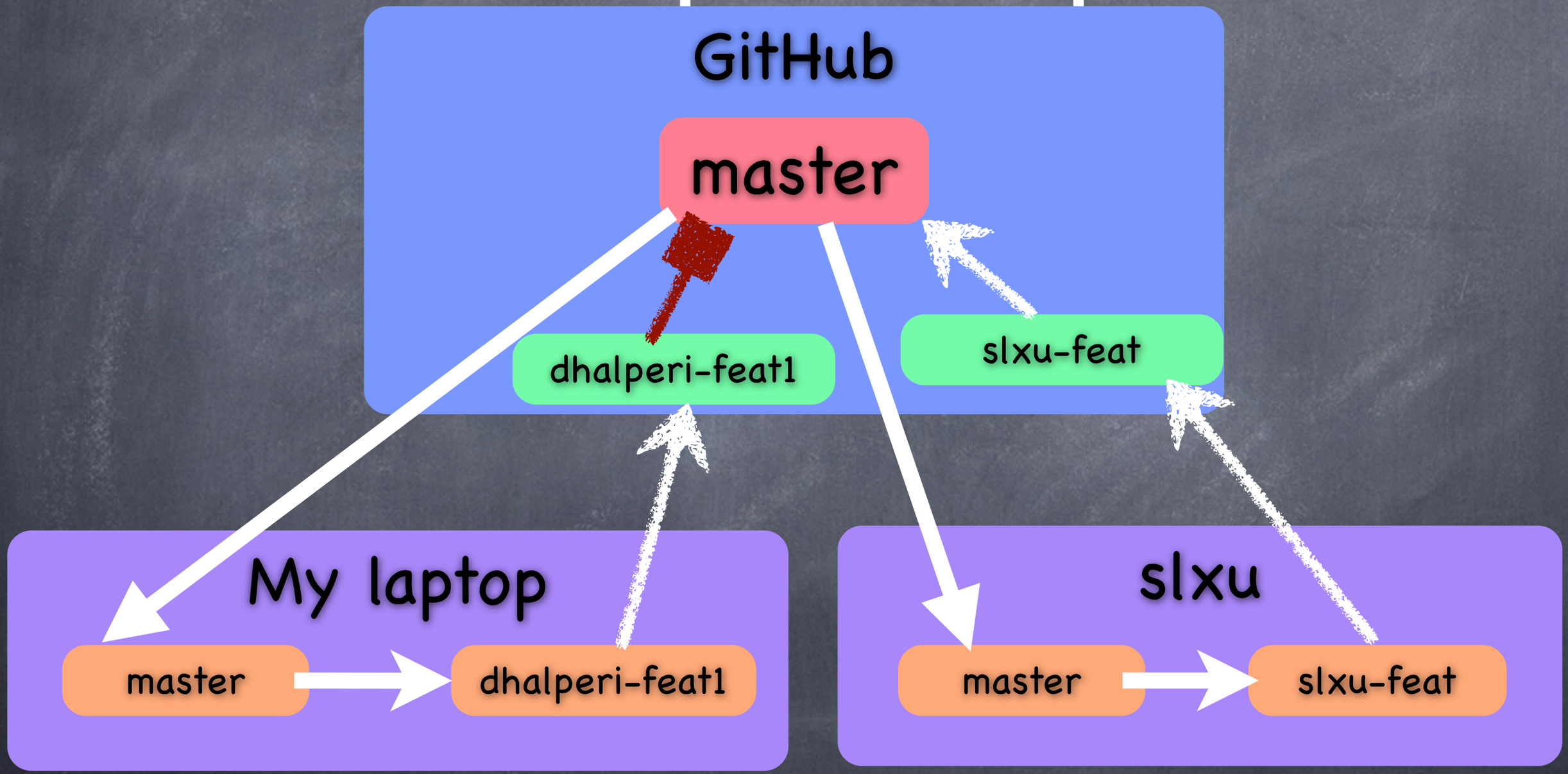

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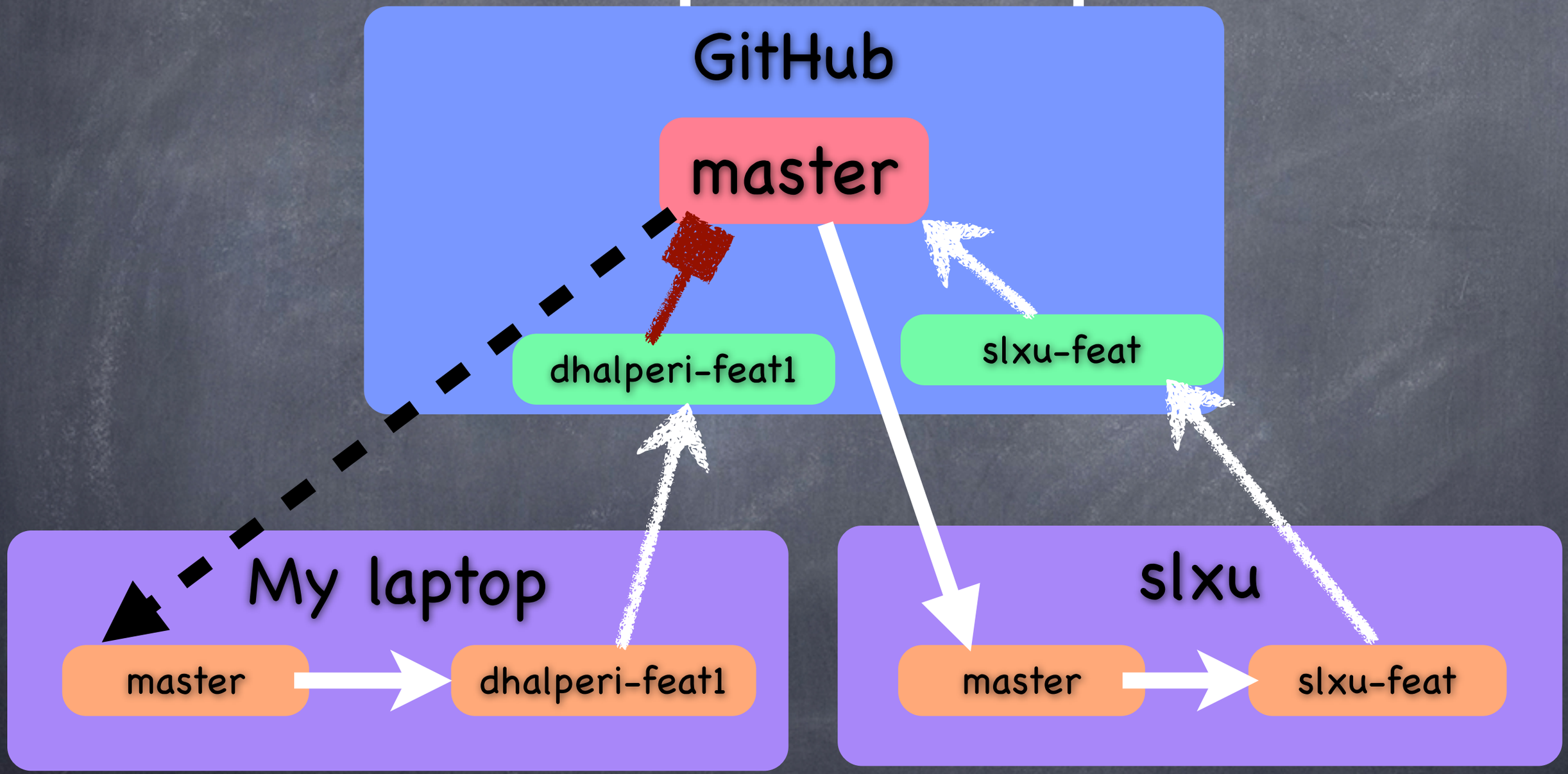

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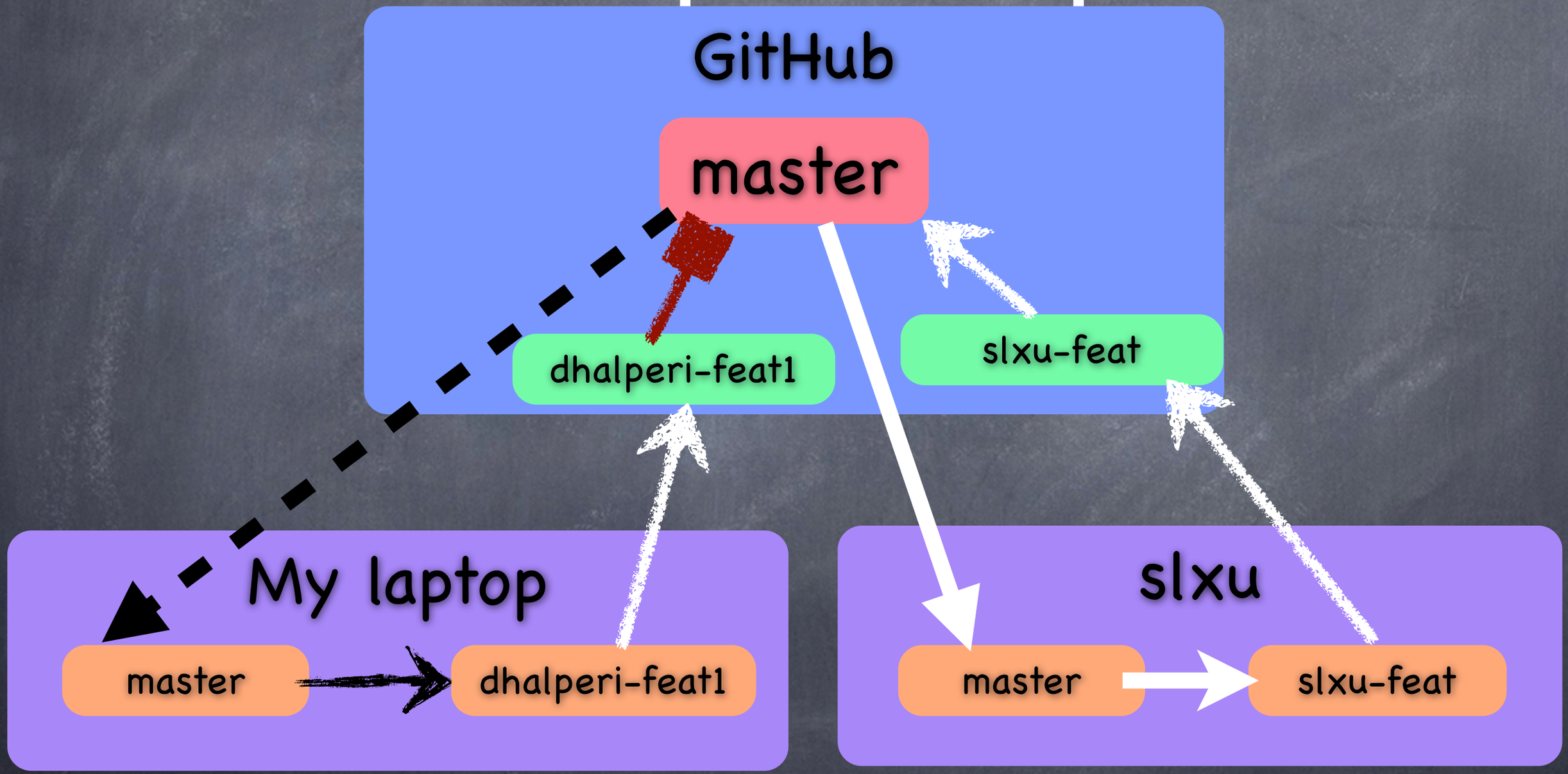

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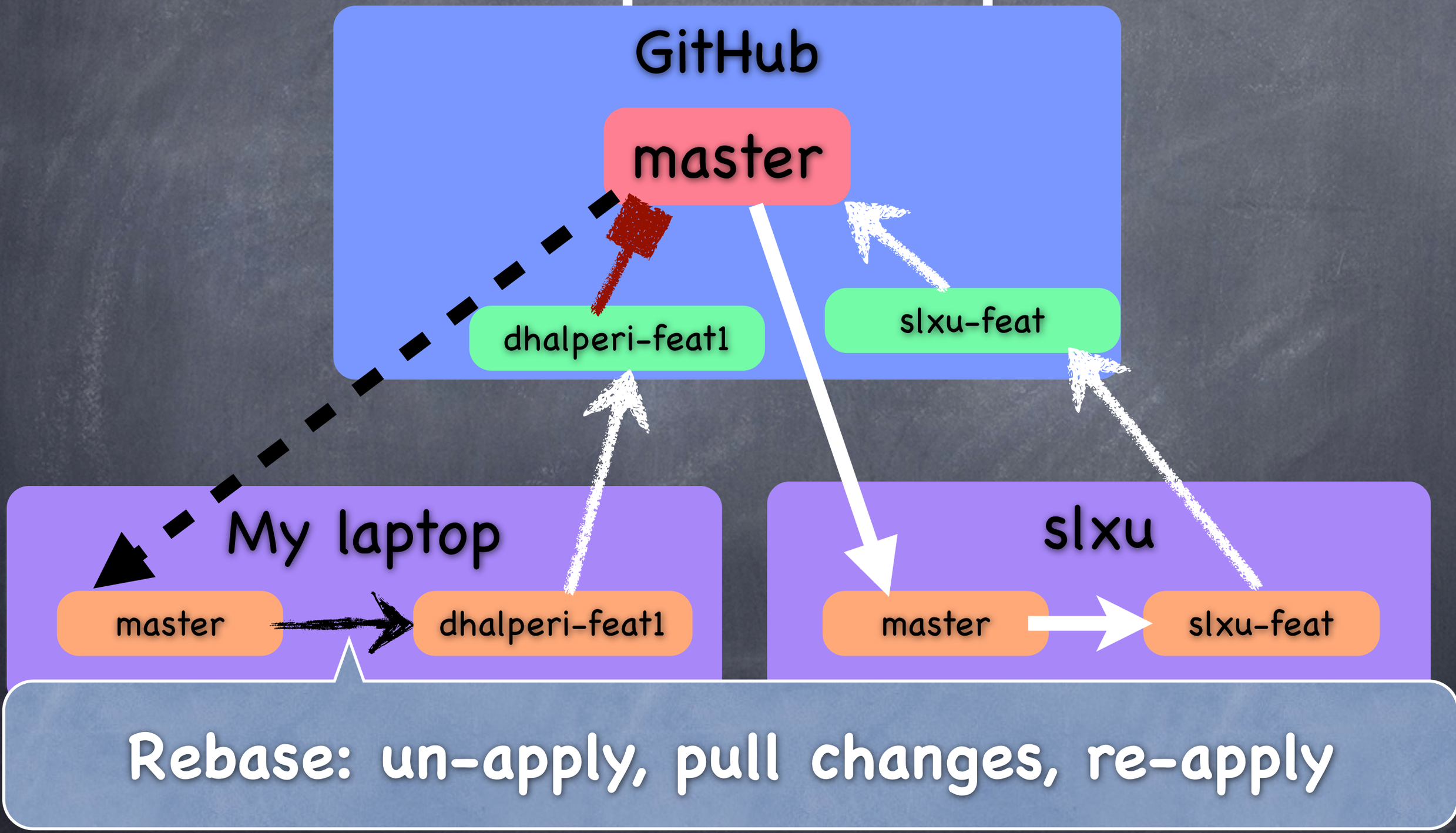

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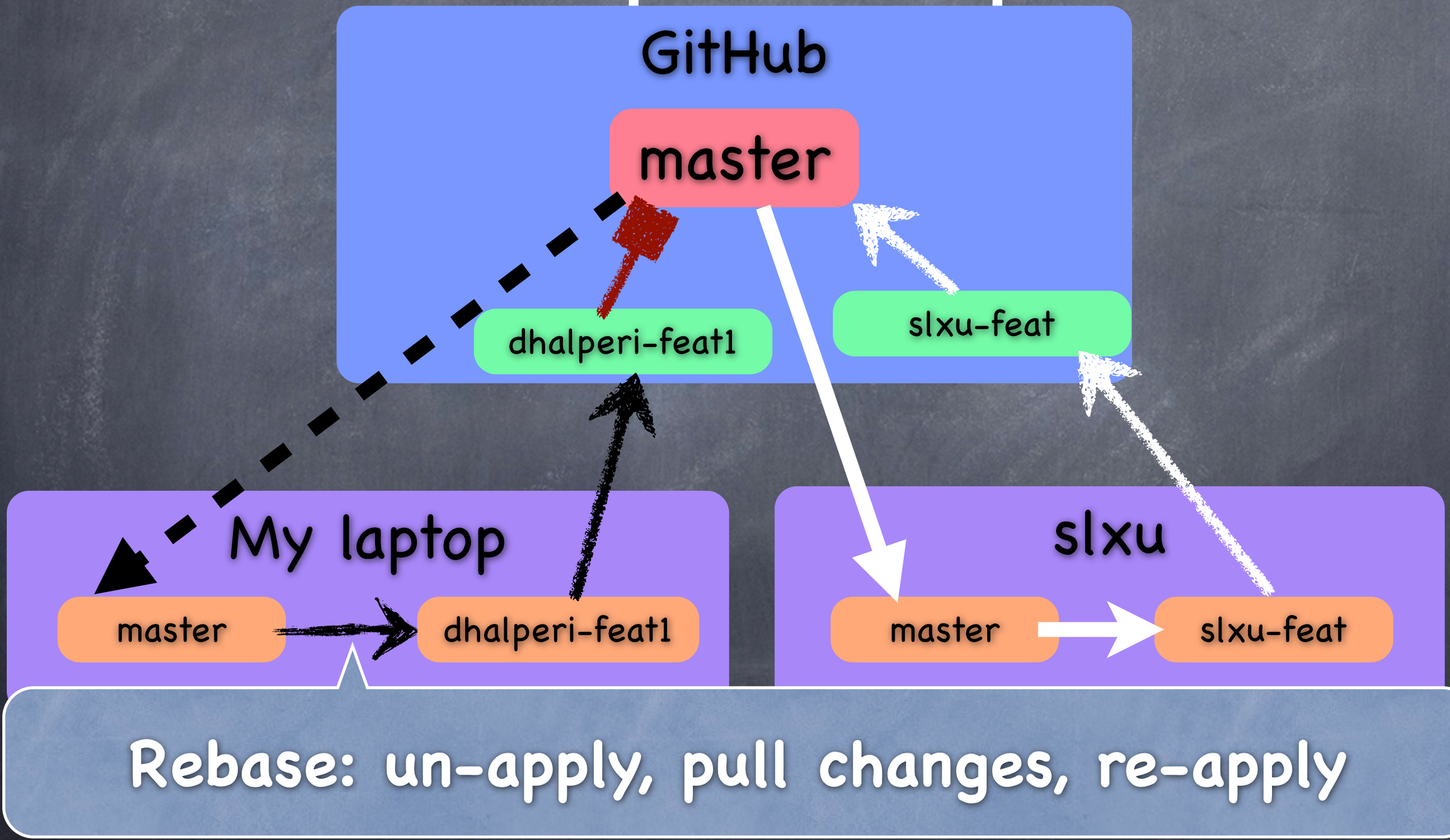

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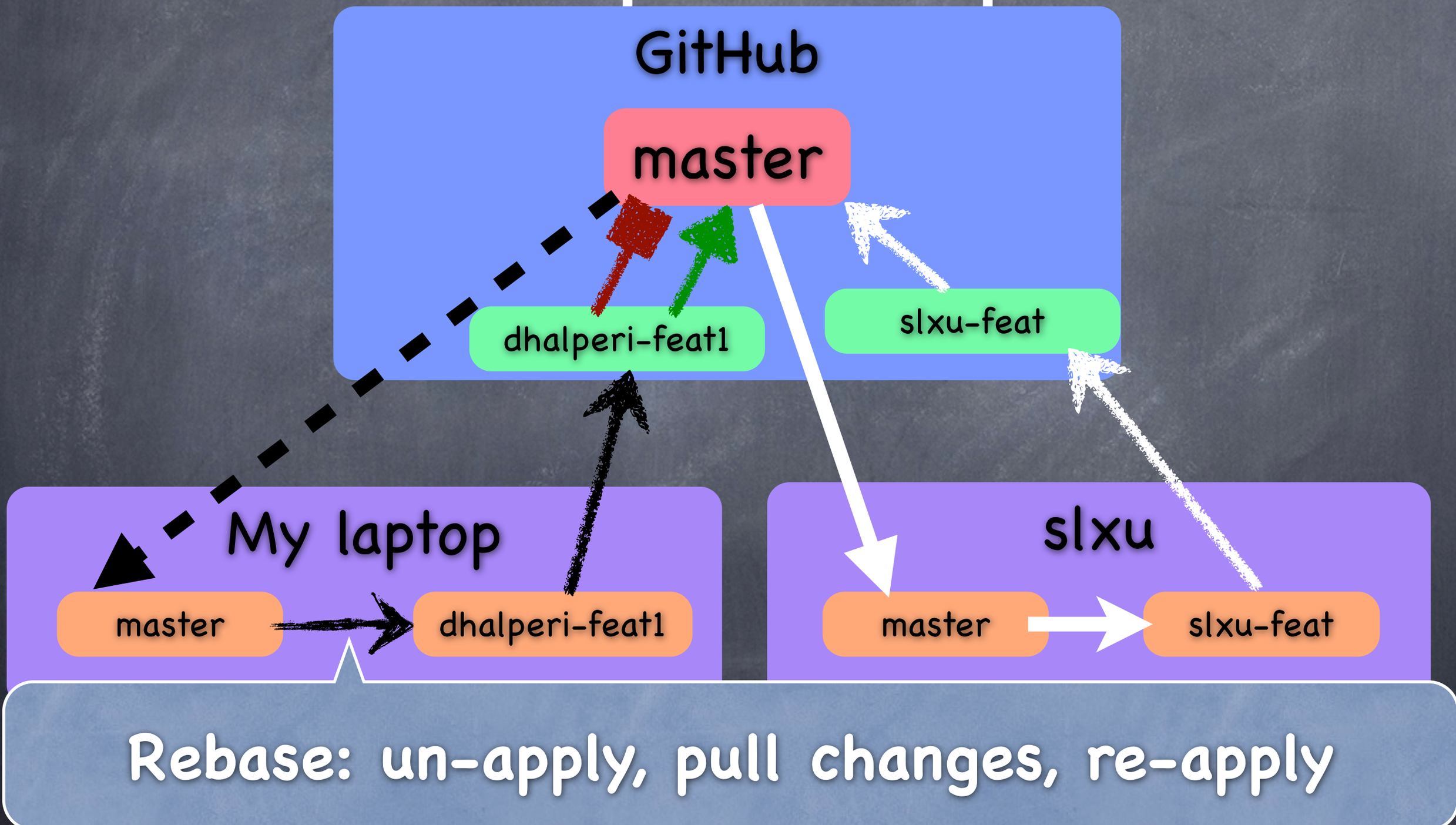


Key principles

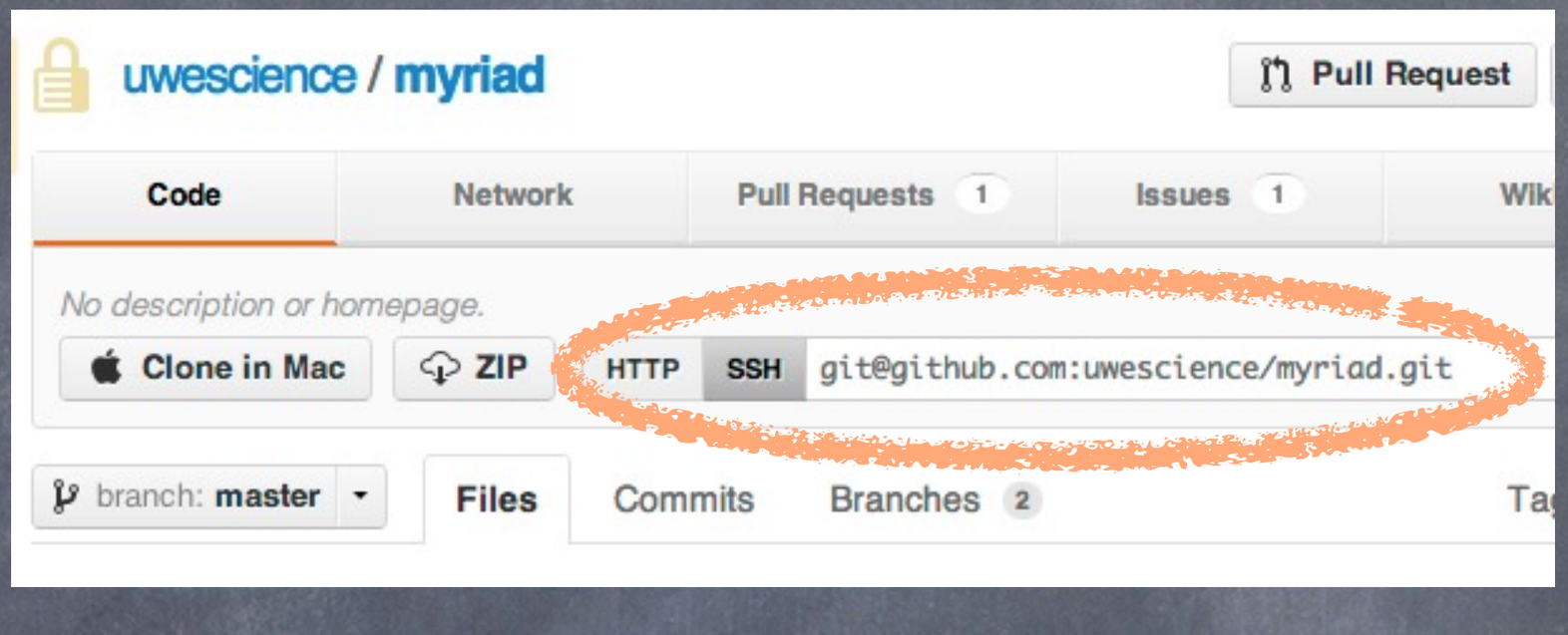
- Make your code easy to review
  - 1 change / commit, good shortlog and log messages
  - Lots of commits, batched into 1 pull request
- Minimize surprises / minimize conflicts
  - Work in a feature branch -> your master can always pull GitHub master w/no conflicts
    - Rebase and/or merge conflicts in your feature branch instead
  - Never push directly to master
    - Push to GitHub branch, then submit pull request
    - All code reviewed before it reaches master branch

Summary

- Git, in my opinion, has much better workflow than SVN
- Distributed >> Centralized
- GitHub has tons of crazy features
  - Commit emails, other simple things
  - Nets Lab has continuous integration testing going w/Jenkins
- What else do you want to know?

Translating from SVN to Git

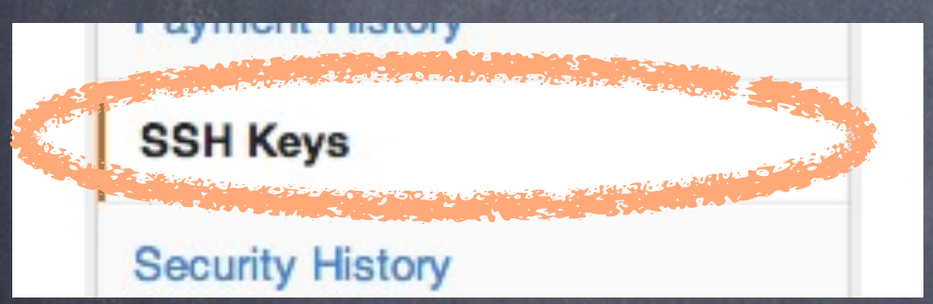
Translate: svn checkout

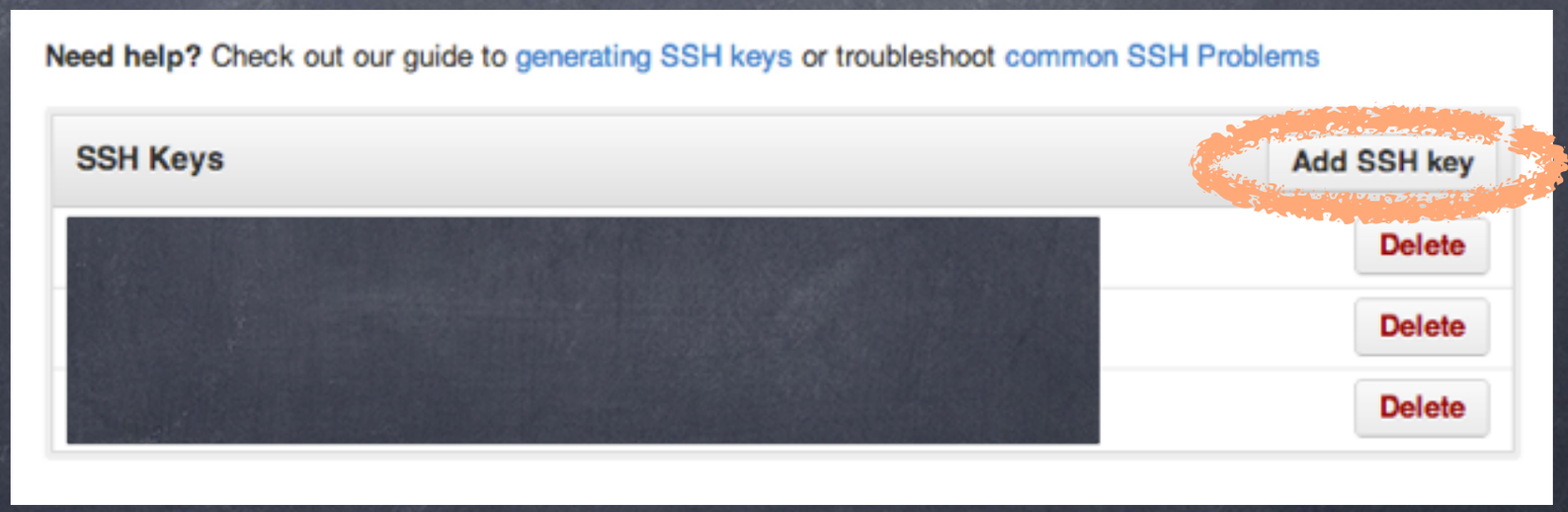


- find repository URL
  - e.g., from GitHub
- `git clone URL [name.git]`
- `git clone git@github.com:uwescience/myriad.git`

Git clone: HTTPS or SSH

- I prefer SSH w/keys
  - In particular, I don't even know my github password. Password reuse is bad!





Translate: svn update

- Fetch and merge all new changes from server
  - `git pull [remote] [branch]`
  - `git pull` =(usually)= `git pull origin master`
- Can do this separately (some would say you should)
  - `git fetch [origin] [branch]`
  - `git merge [origin/branch]`
- For more info: http://longair.net/blog/2009/04/16/git-fetch-and-merge/

Translate: svn commit

- Push to server all local changes, including:
  - tracked files that differ
  - added/deleted files
  - property changes (e.g., make executable)
  - more?

- git makes these two phases:
  - 1) stage changes with `git {add,rm,mv,commit}`
  - 2) generate one or more commits this way
  - 3) send them all to the server with `git push`

Translate: svn status

- What's happening locally

```
dhalperi@dhm temp % git status
# On branch master
# Changes not staged for commit:
#   (use "git add <file>..." to update what will be committed)
#   (use "git checkout -- <file>..." to discard changes in working directory)
#
#       modified:   apple.tex
#
# Untracked files:
#   (use "git add <files>..." to include in what will be committed)
#
#       pear.tex
no changes added to commit (use "git add" and/or "git commit -a")
```

- Tells you which branch is active
- Staged changes: will be committed on `git commit`
- Unstaged changes: diff, but will not be committed
- Any untracked files (no version control)

svn revert: Here there be dragons!

- `svn revert`: undo any local, uncommitted changes
- `git reset --hard HEAD`: `svn revert`
- `git reset HEAD`: just unstages everything, leaves files alone
- `git stash`: take a diff and store it in a local temp place called the stash
- I generally prefer the latter combo, throwing changes away scares me.

svn revert:
Here there be dragons!

- `git revert <commit_id>`: create a new patch that is the reverse of <commit_id>, apply it to HEAD, and `git commit`
- Not `svn revert`!

Translation

SVN	GIT
checkout	clone
update	pull
commit	add &
	commit &
	push
branch	branch
diff	diff
log	log
status	status

SVN	GIT
revert	reset
--	revert