Git

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Code Coffee
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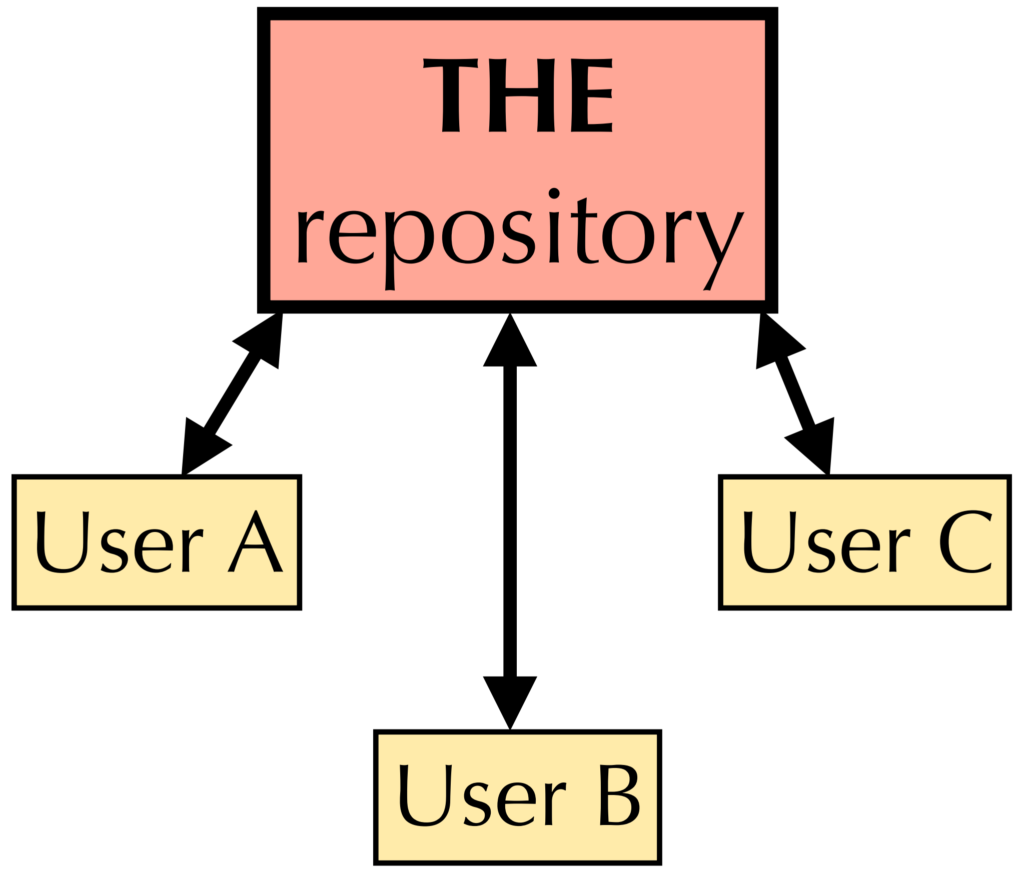
A few questions …

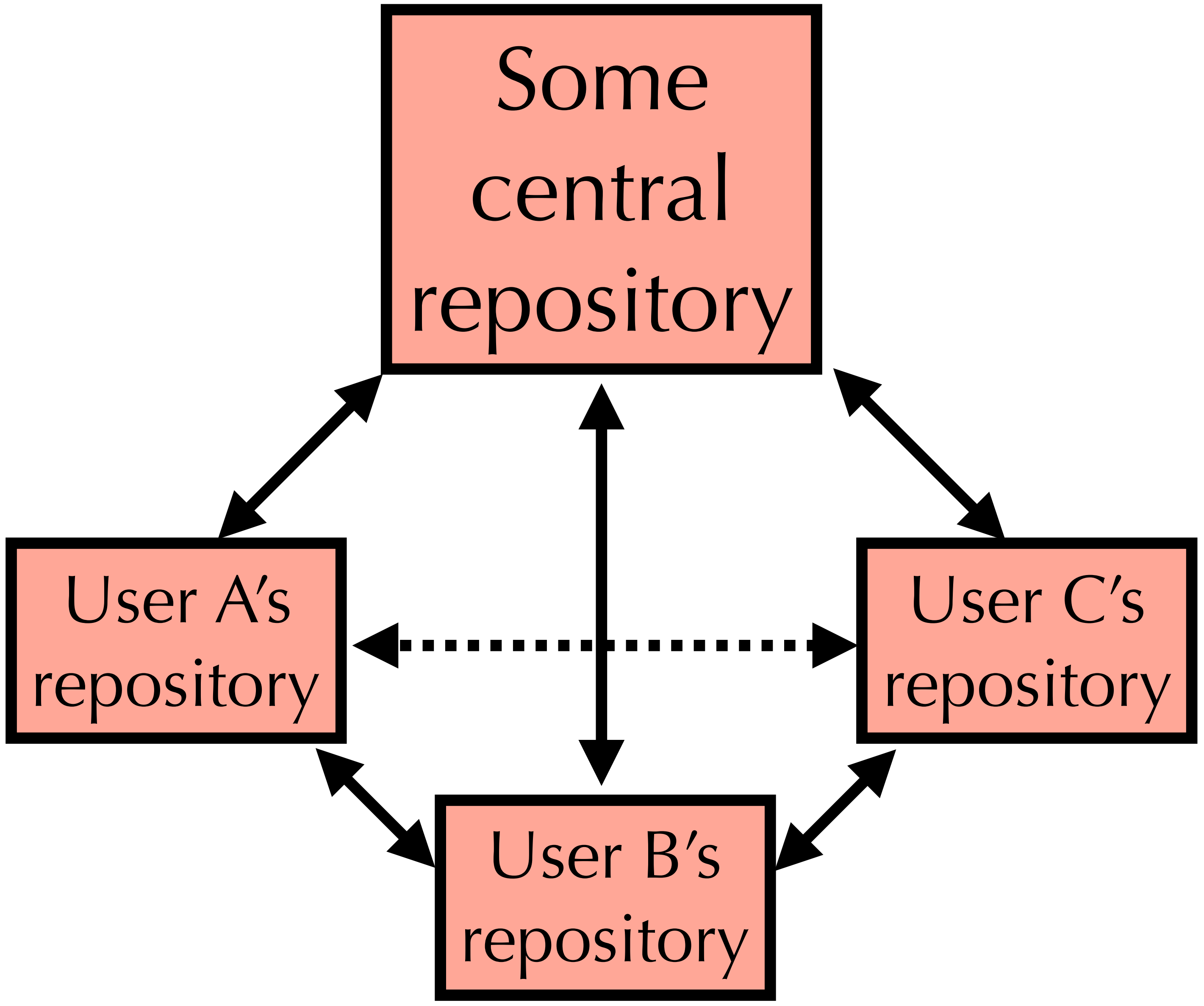
* Has anyone here used **Git** on their own projects? 😃

* Does anyone use a different **VCS** (Version Control Software) other than Git? (e.g. **SVN**, **CVS**, **Mercurial**) 😐

* Does anyone **NOT** use any VCS? 😱

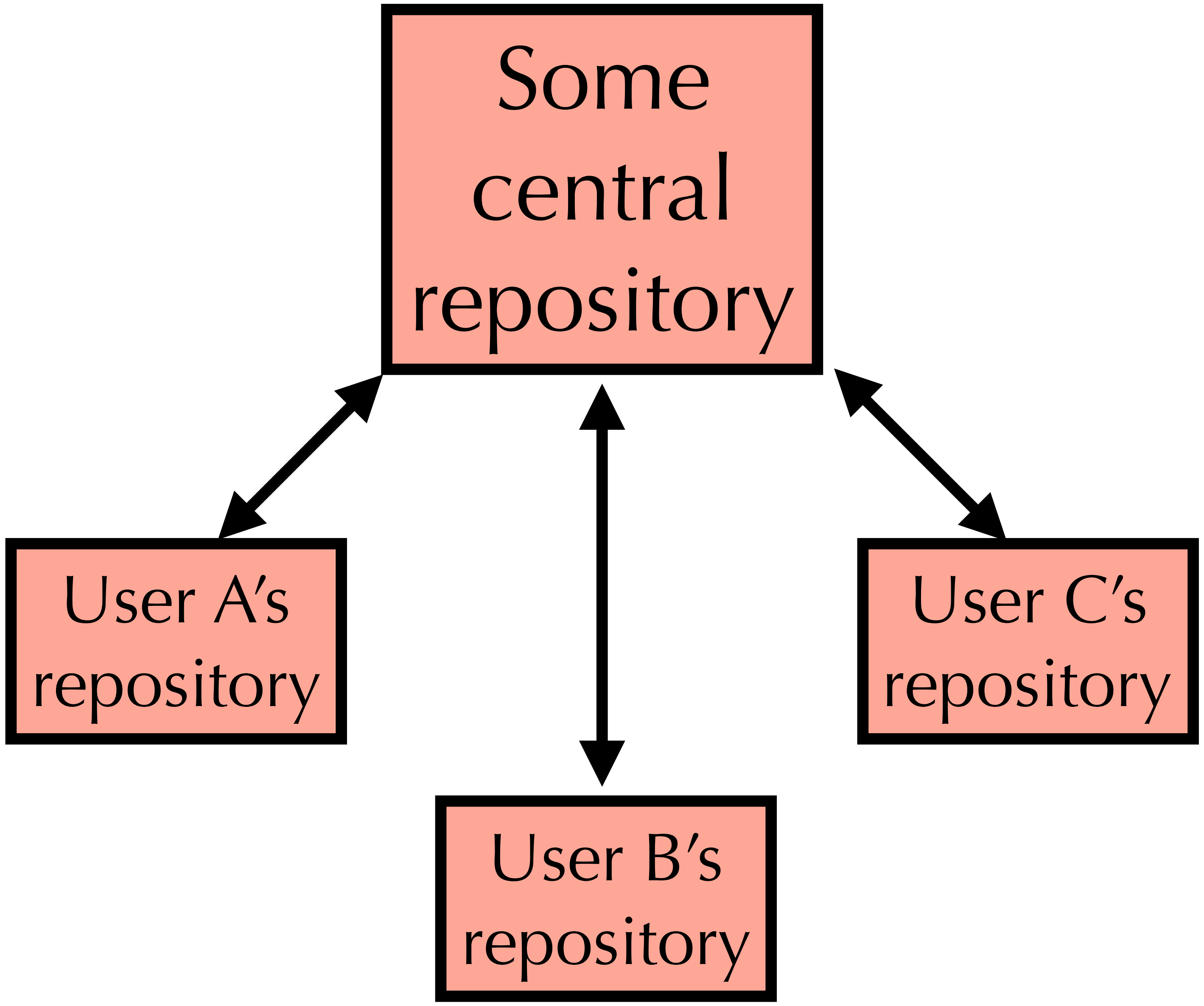
Centralised vs Distributed VCS



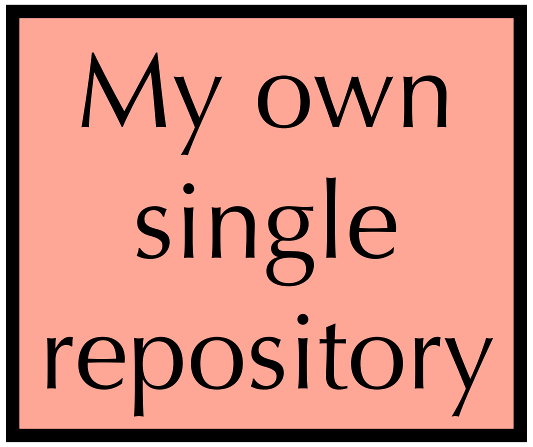


Most common ways of using Git

1. Effective central repository



2. Stand-alone



Git GUIs

* If you don't like the command-line and prefer to use a GUI, there are a large number of Git GUIs available
    * gitk
    * GitKraken
    * Atlassian SourceTree (Windows and Mac only)
    * Plus many more (but NOT necessaily for free)
* Some aspects (e.g. branches, merging, stashing) can be easier to manage using GUIs

Git config options

* Username

```
git config --global user.name “John Doe"
```

* E-mail address

```
git config --global user.email johndoe@example.com
```

* Default editor

```
git config --global core.editor emacs
```

* To check all options

```
git config --list
```

Git primer : Adding files and commiting

- Convert a regular directory into a git repository

```
git init
```

- Add files to the git repository

```
git add file1 file2 file3 …
```

```
git add src/subdirectory
```

```
git add files.????? files.*
```

- Finally commit all files to the repository

```
git commit -m “My very first git commit“
```

Every commit gets a 40-character long hash id, e.g. 6b6edb08dd4316d1ee682f3ff3a94b4205e02f75

Git primer : Diagnostic commands

* To create a (long) list of all the commits of the repository (most recent commits first)

```
git log
```

```
git log —stat
```

More info for each commit

* To get a summary of the current status of the repository

```
git status
```

* To view the difference between recently changed files and those in the repository

```
git diff
```

```
git diff filename
```

Git primer : Making and commiting changes to the local repository

* Make changes to and save any files.

* Inform git of files to be included in next commit (staging)

```
git add modifed_file1 modified_file2
```

* If you wish to move or remove any files

```
git mv filename newname
```

```
git rm filename
```

* Finally commit all files to the repository

```
git commit -m “My first git changes“
```

* Note : shortcut to add and commit all modified files in one go

```
git commit -am “Adding and commiting my first changes“
```

The '.gitignore' file

* 'git status' tells you the status of every file in the git directory, even when you don't want to know about it
    * e.g. Intermediate object files (when compiling), backup files, output generated by the code, other unneeded files
* To tell git to ignore certain filetypes, create a file in the main git directory called '.gitignore'
* Add the names of any files you wish to ignore
* Now everything should be a bit cleaner
* p.s. remember to actually add and commit the .gitignore file to the repository

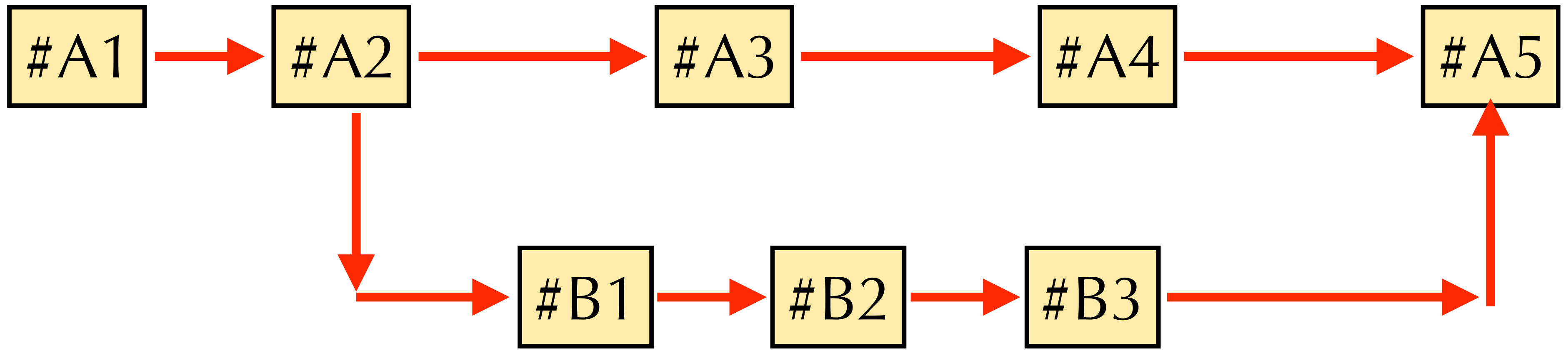
Branches

* Your Git repository can be split into different branches and then merged back together at a later time
* Why do this??
    * Work on a development feature over some timescale in parallel (merge once it's ready)
    * Need to add/test some bug fixes quickly
    * Want to experiment with some new brilliant idea but don't want to pollute the main branch (can delete branch if it's actually rubbish)

Branches

* The default/main branch is called the master branch

Master :



* With multiple branches, the HEAD is a pointer to the currenty active branch and commit

Branches

* To list all local branches (asterix next to currently active branch)

```
git branch
```

* To create a new branch (from current branch) and change to it

```
git branch devel
git checkout devel
```

```
git checkout -b devel
```

Combine both steps

* To delete a branch at any point

```
git branch -d oldbranch
```

Merging branches

- Merging one branch to another means to apply all unique commits in the second branch back to the first branch
- If all the commits affect different parts of the files, then this is trivially done. First change to the target branch (i.e. the one we wish to merge into)

```
git checkout targetbranch
```

- Then merge in all commits from the source branch

```
git merge sourcebranch
```

```
git rebase sourcebranch
```

Different type of merge

When merging goes wrong : Conflicts!

* If you change the same line in different commits and then try to merge, chaos ensues!

How to resolve conflicts

* Git will mark out in the file the conflicted lines with HEAD and the commit hash id (and a string of the log)

* To resolve the conflict, we must simply open the file and choose which of the two options we wish to retain

* Next, save and close the file, then add and commit to tell git the conflict is officially resolved

* In GUIs/IDEs, sometimes there are simple ways to select the chosen lines and commit the corrected files

Github

* Github is a code hosting web service, using Git (obviously) as the VCS
* Free for publically available projects
* Private repositories cost 7+ Dollars (approx 5.70+ Euros) per month (unlimited)

Setting up a Github repository

* Get a Github account
* Go to 'Your Profile' -> 'Repositories'
* Click 'New'
* Give your repository a name and select all basic settings (e.g. public or private)
* Clone your (empty) repository to your local machine

```
git clone https://github.com/username/reponame.git
```

Remotes

* To be able to access external repositories (either on your local machine, or on a server), you need to set-up a remote repository

* When you use 'git clone', the remote is automatically set-up for you

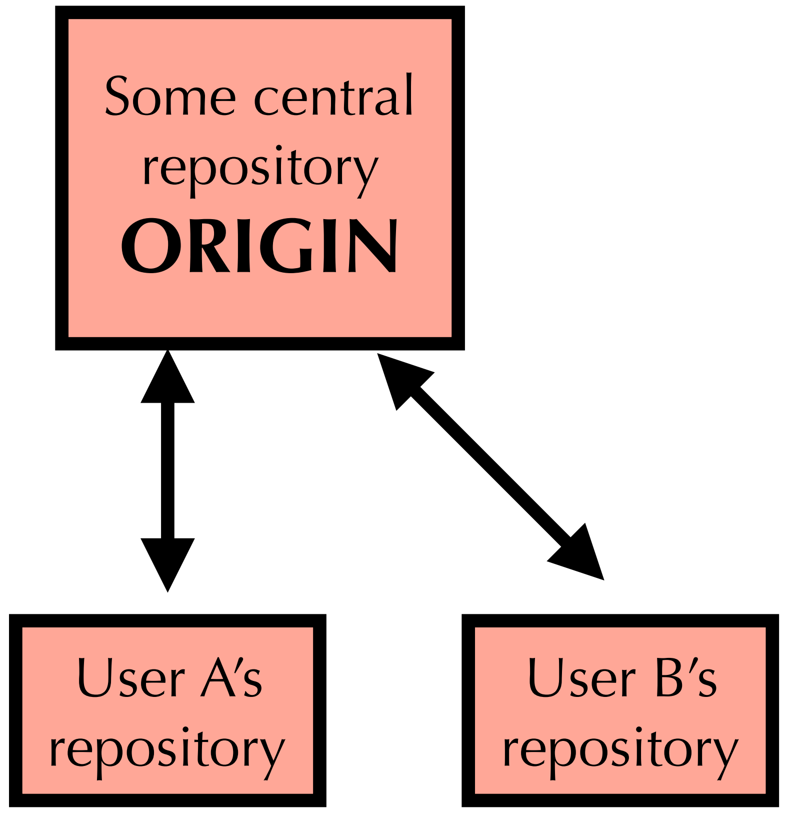
* By default, the 'central' repository is called 'origin'

* To see your remote repositories

```
git remote
```

```
git branch -vv
```

Gives info on remotes for branches



Working with remotes

* To retrieve an updated version of the repository from the remote

```
git fetch
```

* To update a specific repository from the remote repository

```
git pull origin reponame
```

Note : This is like a git merge
Can lead to conflicts!!

* To update the remote repository with your own local commits

```
git pull origin reponame
```

Must first update before pushing

```
git push origin reponame
```

Pull requests

* Often only certain users will have admin rights to push to the main repositories
* Regular users can submit a 'pull request' to the github repository
* This is like sending code to be included but it must be 'approved' by the main admin users before it can be included
* p.s. Regular users might need to fork the project rather than just a regular 'git clone'

Undoing things with Git

* Undoing things with Git can lead to a world of pain so be careful!

* If you've changed a single file but have changed your mind and want to go back to the original version

```
git checkout — filename
```

* If you've already added a file with 'git add' but have changed your mind and wish to undo that

```
git reset HEAD filename
```

Undoing things with Git

- If you've editted many files and need to update (via git pull) but don't want to commit yet

```
git stash
```

Puts all changes into a local patch file

- To re-add the changed code afterwards

```
git stash pop
```

```
git stash apply
```

Same as pop except it does not delete stash file

Git tips

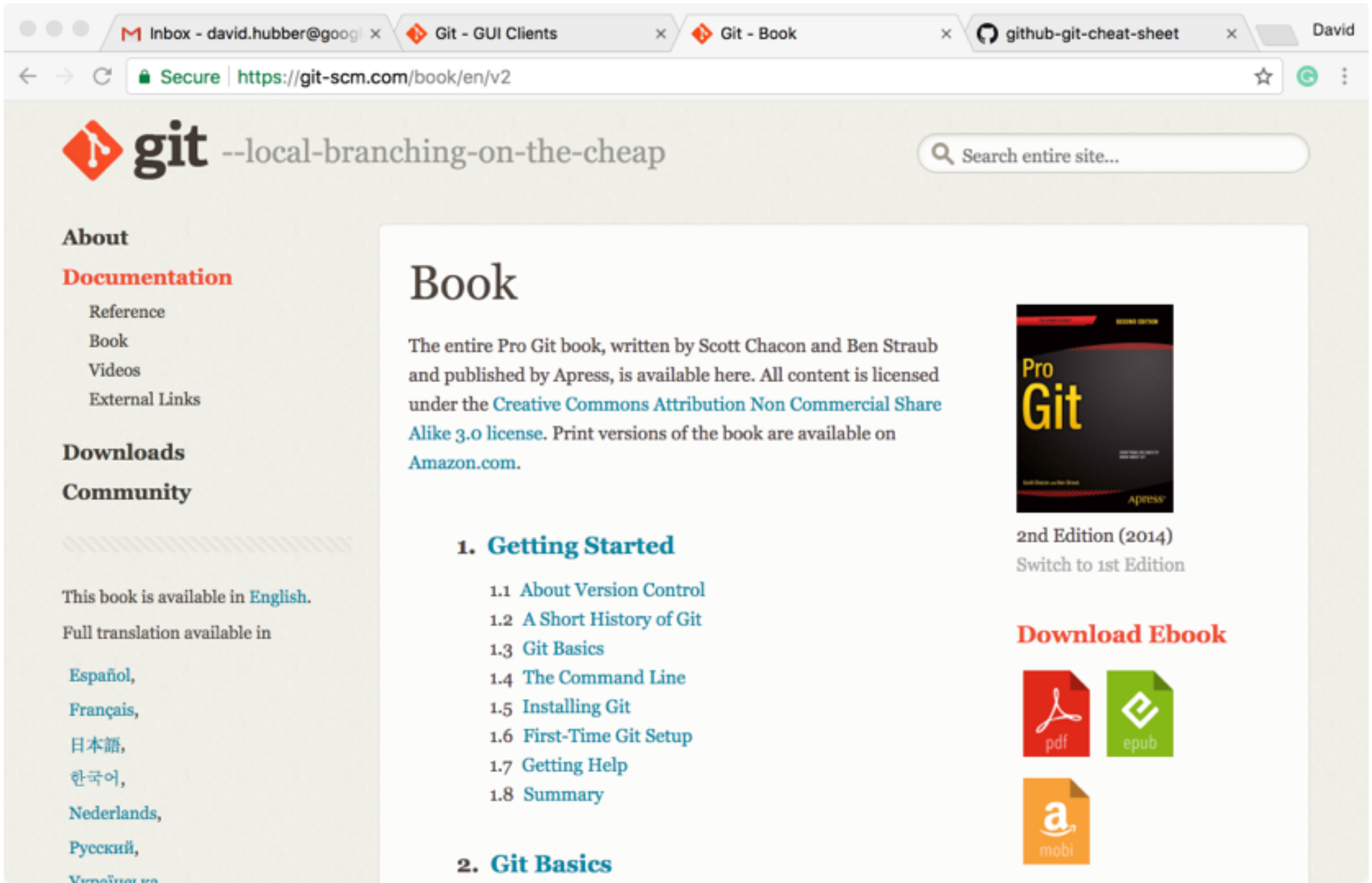
- Make a single commit per new or modified feature
  - If you decide to remove this feature, or find that you've introduced a bug, it's much easier to identify it and purge it from existence if it's contained in a single commit
  - Easier to write concise accurate logs with one or few features per commit
- Always make a new branch before adding a new major development feature, espeically if its experimental
  - If you find its a disaster, you can simply delete the branch and not have your git history contaminated by dead, useless code

Git tips

- Do NOT commit binaries and other large data files (unless absolutely necessary)
    - Git records a history of all added files and the Git metadata can become very big indeed if many large files (which might change with every commit) are added
- Use git stash for emergencies (e.g. when merging, pulling/updating) but try to reapply the stash asap
- Don't try and leave it too long between merges. Always try and update the development branch whenever the master is itself updated (e.g. by a merge with another branch)

Git online book

https://git-scm.com/book/en/v2



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Book

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