git

GitHub

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What to Expect

- Knowledge about Version Control System
- Be familiar using CLI
- Have good practice of using GIT
- Collaborate with others using GIT
- Working with remote repository
- Explore of Github

Agenda

Day 1

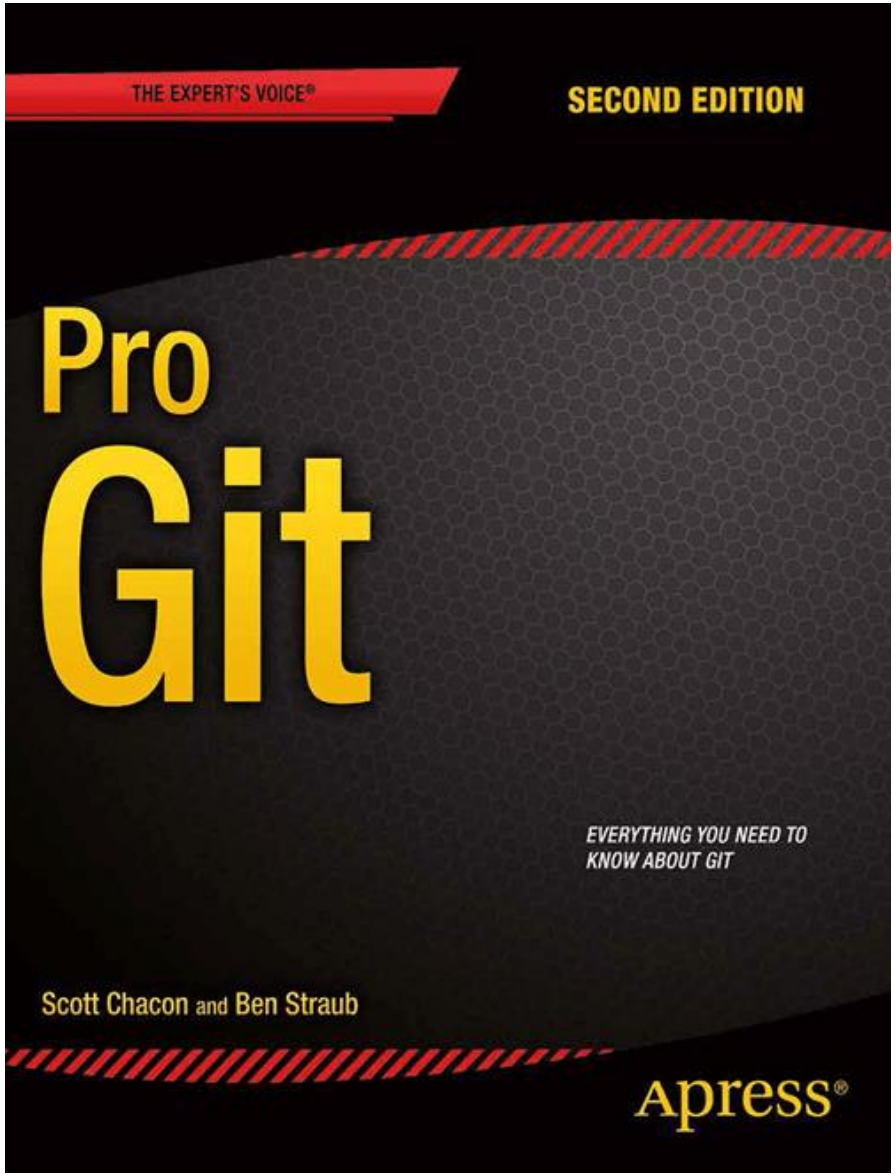
- 09:15 – 09:30: Introduction
- 09:30 – 10:30 : Version Control System (Types – git – how it works)
- 10:30 – 10:50: Break
- 10:50 – 12:30: Dealing with Command line environment

Agenda

Day 2

- 09:15 – 10:30: Git core functionalities
- 10:30 – 10:50: Break
- 10:50 – 11:30: Working with remote (github)
- 11:30 – 12:15: Teamwork
- 12:15 – 12:30: Closing remarks

Reading recommendation & resources



Available online: link

Git: Version Control System (VCS)

- Record changes to directory, files, code
- Essential tool when collaborating with others
- Good-practice to use even without working with others
- Git is the most used VCS
- Created by Linus Torvaldes
- Git is a free and open-source software
- It is simply a file inside your directory

Other VCS

- Apache Subversion (svn)
- Mercurial
- Perforce Helix Core
- Monotone
- Others

Discussion

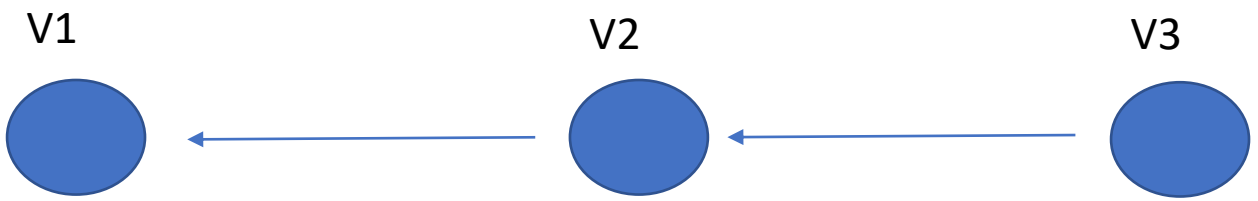
- What are the pros and cons of using a version control system?

VCS Approaches

- Basic: make copies of folder with time stamps
- Manually edit changes from others into your code
- Ends up with final copy or version to use

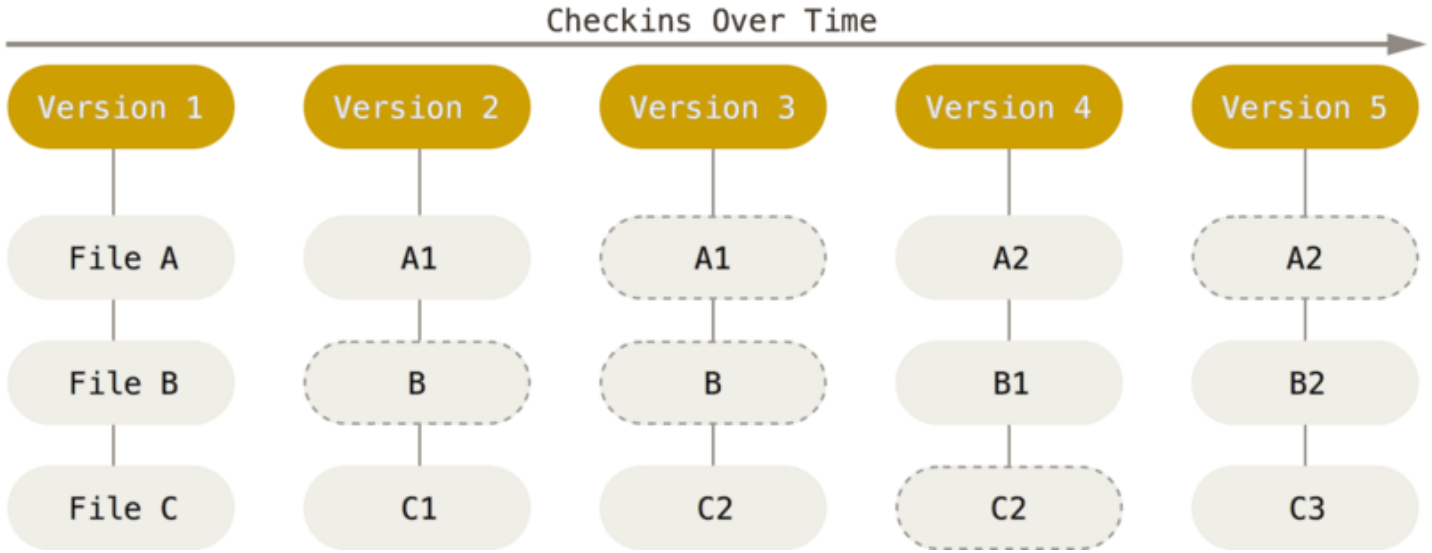
VCS Approaches

- Take a linear snapshots of the tree history



This is a more recent approach than the other one.
It's a good way but when working with many people it is difficult to keep a linear development

Git: Snapshots of changes



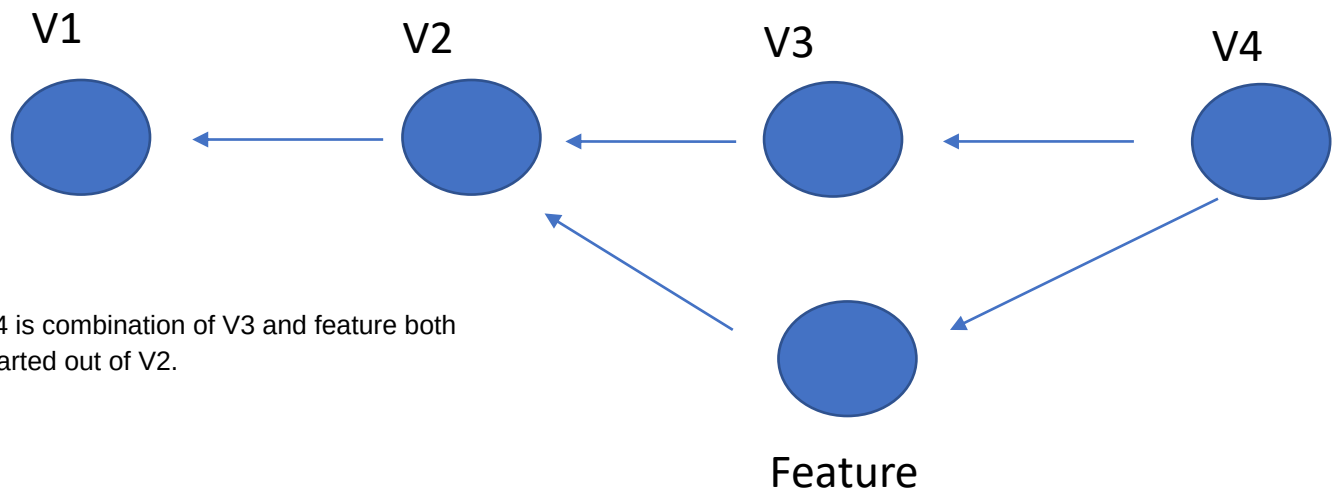
This is again another approach: this way avoid multiple copy of the same content

Credit: Pro Git book, Git Documentation

VCS Approaches

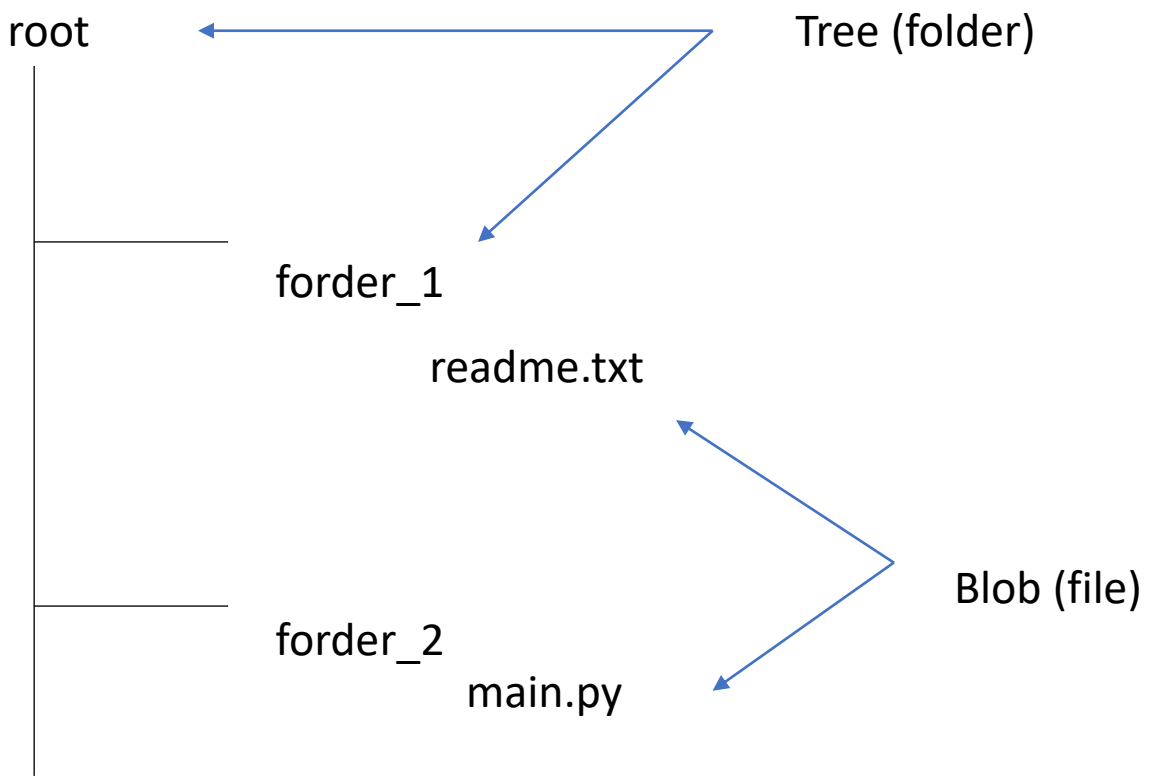
- Git: Directed acyclic graph history

This is the Git way, linear history model that allows the history to diverge from the linear. This is great when working with other people.



V4 is combination of V3 and feature both started out of V2.

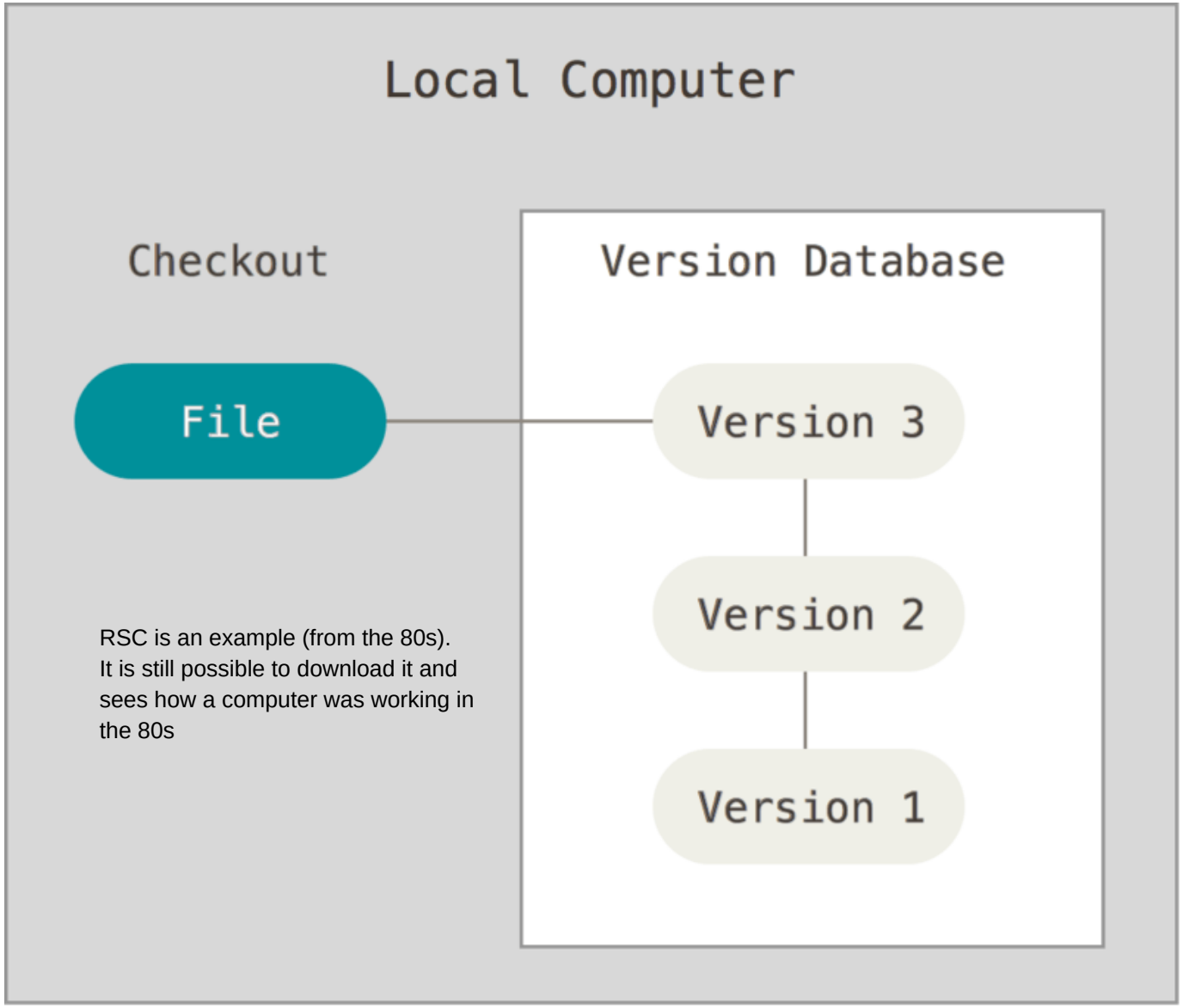
Directory structure



A blob is just a file, a tree is a folder.

Git call all of them objects and hash them. Hashing is converting the object in a very small hashed object.

Local VCS

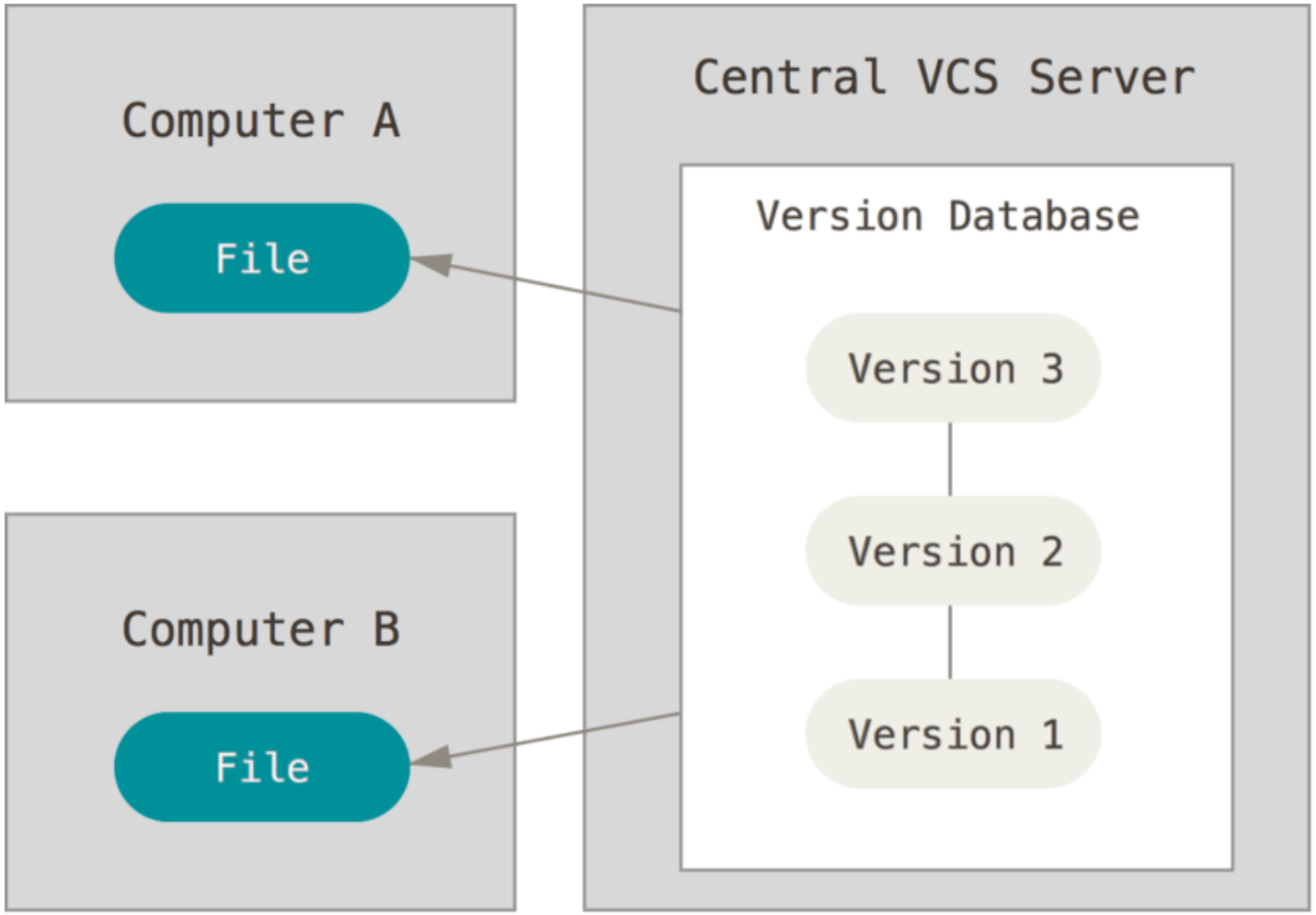


RSC is an example (from the 80s).
It is still possible to download it and sees how a computer was working in the 80s

This is a very basic and old structure of a local VCS.
In this type of local VCS it is not possible to work with other ppl, it is not too secure, in case the system get corrupted there is no other way to retrieve the informations.

Credit: Pro Git book, Git Documentation

Centralized VCS

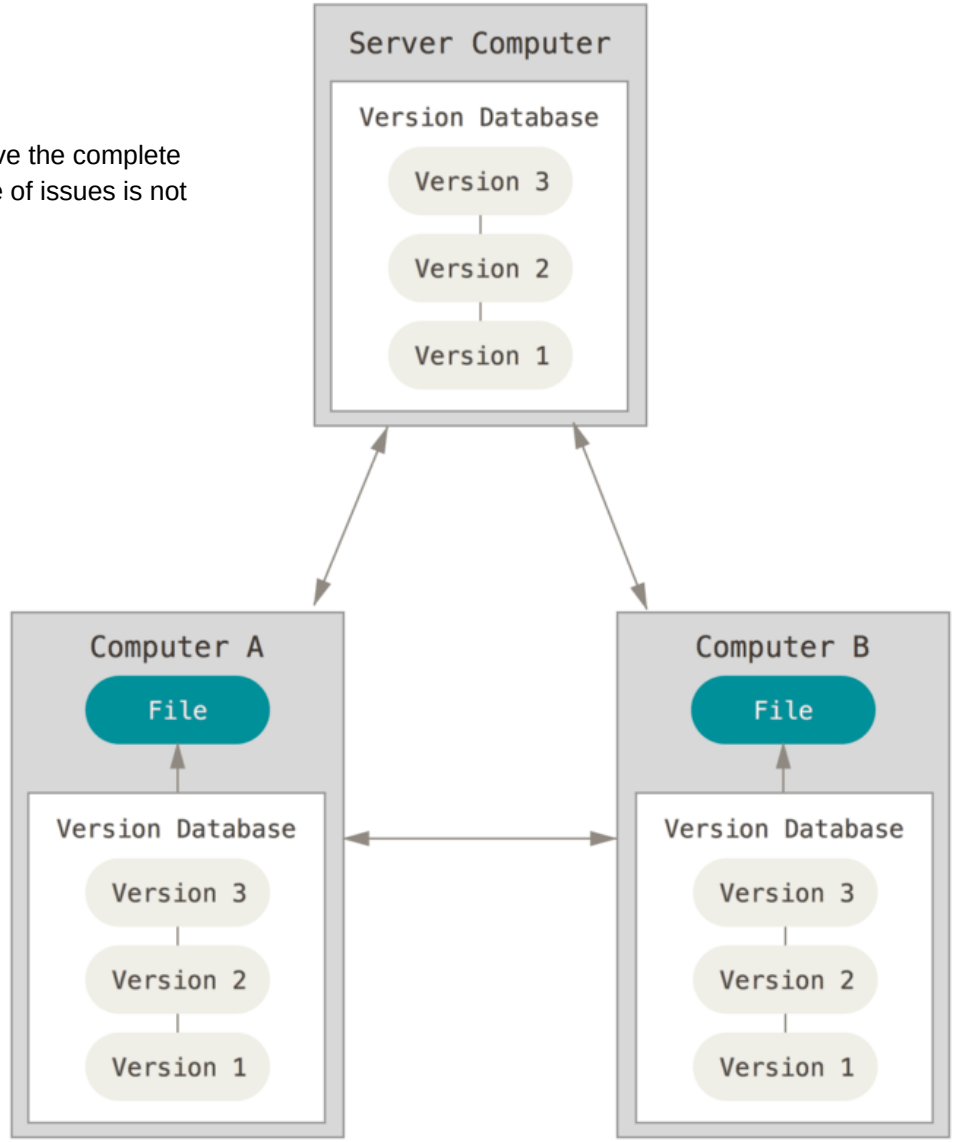


This is an improvement from the past one as more ppl can work in the same project. Cons is that if the connection is down it's not possible to commit the change, no one has in their pc a full version of the doc. Apache is an example

Credit: Pro Git book, Git Documentation

Distributed VCS

This is the Git way, everyone have the complete clone of the project, even in case of issues is not an issue to retrieve the data.
This is fully centralized VCS.



Credit: Pro Git book, Git Documentation

The Command Line with Git

Why the command line?

1- Can run **all** git commands and functionalities

2- If you can use git in command line, you will probably know how to use it in GUIs and not vice-versa

Git was created to work with command line, it is not really user friendly but once learned very efficient.

Git can also be used via GUI, we cannot do everything in GUI but you can in command line, better to learn that directly.

Useful commands

- pwd: Print working directory
- cd: Change directory (cd /mnt/c/users/example/desktop)
- Cd .. : One level up
- ls: «List» It lists the content of directory
- ls -h: list the content of directory in human readable format
- ls -a: list all files and directory (includes hidden)
- cat example_file: see the content of a file
- mkdir dir_name: create a new directory in your working path
- man command: gives the documentation of a command
- command --help: also displays information about certain command
- Check the cheat sheet for similar commands on Windows terminal

Useful commands: Tasks

- List the files of a directory & sort them by size
- Find the usage of –r flag in rm and use it
- Use head or tail commands to display certain number of lines (5 or 7 or any number)

Git: Getting started

- Check the following link to download on your OS: https://git-scm.com/downloads
- Debian / Ubuntu: sudo apt-get install git

```
ahmad9090@LAPTOP-RTERJCFR:~$ sudo apt-get install git
[sudo] password for ahmad9090:
Reading package lists... Done
Building dependency tree
Reading state information... Done
git is already the newest version (1:2.37.1-0ppa1~ubuntu20.04.1).
The following packages were automatically installed and are no longer required:
  libfwupdplugin1 libllvm11
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
ahmad9090@LAPTOP-RTERJCFR:~$
```

- Check if installation went well: # git --version

```
ahmad9090@LAPTOP-RTERJCFR:~$ git --version
git version 2.37.1
ahmad9090@LAPTOP-RTERJCFR:~$
```

Git: Getting started

Set up account username, email & password

1- Username

```
# git config --global user.name “Example user”
```

2- Email

```
# git config --global user.email
“example.user@email.com”
```

3- Password

```
# git config --global user.password “some password”
```

Git: Getting Help

- # git help command

  Example: git help config

- Shorter help page: # git command –h

  Example: # git config –h

Find the command to display all your global configurations.

Git: Create a repository

There are two ways to obtain a git repository:

1- Turn a local directory into a repository
2- clone a git repository from somewhere else

Git Create a repository

Create a local repository:

- Change your path into the directory where you want to create a repository

```
# cd /home/user/my_project
```

- Type the following command:

```
# git init
```

You can see a new subdirectory created ".git" inside your directory. For more information about the content of ".git": https://git-scm.com/book/en/v2/Git-Internals-Plumbing-and-Porcelain#ch10-git-internals

The Three States of Git

Modified (Untracked): Changes to file or directory but not added to git database.

```
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   LICENSE
        modified:   README.md
        modified:   name_entities_example_restaurants_zurich.txt
        modified:   webscraping_with_selenium.py

no changes added to commit (use "git add" and/or "git commit -a")
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$
```

The Three States of Git

Staged: The modified file has been marked for changes to be committed.

git add file_name or

git add . to mark all the files that are modified

```
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git add README.md
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.md

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   LICENSE
        modified:   name_entities_example_restaurants_zurich.txt
        modified:   webscraping_with_selenium.py

ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$
```

The Three States of Git

```
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   name_entities_example_restaurants_zurich.txt

no changes added to commit (use "git add" and/or "git commit -a")
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status -s
 M name_entities_example_restaurants_zurich.txt
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git add name_entities_example_restaurants_zurich.txt
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status -s
M  name_entities_example_restaurants_zurich.txt
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$
```

git status -s

The Three States of Git

Committed: The changes are safely stored to your local database

```
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git commit -m "version 2, changes to all files"
[main 0336347] version 2, changes to all files
 4 files changed, 221 insertions(+), 221 deletions(-)
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$
```

Skip the staging area by adding -a argument: # git commit -a -m “fix bug in example.py”

Commit: Best Practices

- Commit Related Changes
- Commit frequently
- Keep it short (about 50 characters)
- Don’t commit half-done work
- Test your code before commit
- Use imperative voice “fix bug”, instead of “fixed bug”
- Leave second line blank if writing long commit

Commit: Best Practices

- What is wrong with this stagging / committing?

```
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        new file:   .DS_Store
        new file:   products.ts
        new file:   registration.test.ts
        new file:   registration.ts
        new file:   validation.test.ts
        new file:   validation.ts
```

```
git commit -m 'Updated various areas such as validation,
registration and products pages'
```

Errors they made here:boundeling many different files in one commit (m

Source: freeCodeCamp.org

Task

- Create a new directory
- Create a git repository inside the diroctory
- Add files into the diroctory
- Commit the changes of the directory into git

Ignore files

- Sometimes there are files that you want git to ignore from tracking.
- Create a file inside your repository called .gitignore
  with linux: # touch .gitignore
  with winows: # type nul > .gitignore
- Write the name of the file inside .gitignore

```
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ ls -l
total 11517
-rwxrwxrwx 1 ahmad9090 ahmad9090     1093 Jul 27 04:22 LICENSE
-rwxrwxrwx 1 ahmad9090 ahmad9090      608 Aug  5 04:10 README.md
-rwxrwxrwx 1 ahmad9090 ahmad9090 11775488 Jul 27 02:34 chromedriver.exe
-rwxrwxrwx 1 ahmad9090 ahmad9090      253 Sep 26 15:52 name_entities_example_restaurants_zurich.txt
-rwxrwxrwx 1 ahmad9090 ahmad9090      851 Aug  5 04:05 results_18135.json
-rwxrwxrwx 1 ahmad9090 ahmad9090       34 Sep 26 16:14 to_ignore.txt
-rwxrwxrwx 1 ahmad9090 ahmad9090     6889 Aug  5 04:04 webscraping_with_selenium.py
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$ cat .gitignore
to_ignore.txt
ahmad9090@LAPTOP-RTERJCFR:/mnt/c/users/ahmad/desktop/coding_stuff/webscraping_with_selenium$
```

More information on .gitignore syntax: https://git-scm.com/docs/gitignore

Task

- Add .gitignore into your repository
- Add three .txt or .py files into the repository
- Have git ignore these 3 files by writing 1 line into .gitignore
- Add a fourth txt file into your repository but make sure it doesn’t get ignored by git

Make this homework by next week, all info in the link in the previous slide.
On top create a GitHub repo and connect it to ssh-agent by ssh-key (check info online)

Git: Show the history of Commits

To list the commits made in a repository use the command log

```
# git log
```

log shows all the commits in a reverse chronological order

log has options. To show the differences introduced in each commit, use the argument --patch or -p. You can also limit the number of commits display by adding -number

```
# git log -p
# git log -p -2   (shows the last two commits)
```

Undoing changes in Git

Img credit: https://devrant.com/rants/1840117/me-using-git

Undoing changes

Reverse changes to modified file until last commit:

```
# git checkout -- file_name
```

or

```
# git restore file_name
```

USE WITH CAUTIOUS!

Undoing changes

Unstaging a staged file:

git reset HEAD file_name

Useful if you want to have different commits for different files

Newer versions of git introduced git restore --staged:

git restore --staged file_name

Undoing changes

You can edit a commit by using the argument --amend

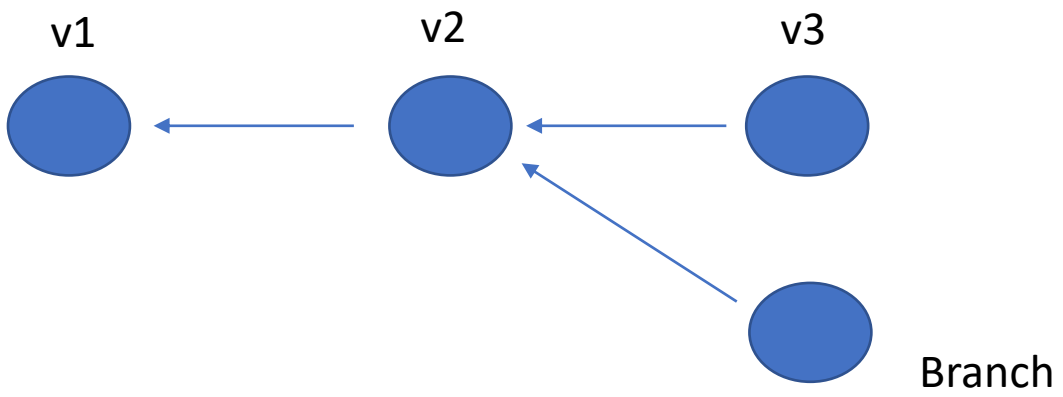
```
# git commit --amend
```

This will allow you to edit a commit. It gives the possibility to stage other files and add them to the commit.

Task

- Make changes to a file in your git repository
- Undo these changes until the last commit
- Make several changes and corresponding commits to file then undo these changes to a certain commit (not last one)

Branching



- A pointer to one of your commits
- Most VCS have branching support
- Git is unique in handling branching (Less expensive, lightweight)

Create New Branch

- Check the branch name of your repository:

  # git branch

  by default, called master or main

- Create new branch:

  # git branch name_of_branch

- See the last commit in each branch

  # git branch -v

- Move to work in a certain branch:

  # git checkout name_of_branch

  Git does not switch to new branch automatically after creating it!

Check Branch changes

- Git log will only show the commits history for the main or master branch when you are in it. To show commits in other branches:

  # git log branch_name

  or

  # git log --all

- Use the argument --oneline to display less information when having too many commits:

  # git log --all --oneline

Git: Switch

- Newer versions of git (2.23) uses switch command to instead of checkout:

  # git switch branch_name

- Delete a git branch:

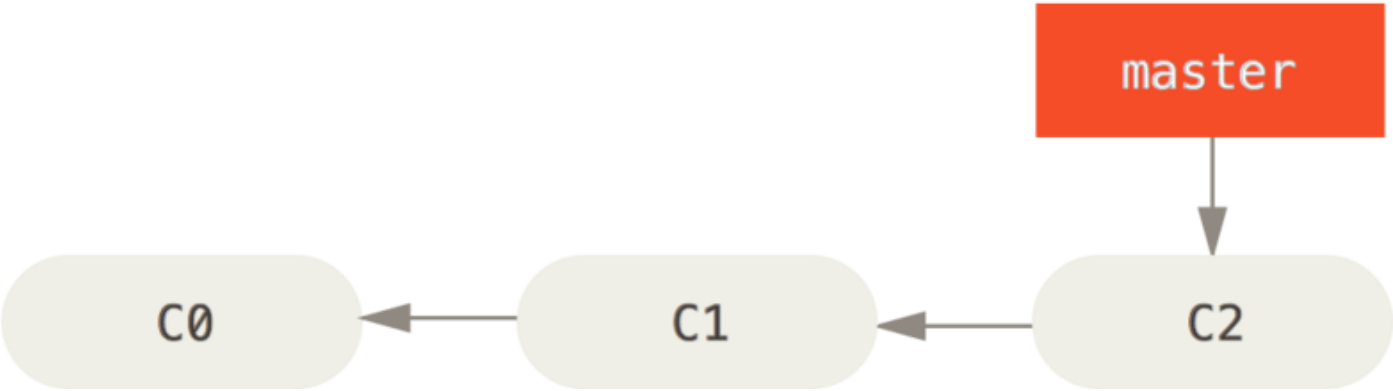
  # git branch -d branch_name

  -D if there are unmerged elements

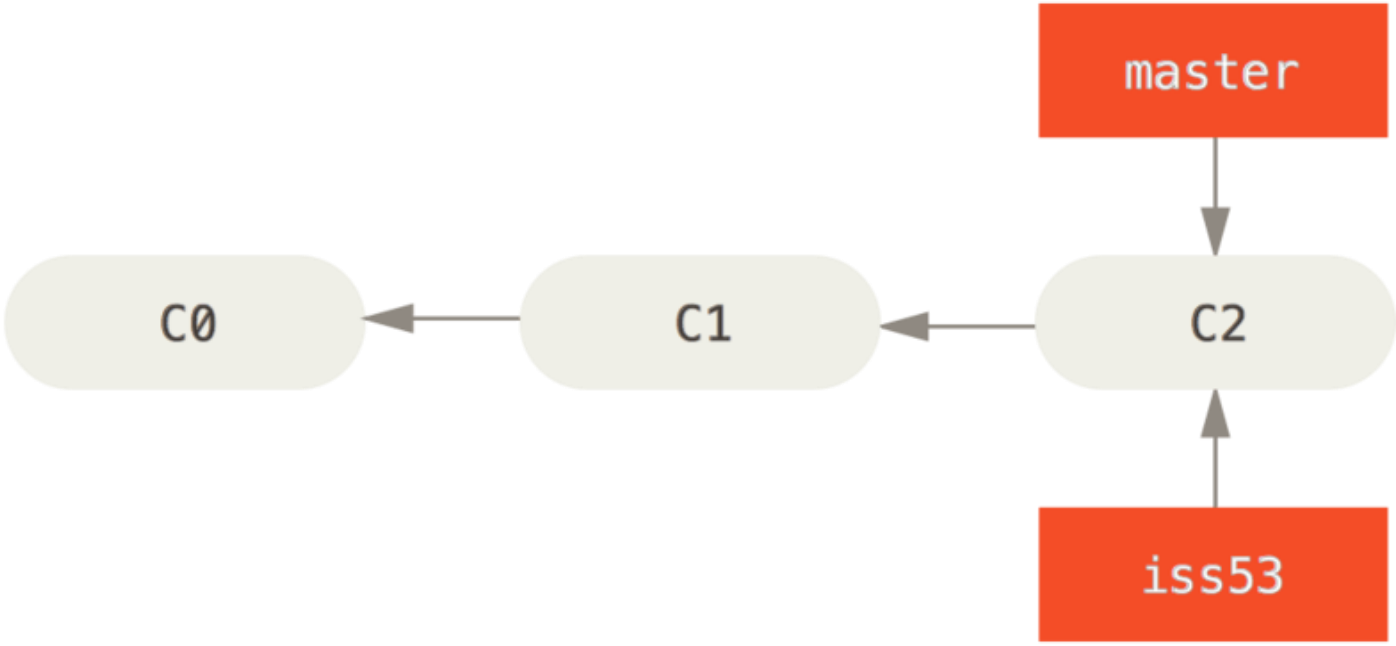
Discussion & Task

- Why branching is useful?
- Create a new branch and switch to it in one command (there are 2 possible ways)
- Do changes in that branch then try to delete it

Branching & Merging



Branching & Merging



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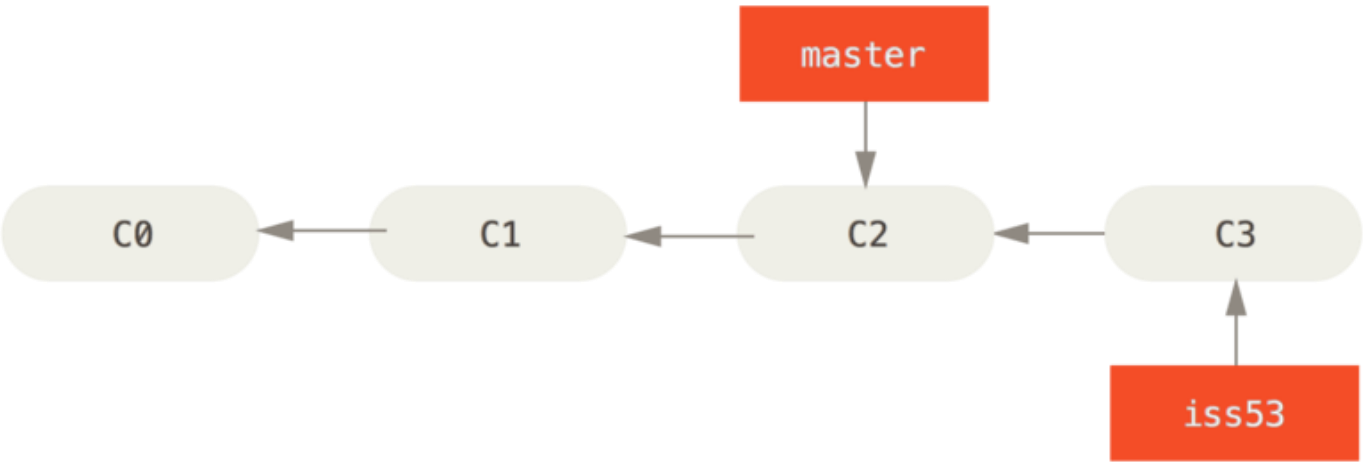

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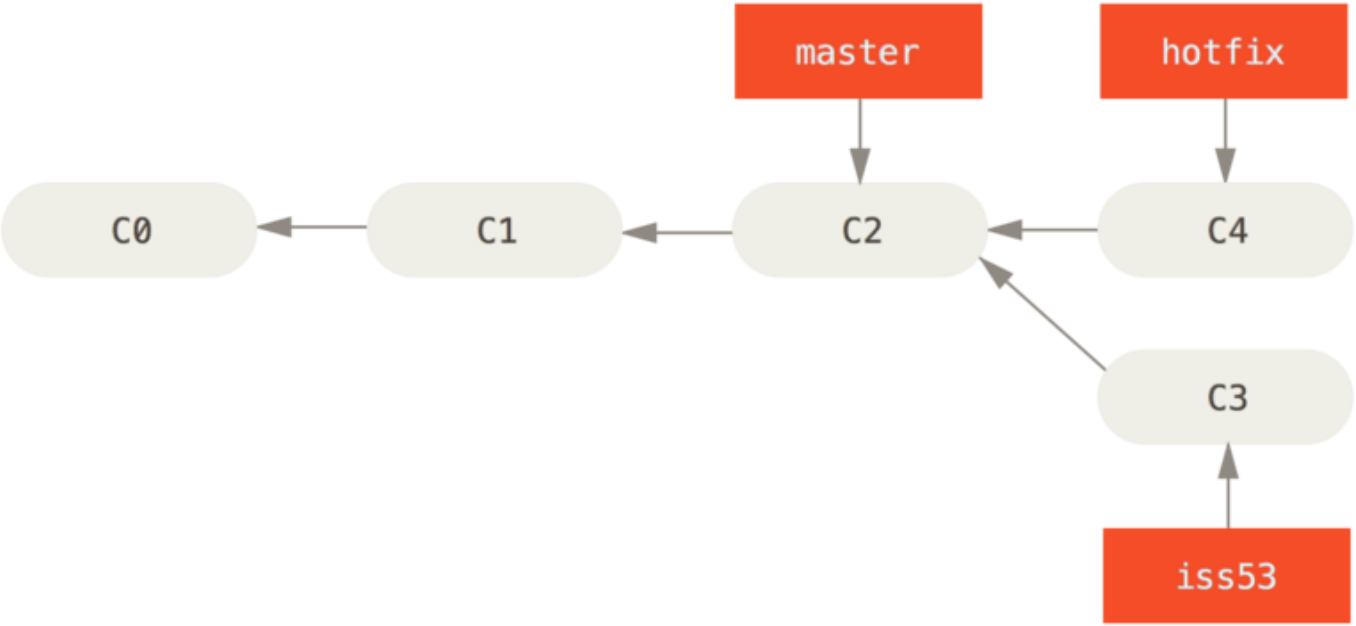

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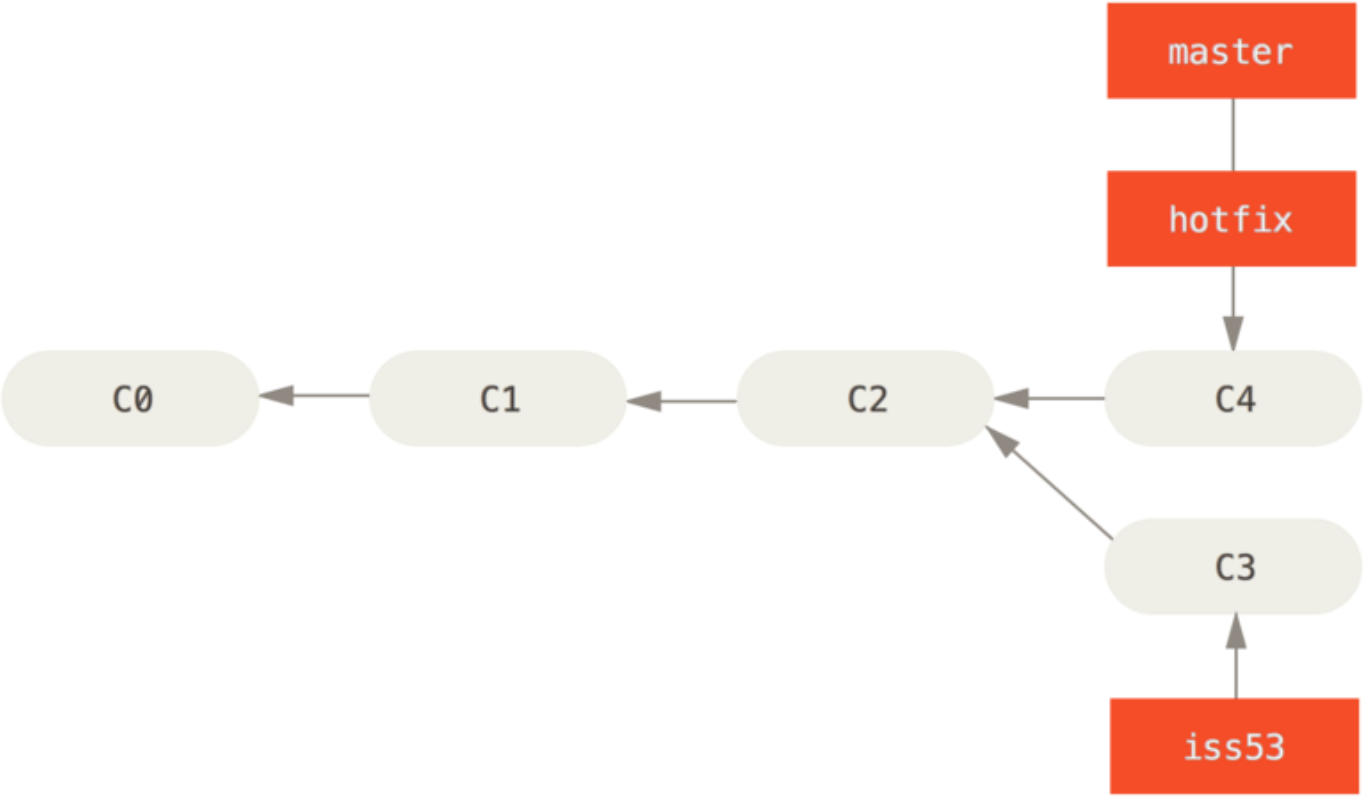

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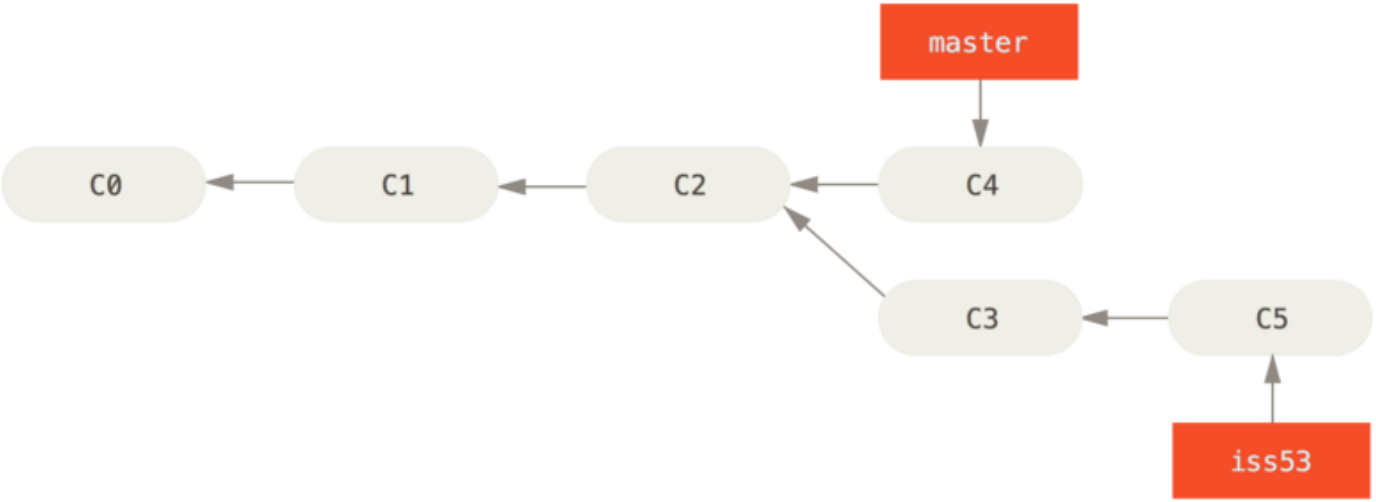
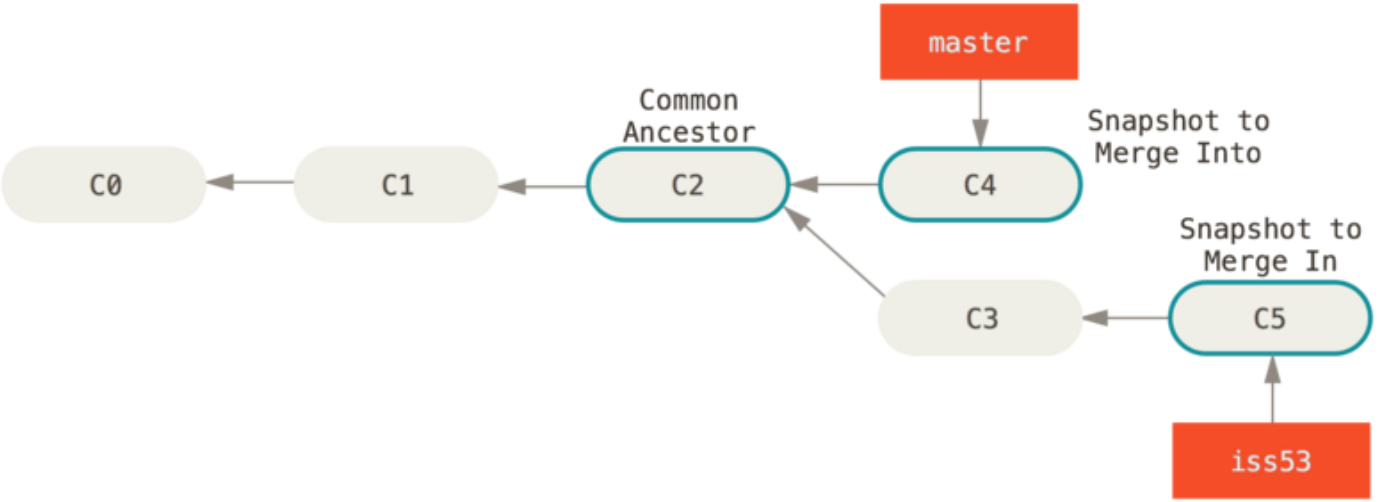
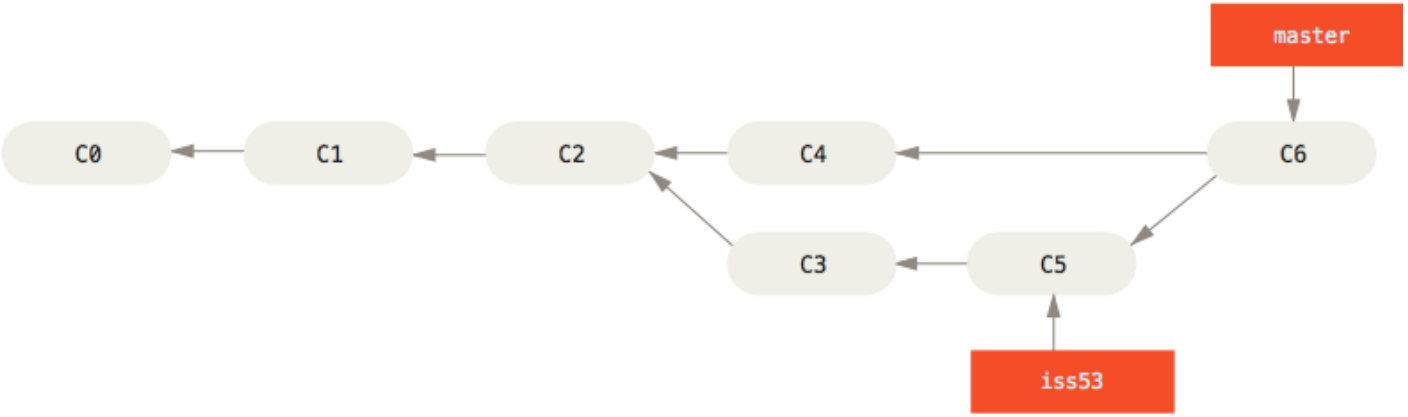


Branching & Merging



Branching & Merging



Git: Branching & merging

- Merging branch: Go to the branch you want to merge into:

  # git merge branch_name

- Dealing with merge conflict:

  # git mergetool OR manually

- See which branch is merged and not merged into your current branch

  # git branch --merged

  # git branch --no-merged

- Abort a merge: Sometimes when you have a merge conflict, you want to abort the merge and fix it in a different way. This is done with the abort flag:

  # git merge --abort

- An option would be to go back to the last commit:

  # git reset --hard HEAD

  Use with caution. All changes until last commit are deleted!

Task

- Create new branch and do changes in it and commit them.
- Do changes in your master branch to the same file and the same lines
- Try to merge the branch and resolve the conflict

Git: Branching & merging

- Dealing with merge conflict strategies:
  - -X ours: to accept changes in current branch
  - -X theirs: to accept changes in the merged branch

Git: Branching & Merging

- Useful flags to use with git merge:

- -Xignore-space-change
- -Xignore-all-space

Rebasing

- Alternative to git merge
- Provides linear “cleaner” history
- Use with caution
- Can be done with the rebase command:

```
# git rebase branch_name
```

Git Stash

- If you don't want to commit certain work but still store it for later use, you can use git stashing.

  # git stash

- You can also add a description of the stash you created:

  # git stash save "changes to file x"

- To display the stashes you have:

  # git stash list

- Apply the first stash changes to your branch:

  # git stash pop

- Reapply certain stash back:

  # git stash apply <stash_id stash@{0}>

Git Stash

- Using stash-apply without specifying the stash id will apply the most recent stash you saved

- You can remove a stash by using drop:

  # git stash drop stash@{0}

- You can create a branch from the stash that you created:

  # git stash branch branch_name

- Clear all the changes but save them into stash:

  # git stash --all

Git Aliases

- For a faster & more sufficient workflow use local aliases
- Examples from Pro git book:

```
$ git config --global alias.co checkout
$ git config --global alias.br branch
$ git config --global alias.ci commit
$ git config --global alias.st status
```

Git: Searching

- You can use git grep to search the content of the files inside your directory. Use the -n or --line-number option to view the line number.

- Use the -c or --count to view only the file containing the searched string

- If you are searching for when rather than where a certain change occurred, use the log -S functionality

Cleaning work directory

- You can use git-clean to remove any unnecessary files or subdirectories that are unneeded:

```
# git clean -f -d
```

- Use git-clean with cautious. It is better to run first –dry-run option to see what would be removed:

```
# git clean -d –n
```

- The previous command will not remove the files that you have in .gitignore. You can include those with the -x flag

- The -i flag allows interactive mode with the clean command as a more safe mesurment.

GIT: GUI

- Git comes with graphical user interface (git-gui). Can run it from the command line:

```
# git gui
```

- Most IDE has extension for using git (VS code, Pycharm, etc)

Github

- What is Github and how is it different from git?

Github

- Largest online host for git repositories
- Central point for collaboration for millions of developer
- Many open-source projects on Github
- Owned by Microsoft (Not part of the Git open-source project)

Github: Usage

- Interaction with local git repository
- Github Pages: Static web hosting service
- Gist: code snippets

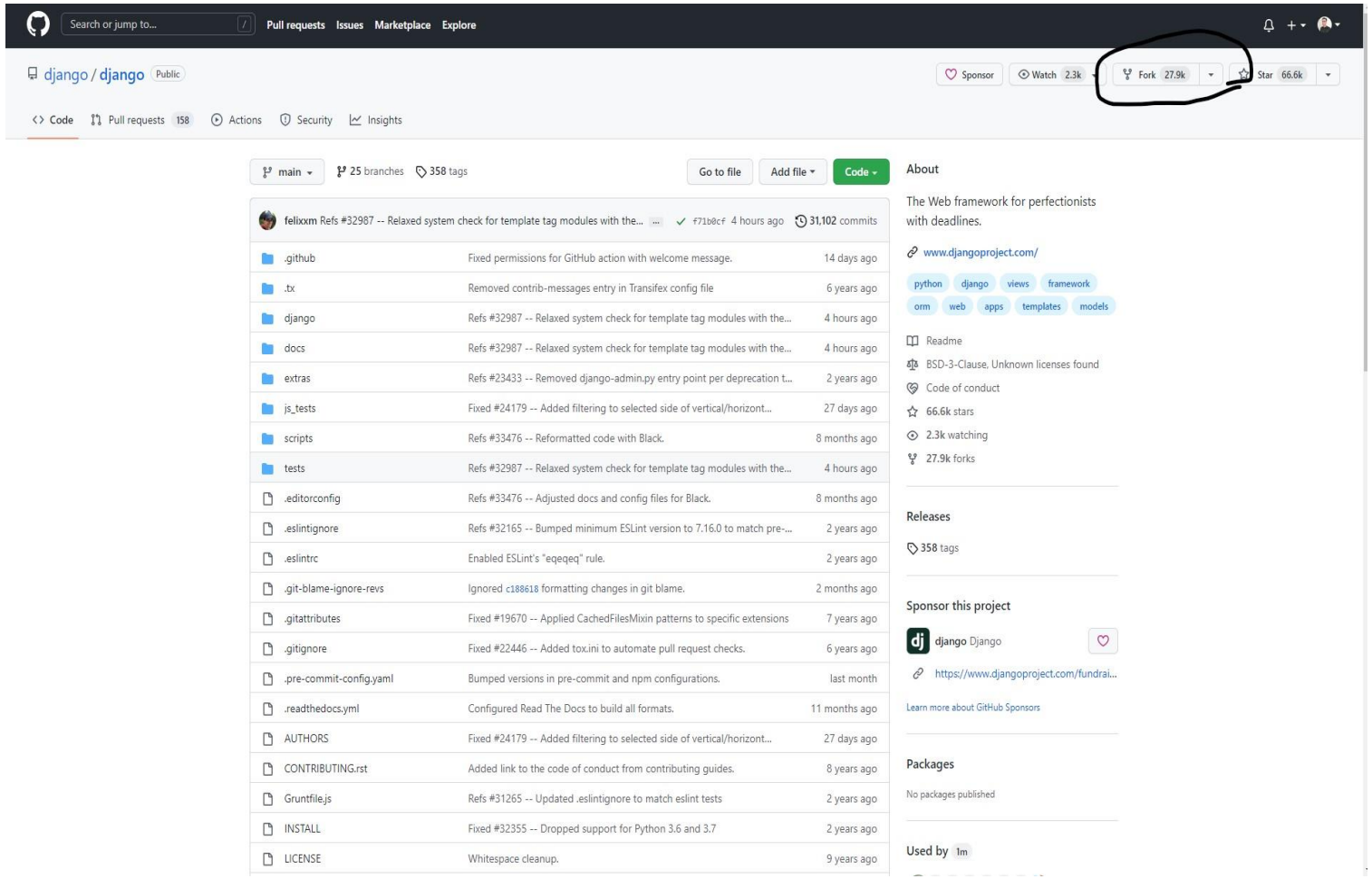
Github: Create Account and SSH Access

- GUI to create account at github!
- Generate SSH public key and add it to your github account from settings
- Key is usually stored at ~/.ssh
- To generate a new ssh key use:
- # ssh-keygen –o
- Paste your public key into github

Github fork

- You can fork a project in github into your private account to work on it. This is usually is done when you do not have push access to that project.

Github: Fork a repository



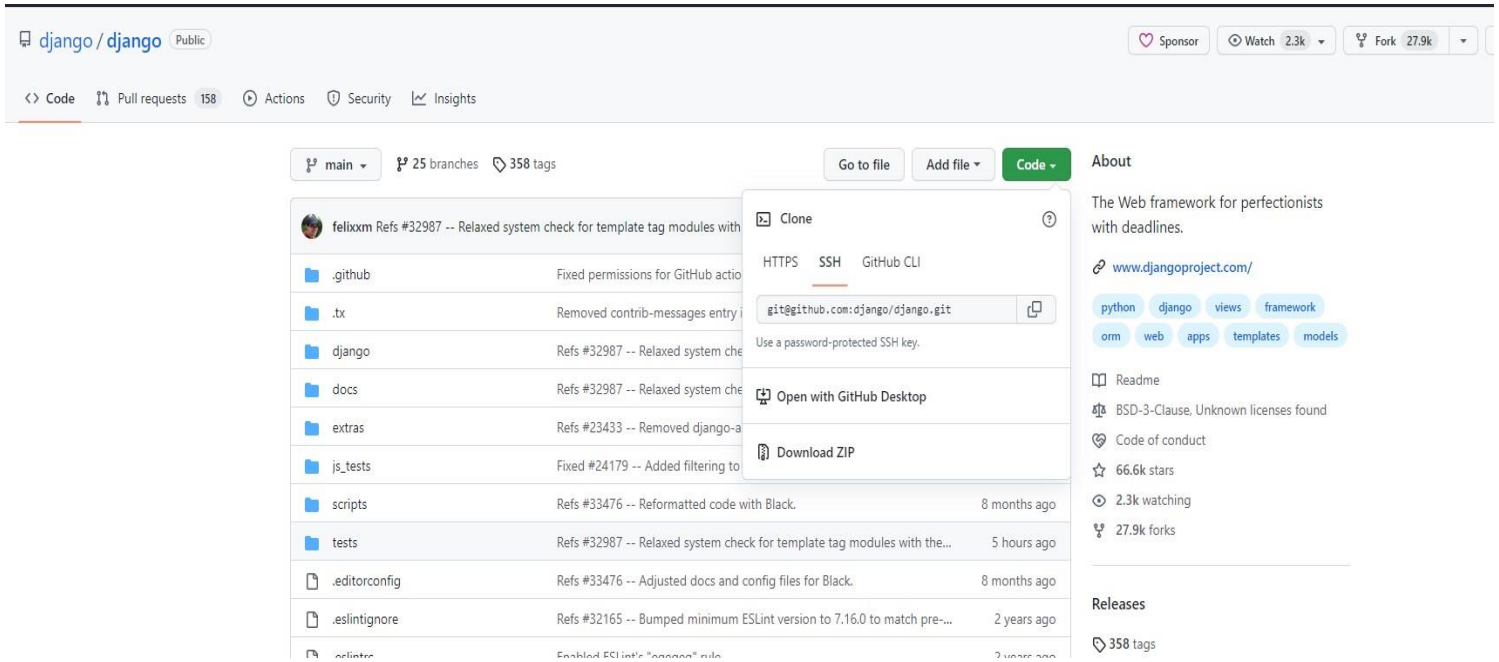
Git & Github: working with remote

- You can clone a repository from github or any remote repository from a different location by using git clone:

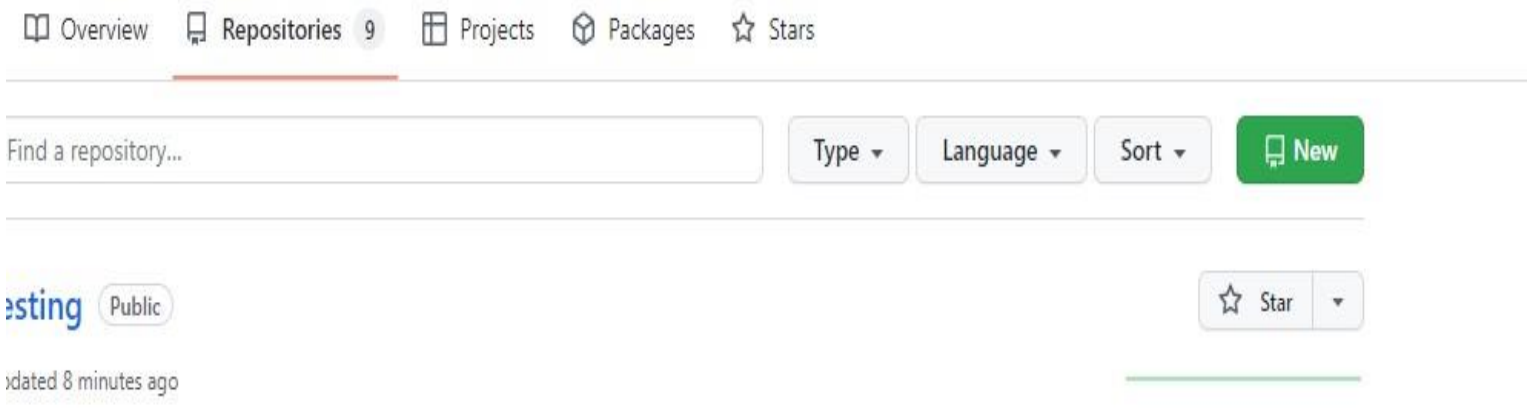
  # git clone https://github.com/django/django.git

- You can use either HTTPS or SSH to clone a repository from github

Git: clone


django / django Public
Sponsor
Watch 2.3k
Fork 27.9k
Code
Pull requests 158
Actions
Security
Insights
main
25 branches
358 tags
Go to file
Add file
Code
felixxm Refs #32987 -- Relaxed system check for template tag modules with
.github
Fixed permissions for GitHub actio
.tx
Removed contrib-messages entry
django
Refs #32987 -- Relaxed system che
docs
Refs #32987 -- Relaxed system che
extras
Refs #23433 -- Removed django-a
js_tests
Fixed #24179 -- Added filtering to
scripts
Refs #33476 -- Reformatted code with Black.
8 months ago
tests
Refs #32987 -- Relaxed system check for template tag modules with the...
5 hours ago
.editorconfig
Refs #33476 -- Adjusted docs and config files for Black.
8 months ago
.eslintignore
Refs #32165 -- Bumped minimum ESLint version to 7.16.0 to match pre-...
2 years ago
Clone
HTTPS
SSH
GitHub CLI
git@github.com:django/django.git
Use a password-protected SSH key.
Open with GitHub Desktop
Download ZIP
About
The Web framework for perfectionists with deadlines.
www.djangoproject.com/
python
django
views
framework
orm
web
apps
templates
models
Readme
BSD-3-Clause, Unknown licenses found
Code of conduct
66.6k stars
2.3k watching
27.9k forks
Releases
358 tags

Github: Create new repository



From your account -> reposotories -> new

Git: working with remote repository

- Clone your new repostitory into your local device either with https or ssh:

  # git clone git@github.com:<user name>/<repo name>.git

- You can list the name Git gives to the remote repository that you cloned:

  # git remote

  This will give you at least «origin»

- You can also view the URLs which git specify to reading and writing to the remote repo:

  # git remote –v

- Add changes to your remote repository that you did locally:

  # git push

- Pull changes that were made to the remote repository:

  # git pull

Github: Adding collaborators

- You can add collaborators to your repository on github to work with others.
- Is done from settings inside the repository --> collaborators --> add people

Task

- Fork a public repo on github then clone it to your device
- Change the readme file
- Push the changes into github
- Add the person next to you as collaborator
- Change the repo into a private one

Github on the CL

- You can use Github on the command line as well
- To install follow the instructions on this link for your OS:

  https://github.com/cli/cli#installation
- To log in to your GitHub account on the CL:

  # gh auth login

Github on the CL

- Assume you have been working locally on a project and you want to have it as a repository on Github. You can create a new repository on Github from your CL.
- Use the command:

  # gh repo create

  Very user friendly

Task

- Install github CLI & log in to your account with it
- Try to create a new repo on github via gh CLI tool

Github on the CL

- After adding the repo on Github, You can push your local work to it with the following commands:

  # git branch -M main

  With SSH:

  # git remote add origin git@github.com:<user name>/<repo name>.git

  With HTTPS:

  # git remote add origin https://github.com/<user name>/<repo name>.git

Teamwork

- Group in teams of 2 or 3 and choose one of the following tasks: