Introduction to Git

As a PhD student, do I really need a version control system?

- Are you in a team of developers or developing a project you have to share? ✓
- Do you need to track changes in your project? ✓
- Are you working in a project that needs to be maintained in the medium term? ✓

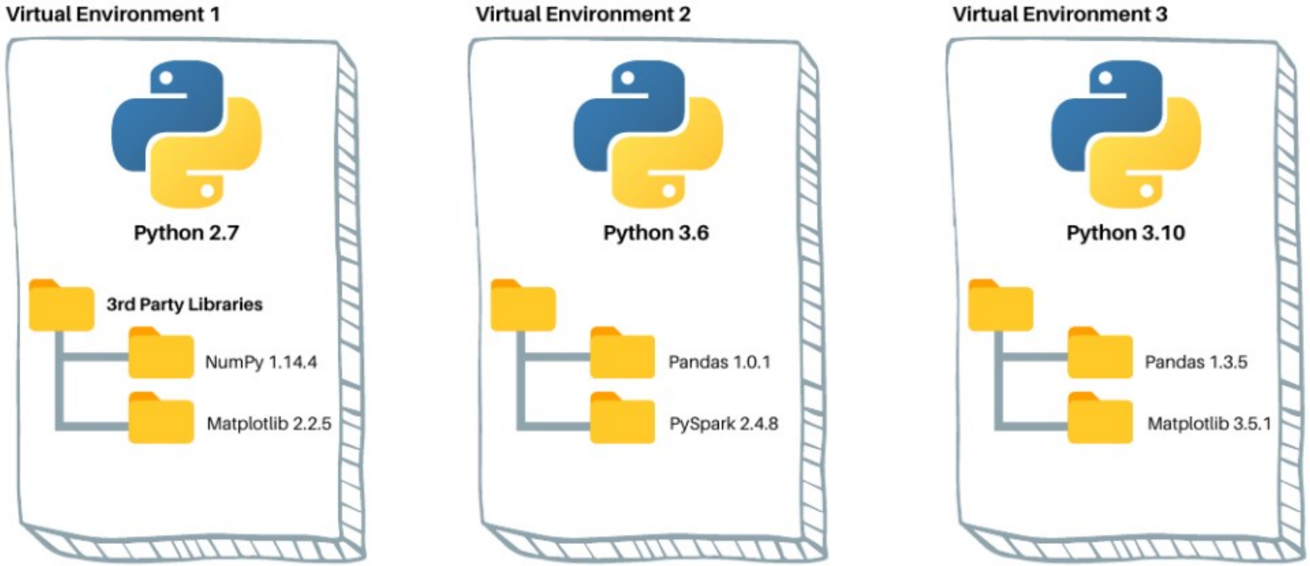
- Are you working on an analysis that you'll never share and you'll never look at it again after you'll finish

Good free reference: https://git-scm.com/book/en/v2

Outline

- Environment management with Conda/Mamba
- Installation and configuration of Git
- Introduction to GitHub repository platform: accounts, local and remote repositories
- SSH protocol and key generation, authentication

Environment management



Environment management

Package and environment manager use cases

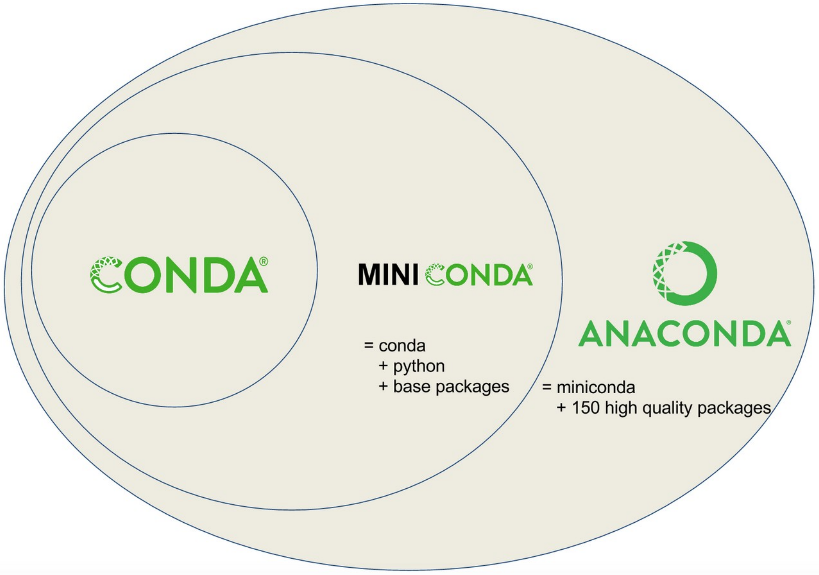
- **Software compatibility:** you’ll **prevent obsolescence** due to future updates of your system libraries
- **Collaborative projects:** same environment for all team members will **avoid compatibility problems**
- **Developing incompatibilities:** **prevent conflicts** between modules/libraries developed by you and those of your system

CONDA Family

- **Conda**: the package and environment manager
  - It will create and manage the environments
  - It will install packages and update them when you need it

- **Miniconda**: conda + python + few dependencies (~400MB)

- **Anaconda**: conda + lots and lots of packages (~3GB)



MINICONDA

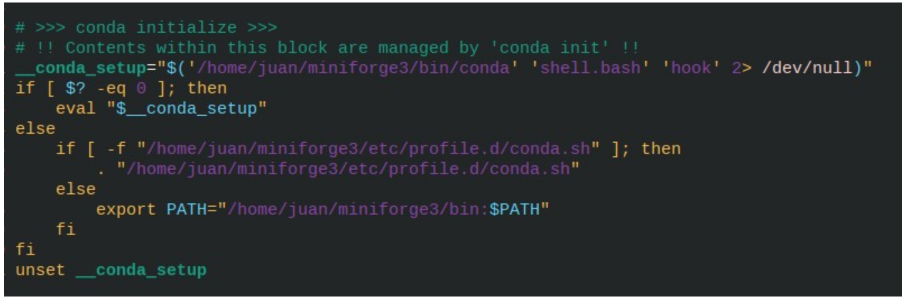
- Let’s install MINICONDA

  - wget https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh   (Linux)
  - wget https://repo.anaconda.com/miniconda/Miniconda3-latest-MacOSX-x86_64.sh (macOS)

  - chmod +x Miniconda3-latest-Linux-x86_64.sh (Linux)
  - ./Miniconda3-latest-Linux-x86_64.sh (Linux)

  - You’ll have to accept the license
  - You’’l have to accept the location to be installed
  - You can/can’t accept base conda environment being activated
    - If you want to deactivate it: conda config –set auto_activate_base false
  - Type on a term:
    - conda version
    - conda –list

You should have conda now



```
# >>> conda initialize >>>
# !! Contents within this block are managed by 'conda init' !!
__conda_setup="$('/home/juan/miniforge3/bin/conda' 'shell.bash' 'hook' 2> /dev/null)"
if [ $? -eq 0 ]; then
    eval "$__conda_setup"
else
    if [ -f "/home/juan/miniforge3/etc/profile.d/conda.sh" ]; then
        . "/home/juan/miniforge3/etc/profile.d/conda.sh"
    else
        export PATH="/home/juan/miniforge3/bin:$PATH"
    fi
fi
unset __conda_setup
```

  - conda create -n "myenv" python=3.3.0
  - conda activate myenv
  - conda deactivate

CONDA problems… ??

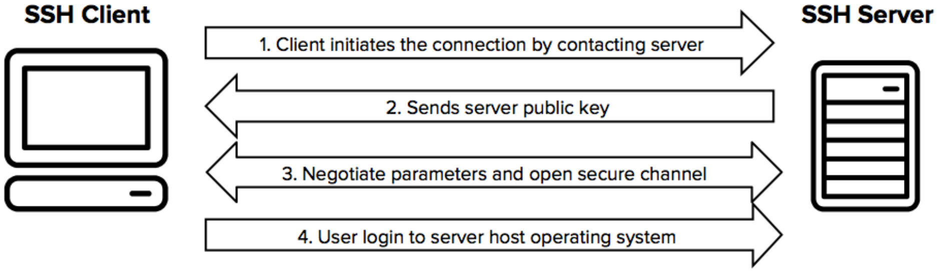
- CONDA had/have performance issues, which led to the development of Mamba as a faster alternative.

- Supposedly, after CONDA version 23.11 is expected to offer similar performance levels.

Mamba

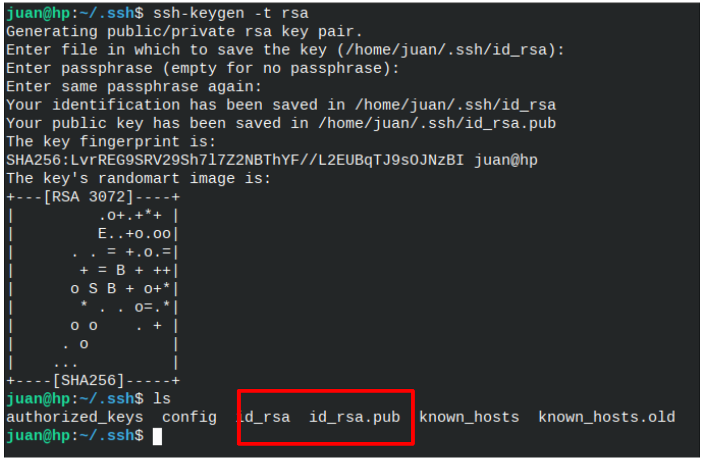
SSH protocol

SSH stands for Secure Shell, and enables secure system administration and file transfers over insecure networks.


SSH Client
SSH Server
1. Client initiates the connection by contacting server
2. Sends server public key
3. Negotiate parameters and open secure channel
4. User login to server host operating system

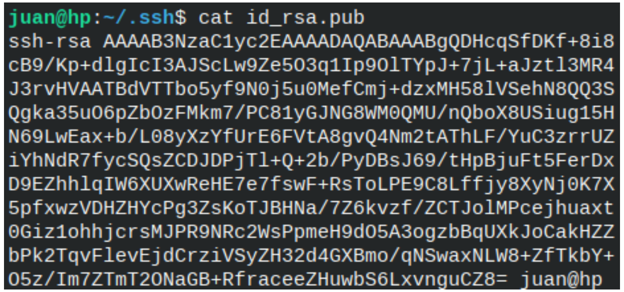
SSH protocol

- To create ssh keys: ssh-keygen -t rsa



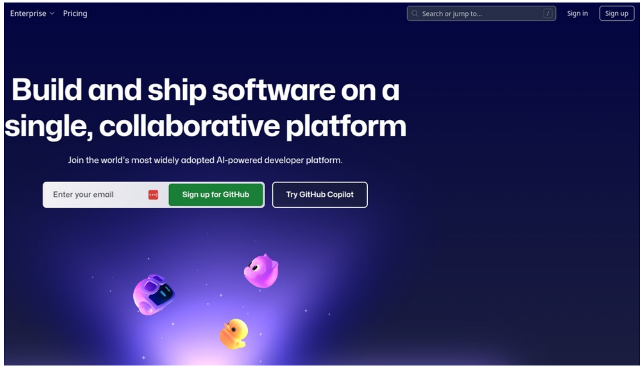
```
juan@hp:~/.ssh$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/juan/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/juan/.ssh/id_rsa
Your public key has been saved in /home/juan/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:LvrREG9SRV29Sh7l7Z2NBThYF//L2EUBqTJ9sOJNzBI juan@hp
The key's randomart image is:
+---[RSA 3072]----+
|         .o+.+*+ |
|         E..+o.oo|
|      . . = +.o.=|
|       + = B + ++|
|      o S B + o+*|
|       * . . o=.*|
|      o o    . + |
|     . o         |
|    ...          |
+----[SHA256]-----+
juan@hp:~/.ssh$ ls
authorized_keys  config  id_rsa  id_rsa.pub  known_hosts  known_hosts.old
juan@hp:~/.ssh$ 
```

- You will have to copy your public key to your github account: cat id_rsa.pub



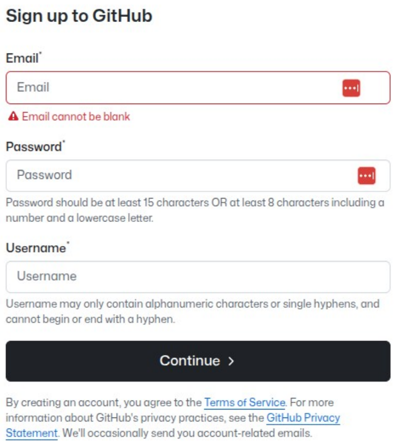
```
juan@hp:~/.ssh$ cat id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABgQDHcqSfDKf+8i8
cB9/Kp+dlgIcI3AJScLw9Ze5O3q1Ip9OlTYpJ+7jL+aJztl3MR4
J3rvHVAATBdVTTbo5yf9N0j5u0MefCmj+dzxMH58lVSehN8QQ3S
Qgka35uO6pZbOzFMkm7/PC81yGJNG8WM0QMU/nQboX8USiug15H
N69LwEax+b/L08yXzYfUrE6FVtA8gvQ4Nm2tAThLF/YuC3zrrUZ
iYhNdR7fycSQsZCDJDPjTl+Q+2b/PyDBsJ69/tHpBjuFt5FerDx
D9EZhhlqIW6XUXwReHE7e7fswF+RsToLPE9C8Lffjy8XyNj0K7X
5pfxwzVDHZHYcPg3ZsKoTJBHNa/7Z6kvzf/ZCTJolMPcejhuaxt
0Giz1ohhjcrsMJPR9NRc2WsPpmeH9dO5A3ogzbBqUXkJoCakHZZ
bPk2TqvFlevEjdCrziVSyZH32d4GXBmo/qNSwaxNLW8+ZfTkbY+
O5z/Im7ZTmT2ONaGB+RfraceeZHuwbS6LxvnguCZ8= juan@hp
```

Create a github account



Build and ship software on a single, collaborative platform

Join the world's most widely adopted AI-powered developer platform.



Sign up to GitHub

Email*

Email

Email cannot be blank

Password*

Password

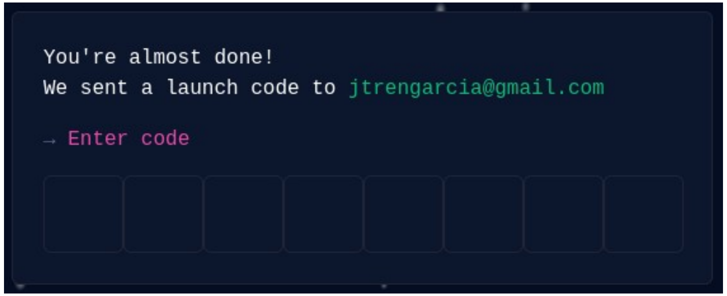
Password should be at least 15 characters OR at least 8 characters including a number and a lowercase letter.

Username*

Username

Username may only contain alphanumeric characters or single hyphens, and cannot begin or end with a hyphen.

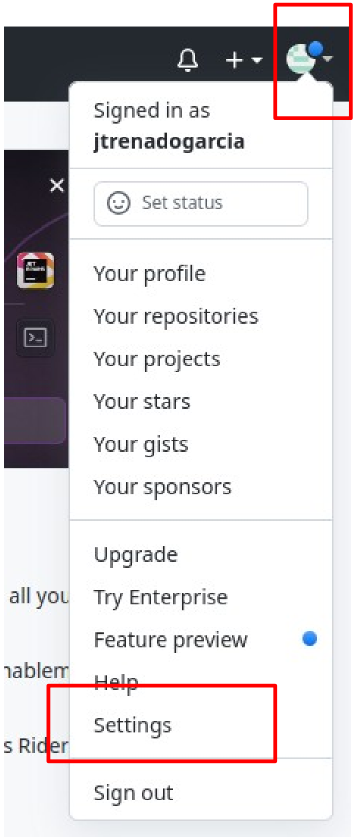
By creating an account, you agree to the Terms of Service. For more information about GitHub's privacy practices, see the GitHub Privacy Statement. We'll occasionally send you account-related emails.

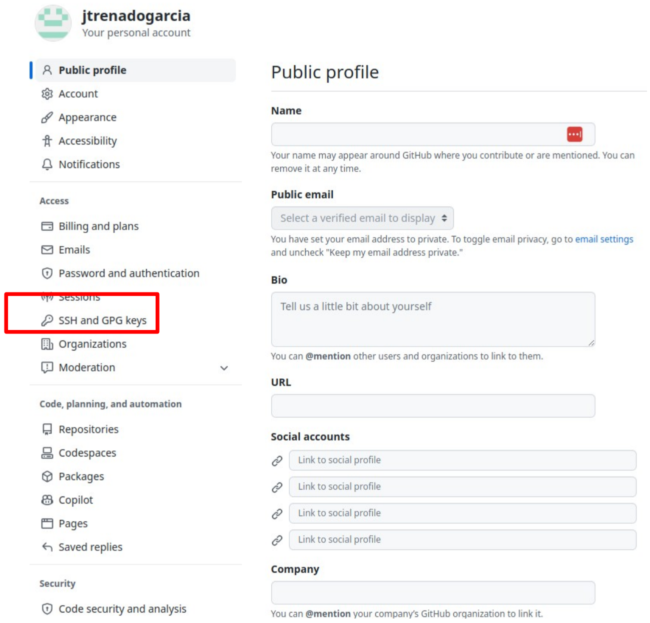


```
You're almost done!
We sent a launch code to jtrengarcia@gmail.com

→ Enter code
```

Add your pub key to you github account





Public profile

Name

Your name may appear around GitHub where you contribute or are mentioned. You can remove it at any time.

Public email

Select a verified email to display

You have set your email address to private. To toggle email privacy, go to email settings and uncheck "Keep my email address private."

Bio

Tell us a little bit about yourself

You can **@mention** other users and organizations to link to them.

URL

Social accounts

Link to social profile

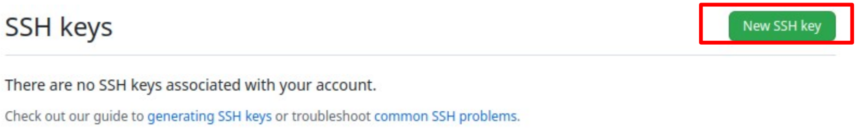
Link to social profile

Link to social profile

Link to social profile

Company

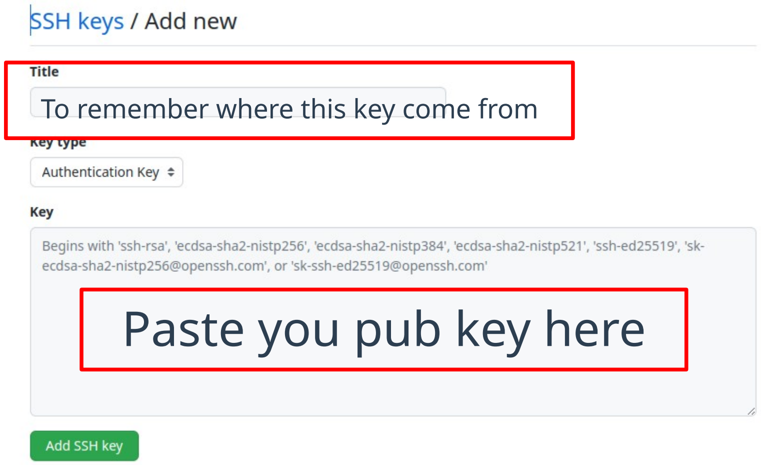
You can **@mention** your company's GitHub organization to link it.



SSH keys

There are no SSH keys associated with your account.

Check out our guide to generating SSH keys or troubleshoot common SSH problems.



SSH keys / Add new

Title

To remember where this key come from

Key type

Authentication Key

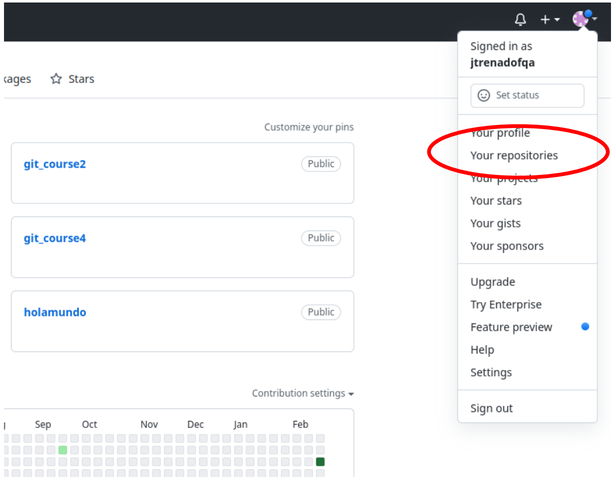
Key

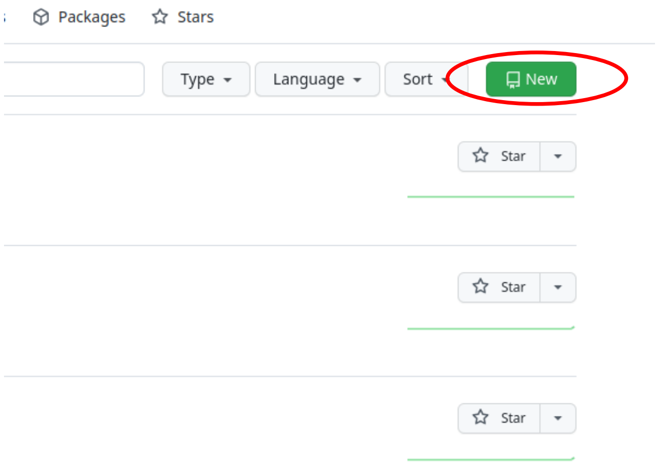
Begins with 'ssh-rsa', 'ecdsa-sha2-nistp256', 'ecdsa-sha2-nistp384', 'ecdsa-sha2-nistp521', 'ssh-ed25519', 'sk-ecdsa-sha2-nistp256@openssh.com', or 'sk-ssh-ed25519@openssh.com'

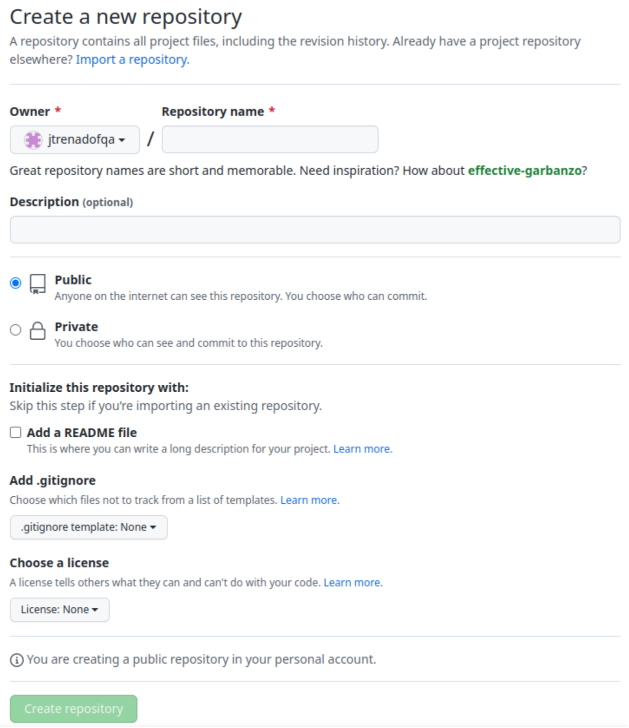
Paste you pub key here

Basics: create origin repo

- Create a remote repository called holamundo







Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Owner * **Repository name** *

jtrenadofqa /

Great repository names are short and memorable. Need inspiration? How about **effective-garbanzo**?

Description (optional)

● **Public**
Anyone on the internet can see this repository. You choose who can commit.

○ **Private**
You choose who can see and commit to this repository.

Initialize this repository with:
Skip this step if you're importing an existing repository.

□ **Add a README file**
This is where you can write a long description for your project. Learn more.

Add .gitignore
Choose which files not to track from a list of templates. Learn more.

.gitignore template: None

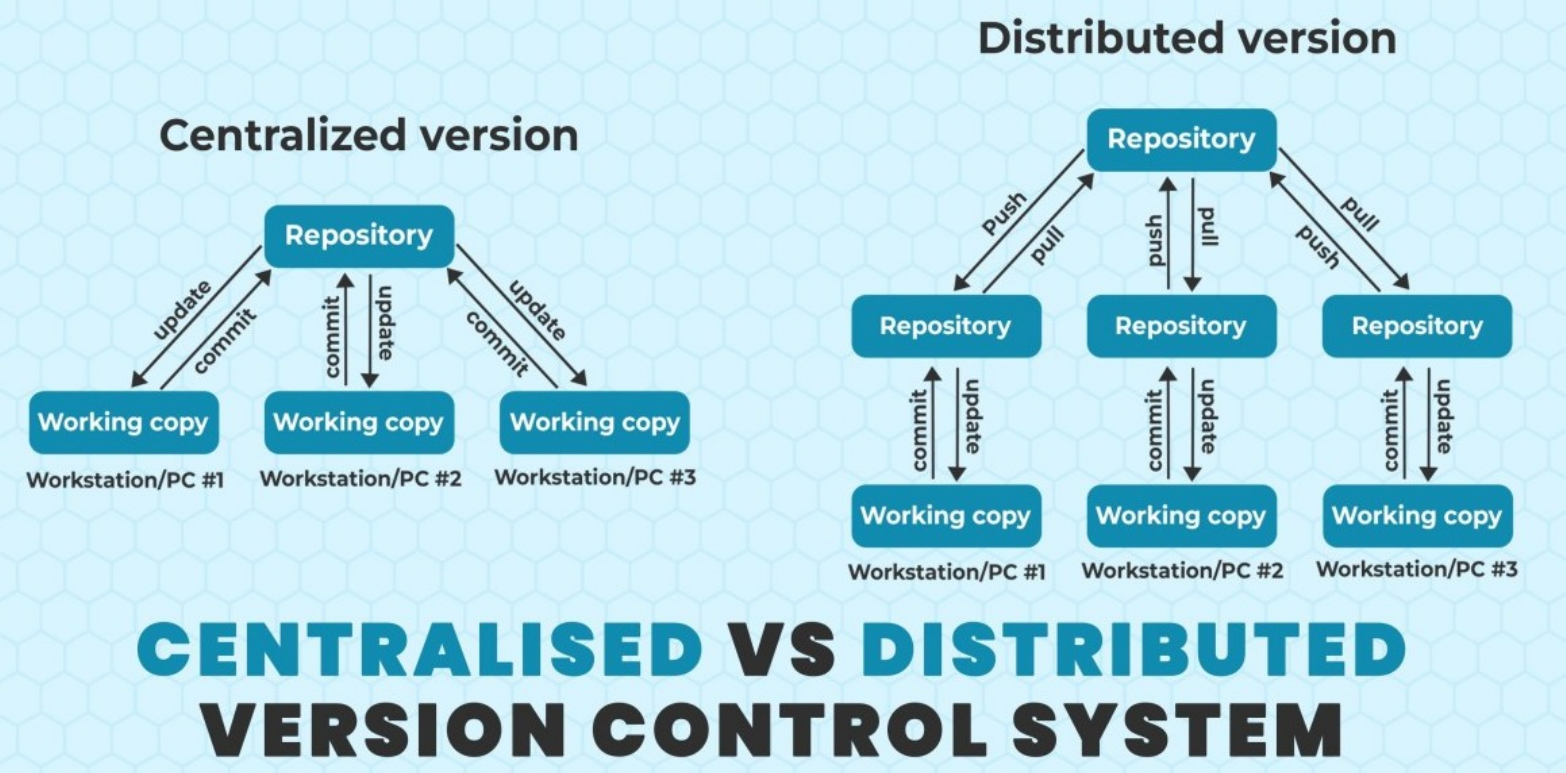
Choose a license
A license tells others what they can and can't do with your code. Learn more.

License: None

ⓘ You are creating a public repository in your personal account.

Create repository

CVCS vs DVCS


Centralized version
Repository
update
commit
commit
update
update
commit
Working copy
Working copy
Working copy
Workstation/PC #1
Workstation/PC #2
Workstation/PC #3
Distributed version
Repository
Push
pull
push
pull
pull
push
Repository
Repository
Repository
commit
update
commit
update
commit
update
Working copy
Working copy
Working copy
Workstation/PC #1
Workstation/PC #2
Workstation/PC #3
CENTRALISED VS DISTRIBUTED
VERSION CONTROL SYSTEM

CVCS vs DVCS

Distributed Version Control System (DVCS - GIT)

- Every developer has a copy of the entire repository locally, so you can work offline
- Working on branches is easy because every developer has a entire history of the code
- If the remote repo goes down or it crashes you can back it up from local
- Projects with long history or large binary files will need more space locally and they will be slower to download and push changes.
- Less merger conflicts, only when pushing/pulling changes.

Centralized Version Control Systems (CVCS – Subversion)

- There is only one copy of the repository in a central server, so you need to be connected to the server to make changes.
- Working with branches is more complicated because it requires continuous communications with the server
- Suitable for projects with large binary files because they don’t have to be upload/download continuously and they don’t need a entire copy locally.
- More merger conflicts because we have to commit to remote continuously any change.

GIT – Installation & Configuration

- For Ubuntu-like systems
  - sudo apt-get install git

  - For other OS
    - https://git-scm.com/book/en/v2/Getting-Started-Installing-Git

- Configure your credentials and editor
  - User: **git config --global user.name “Your name”**
  - Email: **git config --global user.email “Your email”**
  - Editor: **git config –global core.editor “Your editor”**