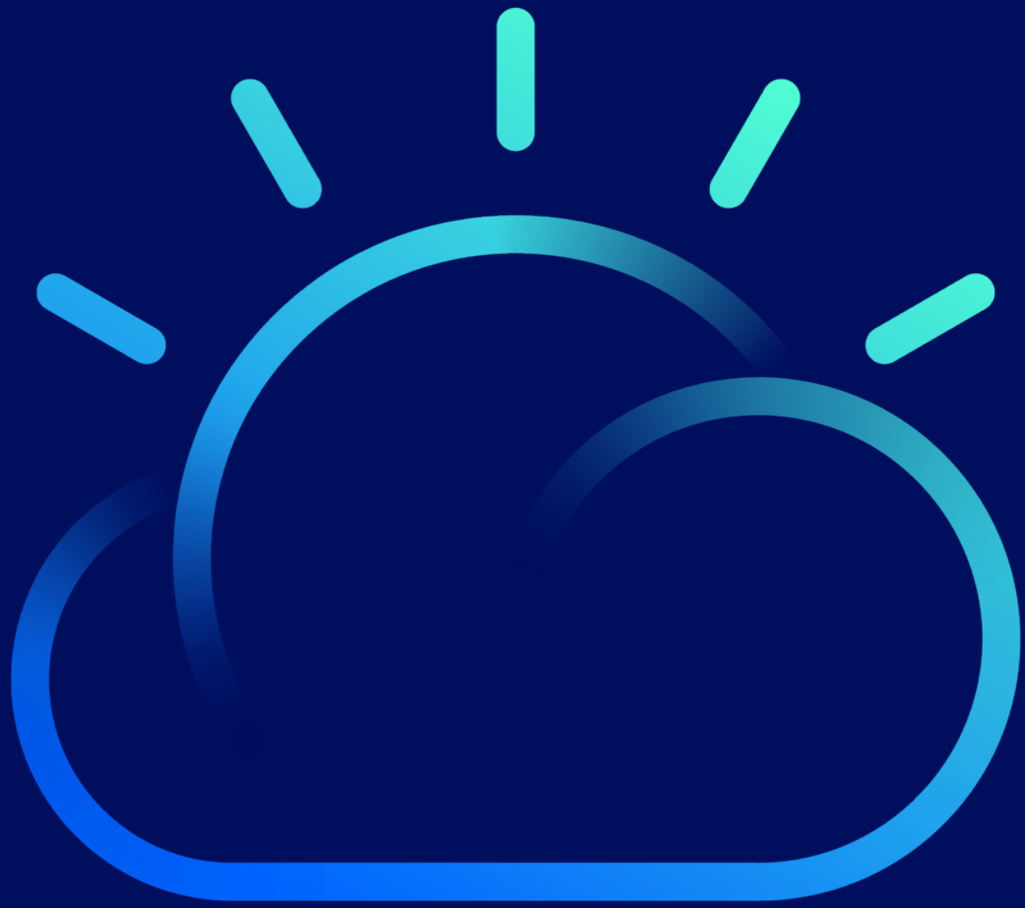
IBM Cloud Automation Manager Bootcamp



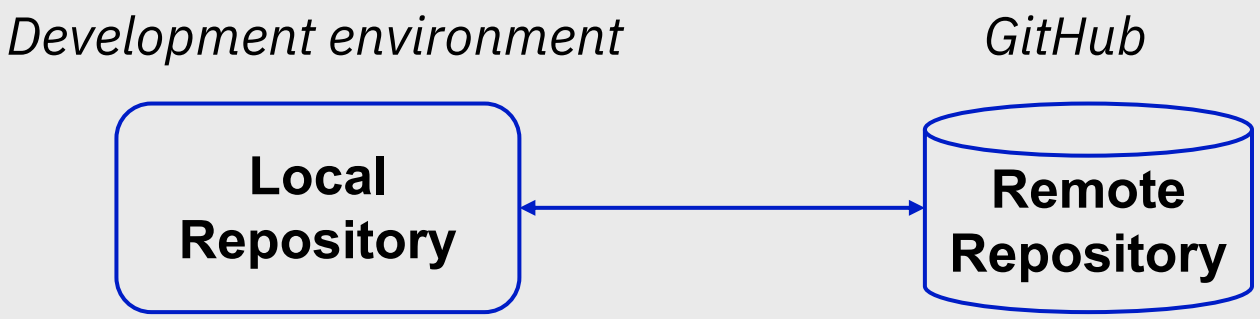
Working with GIT

Collaborative Infrastructure

IBM Cloud

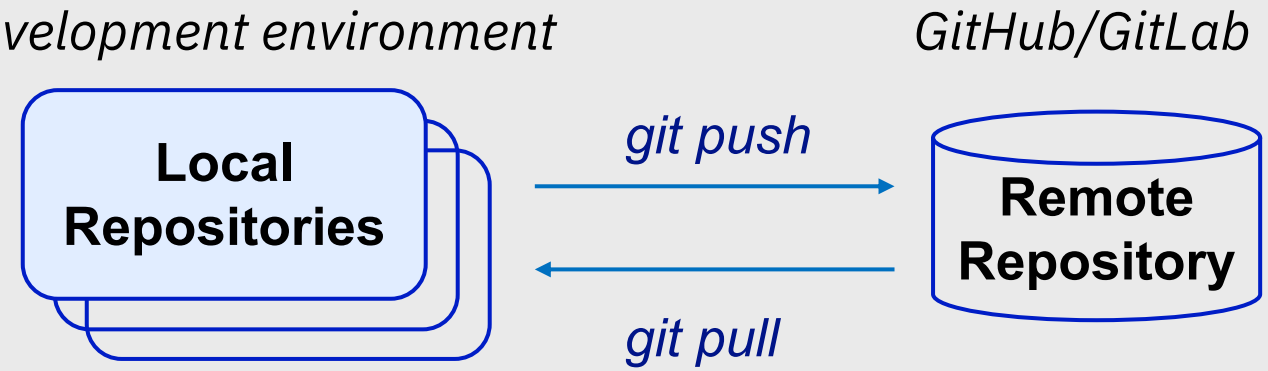
Why using a version control system such as Git ?

- Access to all versions of all terraform files at any time
- You don’t loose a piece of code from a previous state of your environment
- Collaborate and work as a team without interfering with each others
- Terraform plan gives an opportunity for team members to review what has been done by each other



Distributed version control system

Each user has a complete local copy of a repository on his computer (cloning)



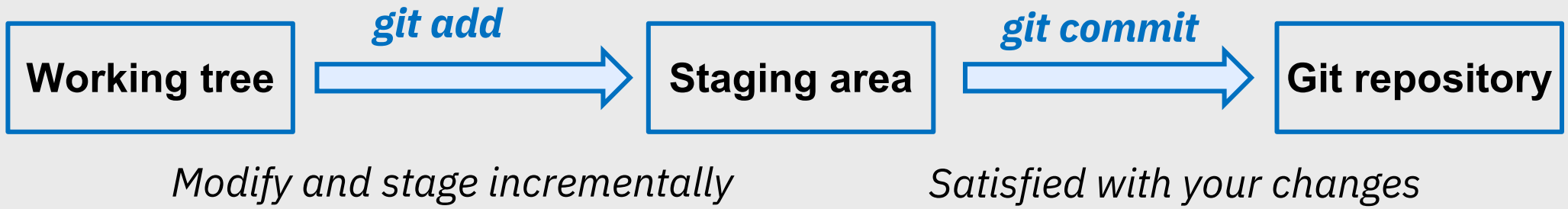
- The code is developed on each local computer
- GitHub is a central remote point hosting repositories and enabling users to obtain, alter and integrate changes through Git
- You have to setup a Git account as an hosting utility
- You can create a repository locally with the command ***git.init***
- Or you can create a repository on GitHub (web ui) and clone it locally using the command ***git.clone***

Working tree, staging area and repository

In a **local repository** a **working tree** is a collection of files which originate from a certain version of the repository.

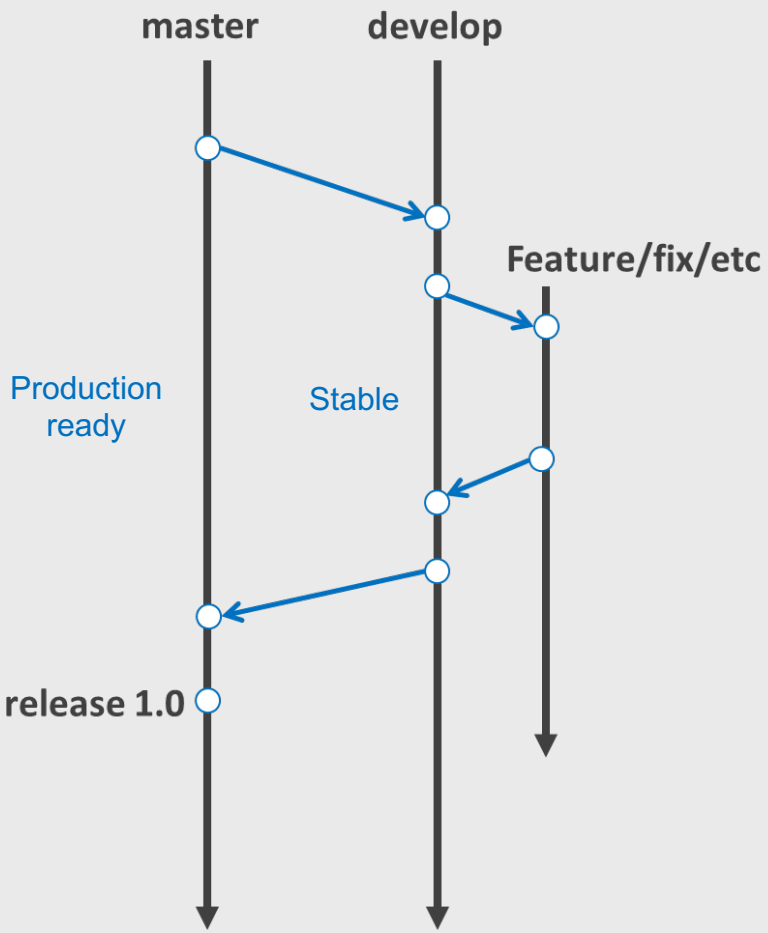
To persist changes in a working tree you need:

- To add selected changes to the staging area (Index) with the command *git add*
- To commit the staged changed into the git repository with the command *git commit*



A **branch** points to a specific commit. **HEAD** is a reference to the last commit in the currently check-out branch .

The concept of branches



The **master branch** is the default branch automatically created when cloning or creating a repository

A branch allows the user to switch between different versions of a collection of files so that he can work on different changes independently from each other.

Branches in Git are local to the repository.

The command *git checkout* allows to select a branch (switch to a branch) and the command *git branch* to create one. Use *git merge* to combine a branch in the current checkout branch.

Why branches ?

- Never commit on Master, instead uses branches created from the master and merge from your working branches
- Old code untouched until the new one works

Fetch, Merge and Stash

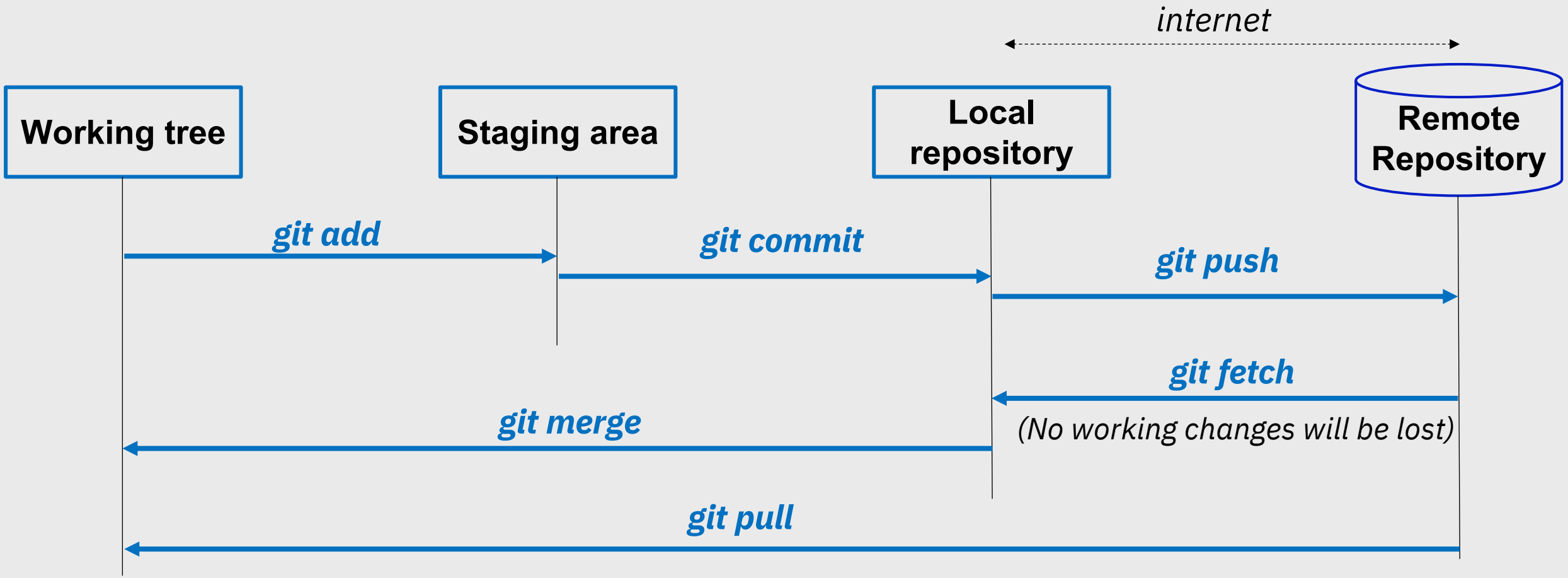
Fetch: See what everybody else has been working on. If you have conflicting files, you will need to manually **merge** them. Git fetch does not touch your working tree. It gives you the chance to decide what to do next.

Merge: When two files have been changed, merge them. After a fetch it brings the changes into your working tree. When merging branches the commit history get merged.

Pull: Fetch + merge

Stash: temporarily save uncommitted local changes and leave you with a clean working copy (*git stash*)…. for example when you have to switch context to work on an urgent bug….to continue later on you can restore the saved state (*git stash pop*)

Put all together



Few more commands....

- The command *git status* retrieve the status of a file
  - ✓ Untracked: file whose changes are not monitored by Git and not declared in the gitignore file
  - ✓ Unstaged: file whose changes are being tracked by Git and changed since the last commit
  - ✓ Staged: file whose changes are being tracked by Git and ready for the commit
- Run *git reset* for unstaging stuff you don't want in your next commit
- Run *git rm* to remove files from your staging area and your working directory
- Run *git diff* to show changes between commits or commit and working tree
- Run *git show* to see an older version of a file *(run git show HEAD~2:file)*
- *Run git log –all to see all commits on the branch currently checked out*

Repository Tags

- Tags are used to identify specific significant points on a repository’s history
- You tag a specific commit
- Use the command *git tag <tag name>*
- A tag is like a branch which does not change

Ignoring files

- Tell Git which files and directories to ignore, before you make a commit.
- Create a .gitignore file
- Commit the .gitignore file to share the ignore rules with any other users that clone the repository

```
vi .gitignore


#  Local .terraform directories
**/.terraform/*

# .tfstate files
*.tfstate
*.tfstate.*

# .tfvars files
*.tfvars
```

Configure your environment

You already have a remote repository – Configure a remote repository URL

1 - Add a remote repo url to your local git configuration (create a connection to a remote repository)

- *git remote add <remote_name> <remote_repo_url>*

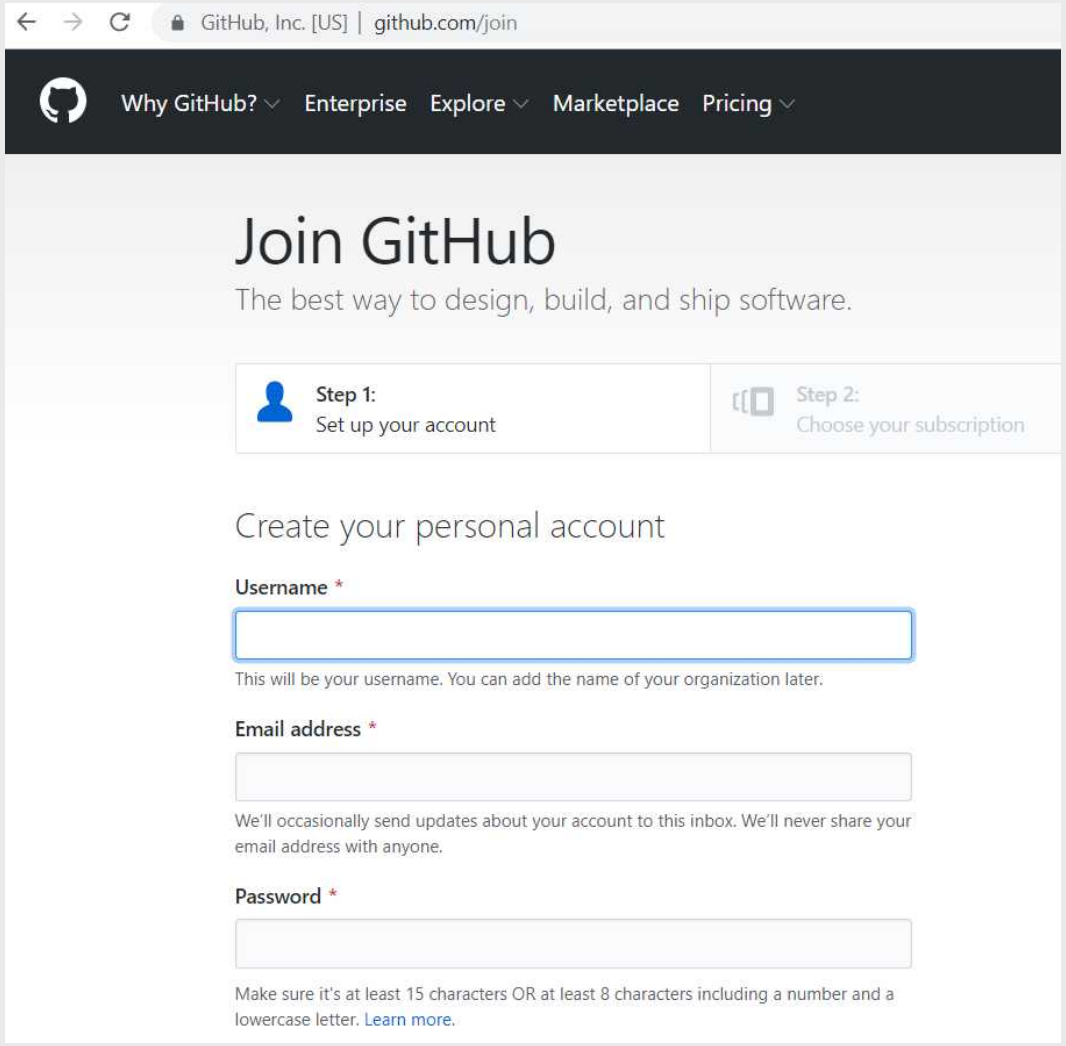
2 - Push a local branch to the remote repository

- *git push -u <remote_name> <local_branch_name>*

You can also configure global options such as user name to be used for all commits

- *git config –global user.name <name>*

Create a GitHub Account



What’s GitLab ?

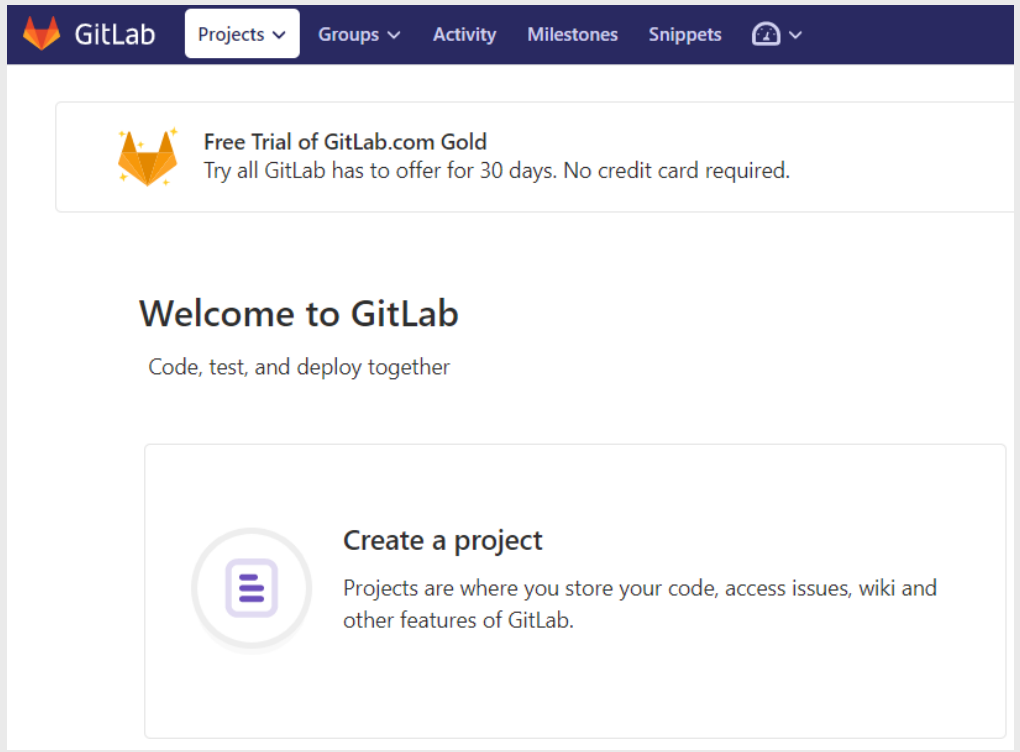
GitLab is built on top of git so that users who are contributing work to a project will have a copy of the project downloaded/checked out/cloned on their local computer.

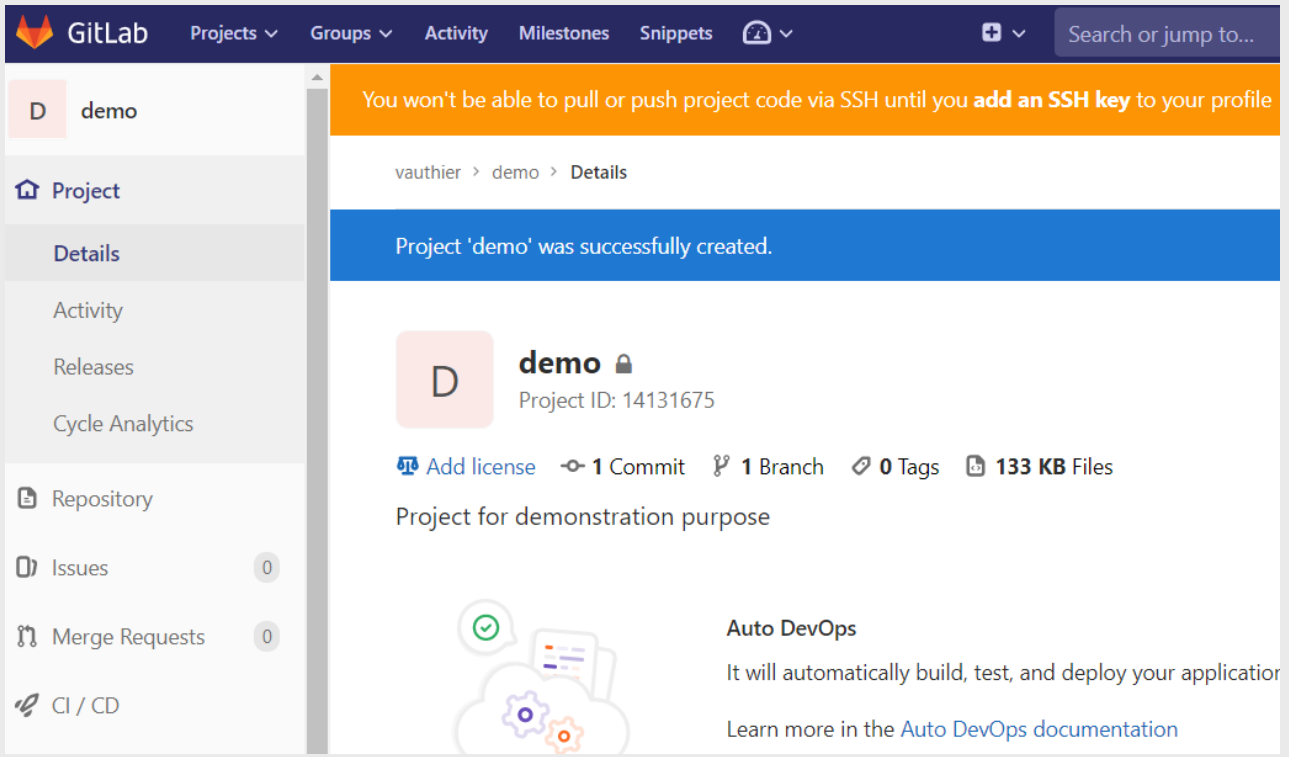
It provides a web interface for handling many of git's more advanced workflows, and recommends a workflow for interacting with git for the best in productivity, efficiency, and ease of use.

- ✓ File browser to explore the files in your repository
- ✓ A branch viewer
- ✓ A tag viewer
- ✓ Analyze and view the commit graph
- ✓ Web interface to make changes to code and commit it

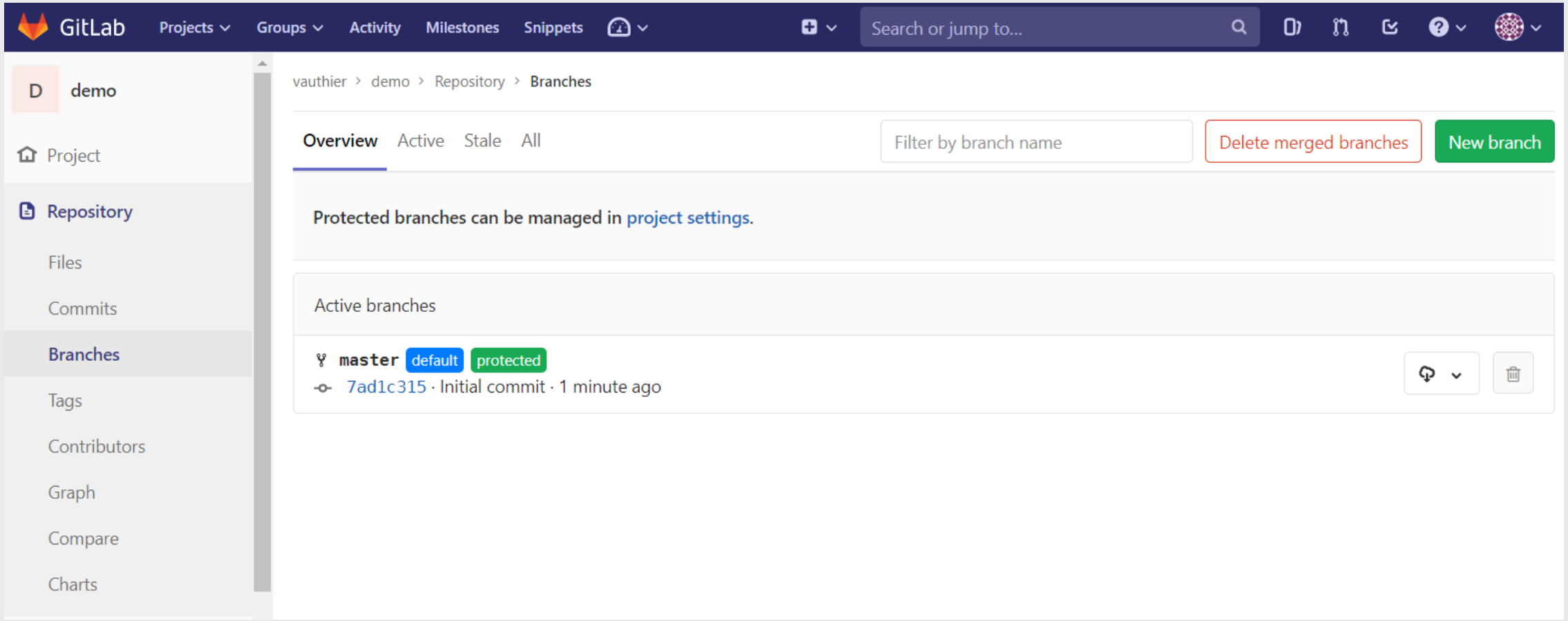
What is a GitLab project ?

- A Git repository to host the code with branches
- Several features such as issues tracking, CI/CD features....





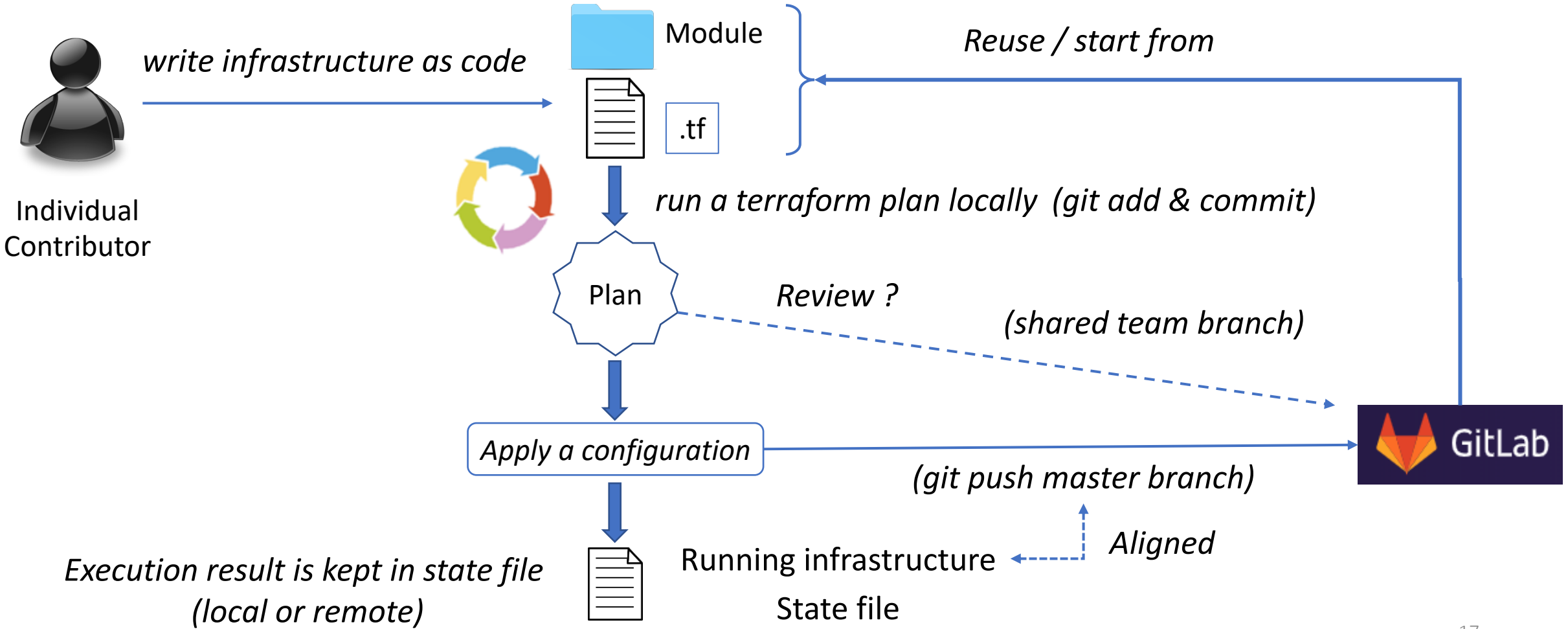
GitLab create a project



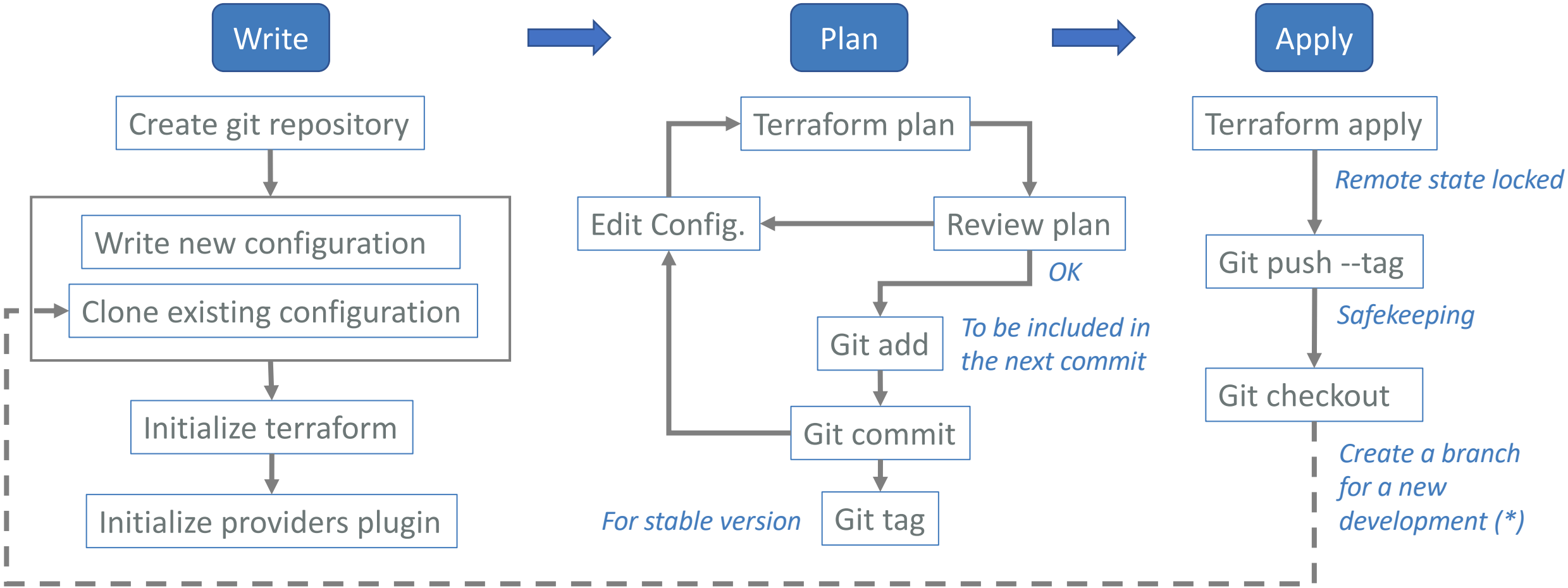
Git, Terraform and Devops

The good the bad and and the ugly

Terraform workflow, working with Git



Terraform workflow, working with Git

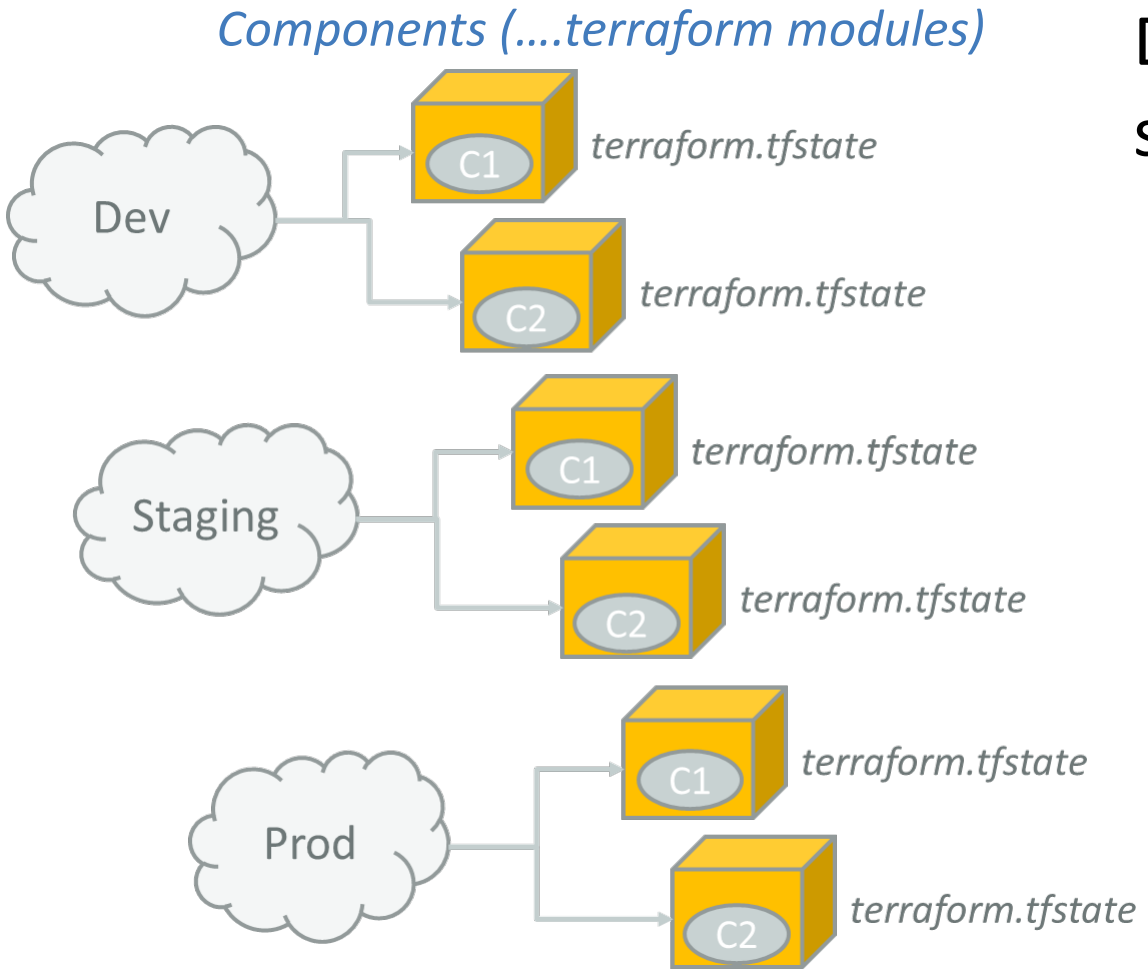


(*) Master is the default branch, but several branches can be used such as release, hot fix, feature dev.,… depending on the context

Troubles with branches

- Locking mechanism provided by Terraform backends avoid changes to overwrite in the terraform state file…. but not in the source code
- If 2 team members are deploying the same code to the same environment but from 2 different branches => conflicts can occur
- For one shared environment *(staging, prod,…)* always deploy from a single branch
- After a plan, review the changes. Then when all the tests are passed merge all your changes in the master branch
- Terraform is a declarative language and control over deployment is limited when applying changes. Be prepared to address efficiently situations where something goes wrong. Always test your changes in a staging environment before deploying in production.

Environments isolation

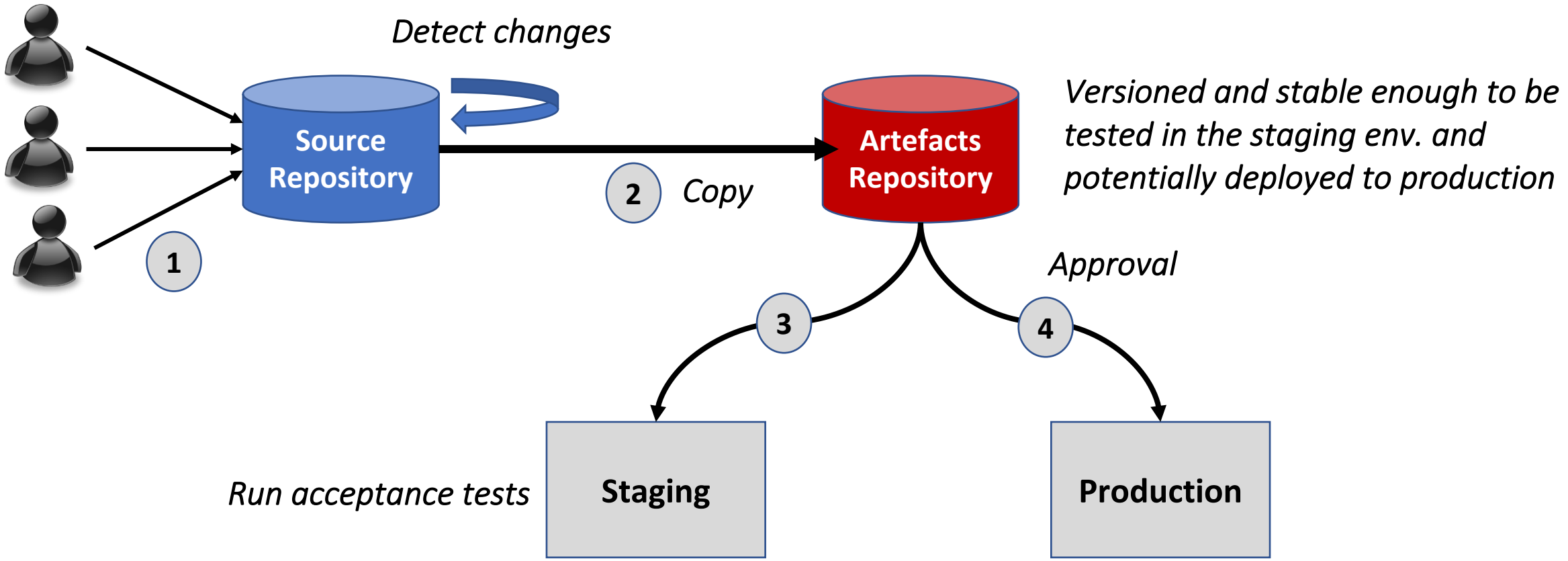


Do not put all your environments in a single stack

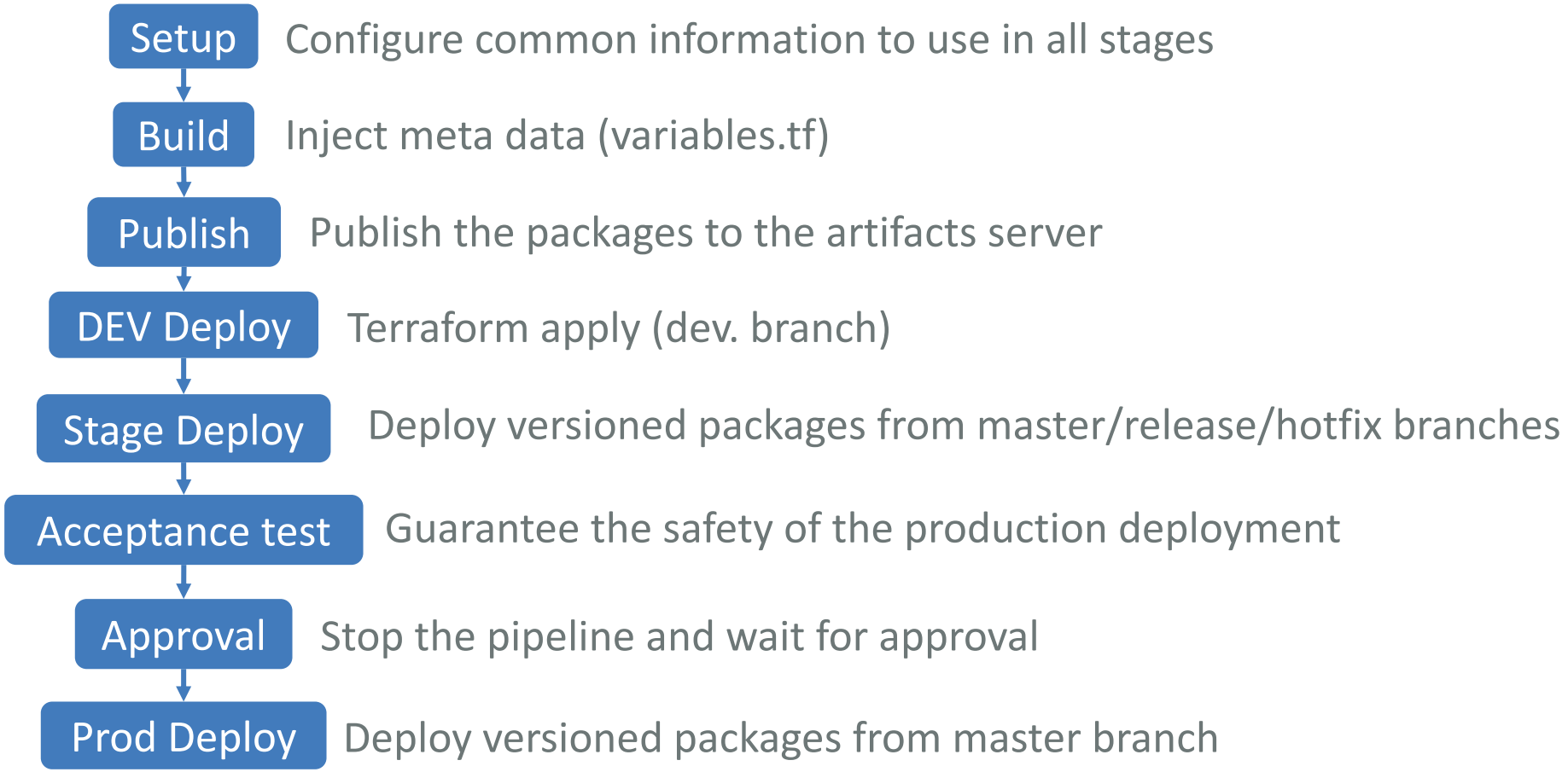
- An option could be to have a separate stack for each environment. Drawback: differences creep across environments. Maintaining separate definition required discipline to keep them consistent. For simple env.

- An alternative is to use a continuous delivery pipeline across environments. Promote component definition through a pipeline (parametrized).

Define your pipeline



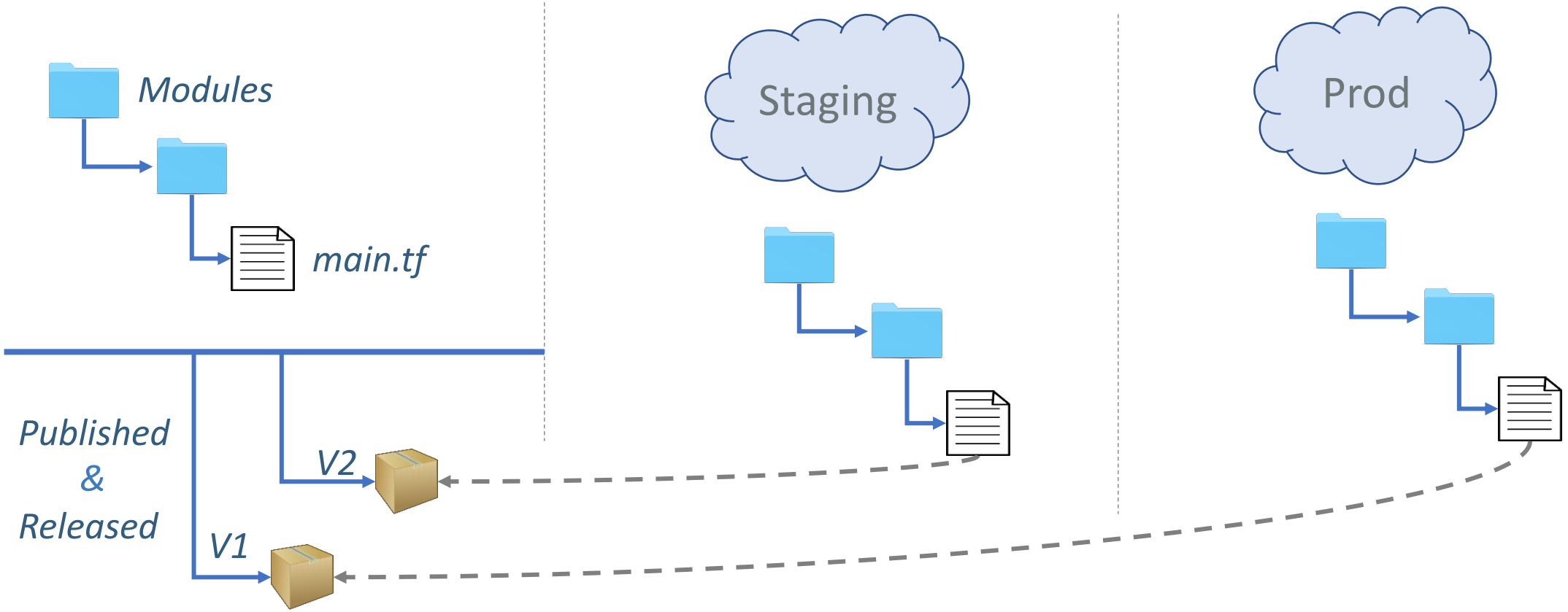
Define your pipeline



Reusing terraform modules

You need a repository for your modules

You need a live repository for infrastructure deployed in each environment



Some references

- ✓ https://www.terraform.io/guides/core-workflow.html
- ✓ Terraform: Up and Running, Yevgeniy Brikman