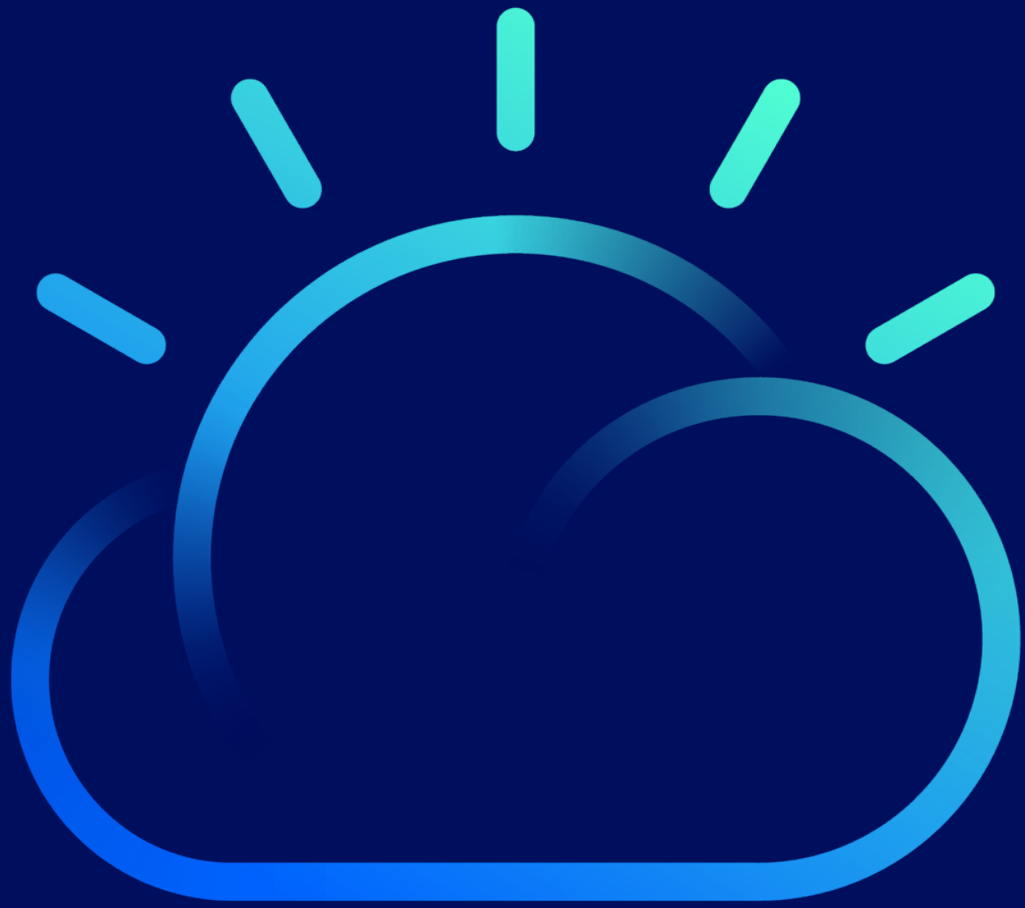
IBM Cloud Automation Manager Bootcamp



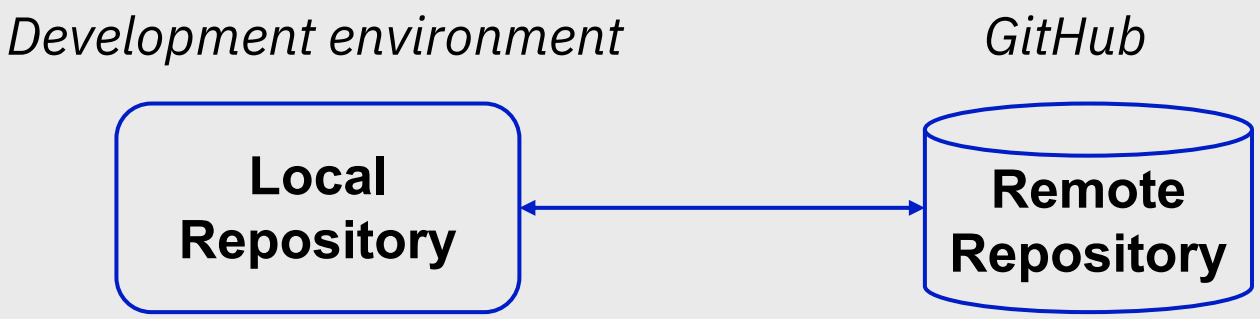
Working with GIT

Collaborative Infrastructure

IBM Cloud

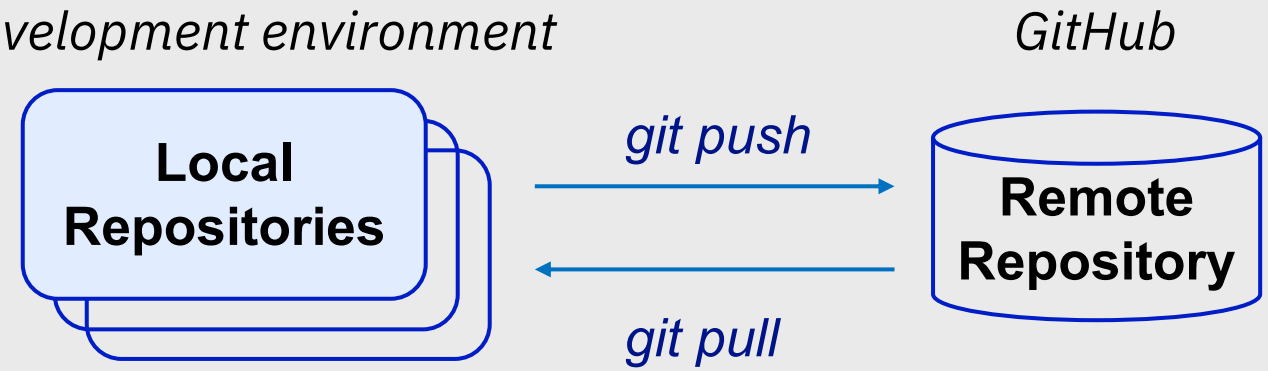
Why using a version control system such as Git ?

- 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



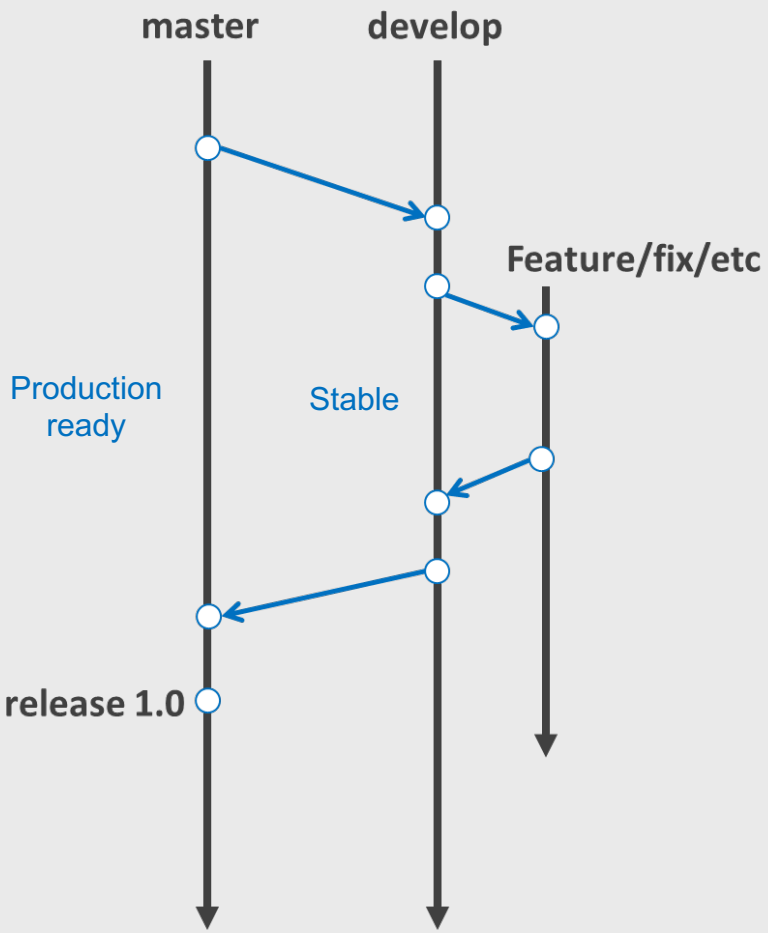
Distributed version control system

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*

The concept of branches



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 master branch is the default branch automatically created when cloning a repository

The command *git checkout* allows to select a branch (switch to a branch)

Why branches ?

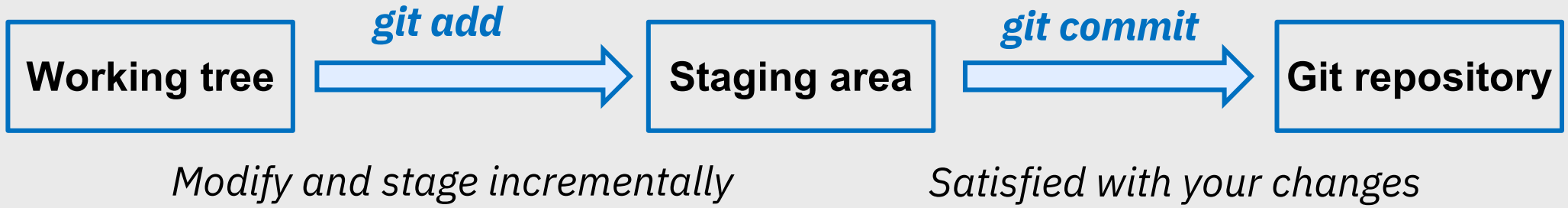
- Never commit on Master, instead uses branches created from the master and merge from your working branches
- Old code untouched until the new one works

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 .

Versioning Commits

- 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 add* to stage the changes made to the file
- Run *git rm* to remove files from your staging area and your working directory
- Run *git commit –m "reason for change"* to commit the staged changed
- Use *git diff* to show changes between commits or commit and working tree

Fetch, Merge and Stash

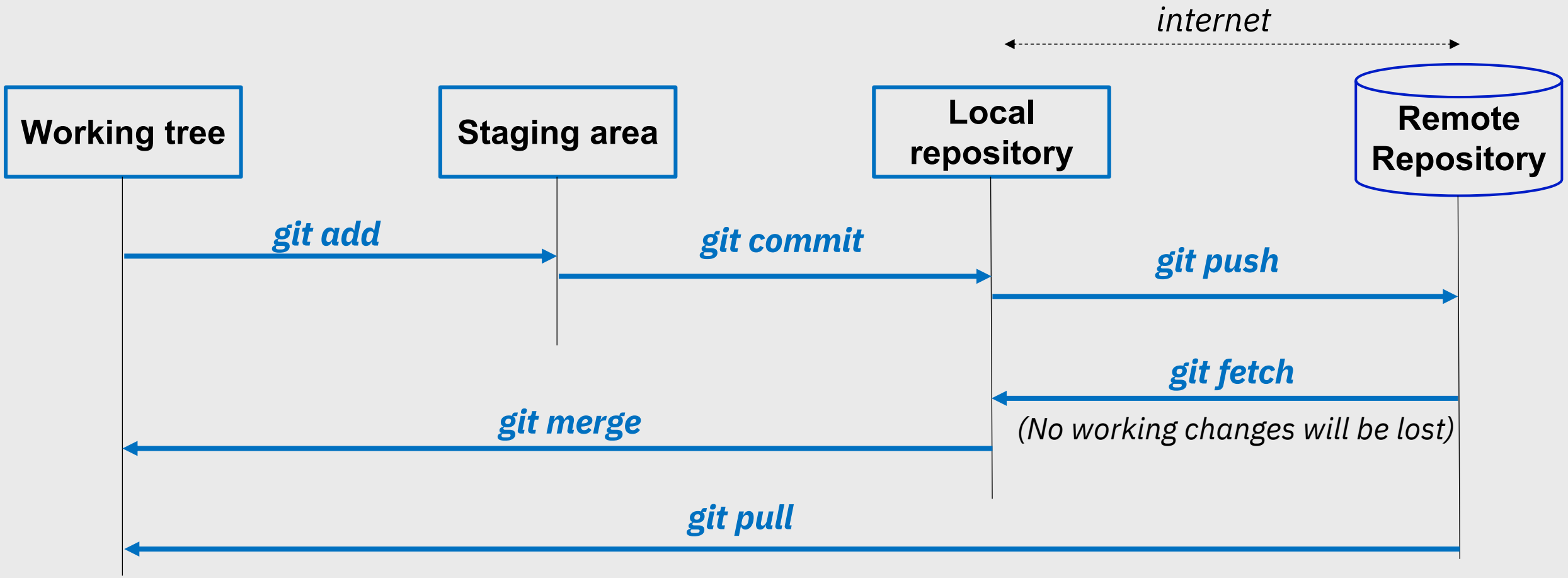
Fetch: See what everybody else has been working on. If you have conflicting files, you will need to manually **merge** them. Git fetch does not touch your working tree. It gives you the chance to decide what to do next.

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



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

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>*

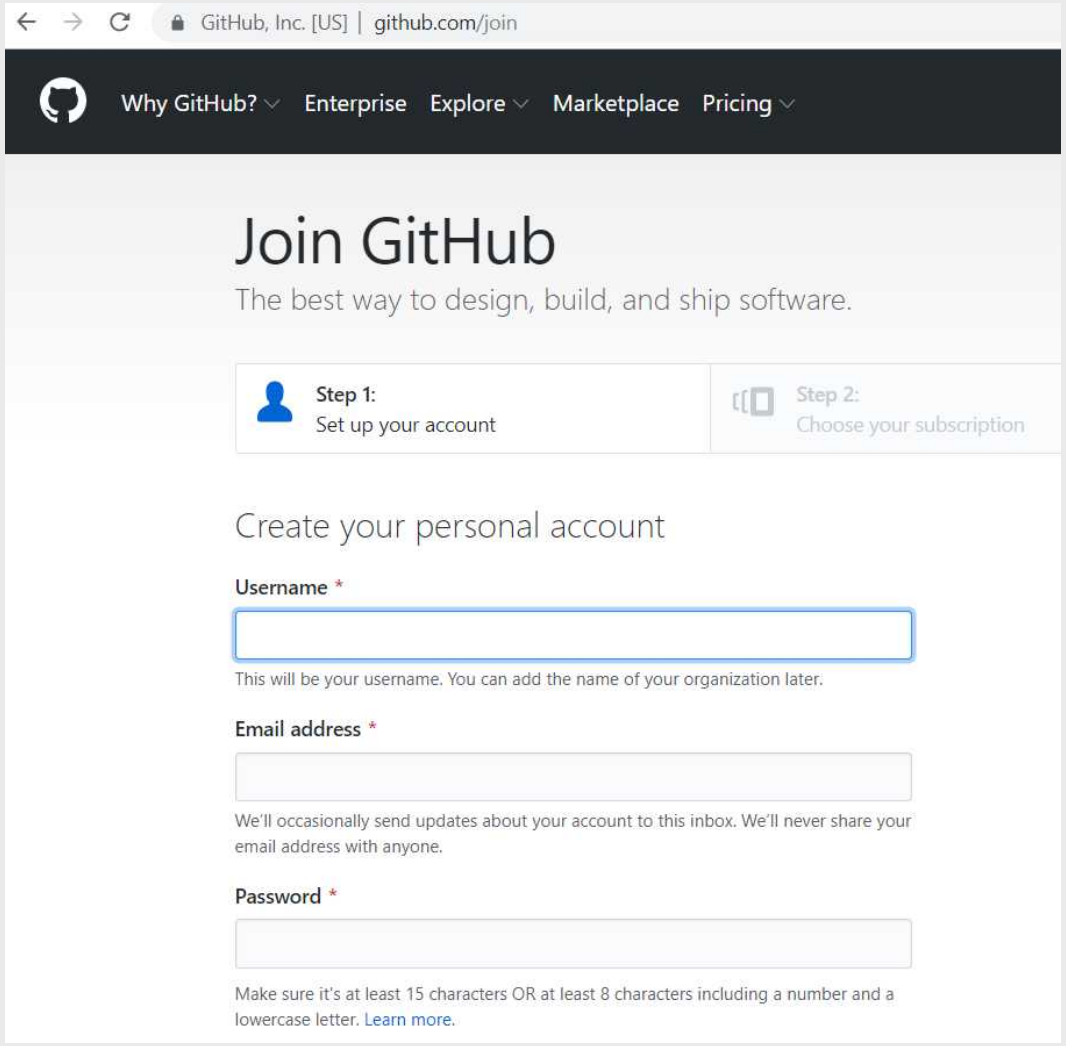
2 - Push a local branch to the remote repository

- *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 ?

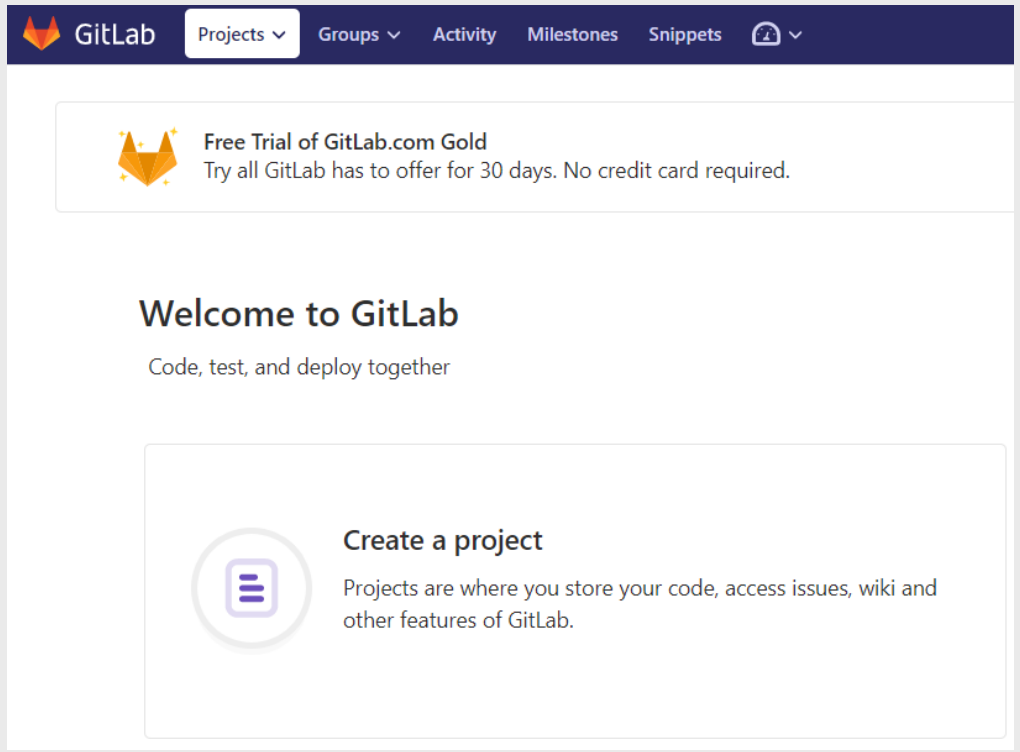
GitLab is built on top of git so that users who are contributing work to a project will have a copy of the project downloaded/checked out/cloned on their local computer.

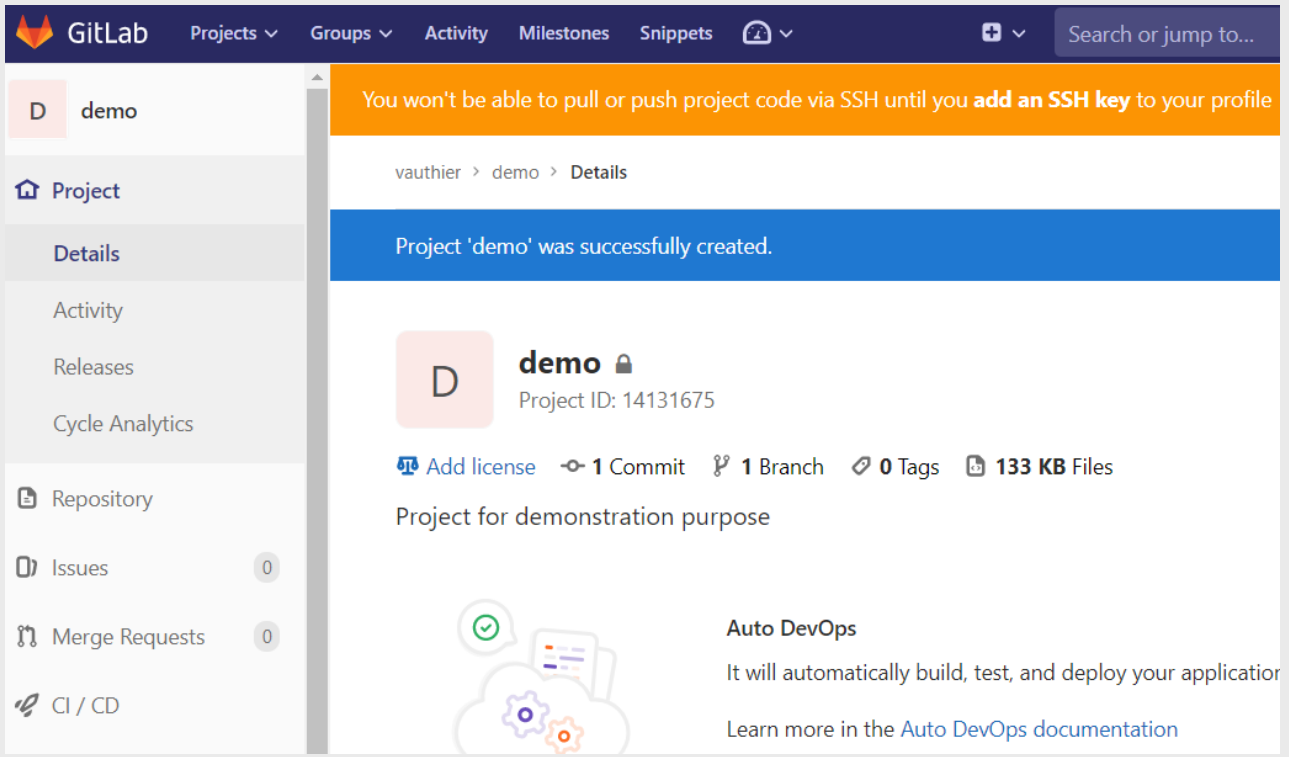
It provides a web interface for handling many of git's more advanced workflows, and recommends a workflow for interacting with git for the best in productivity, efficiency, and ease of use.

- ✓ 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

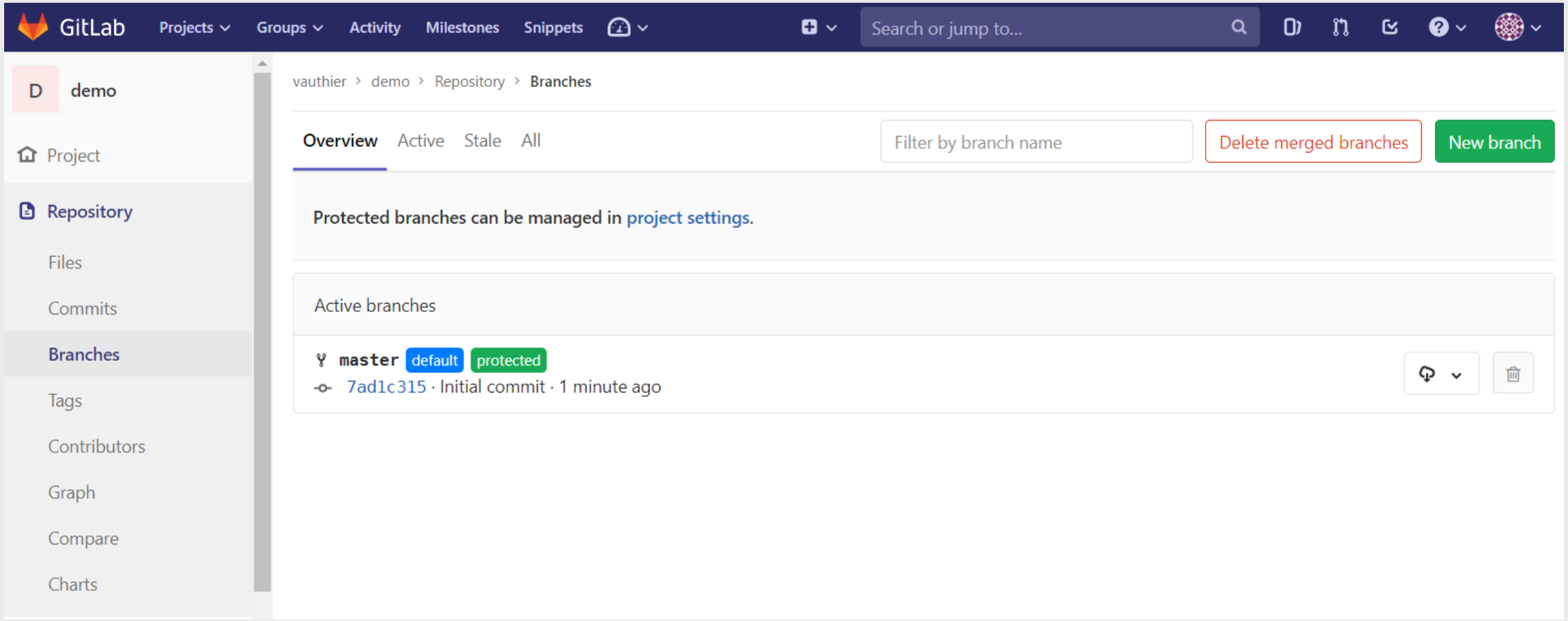
What is a GitLab project ?

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





GitLab create a project



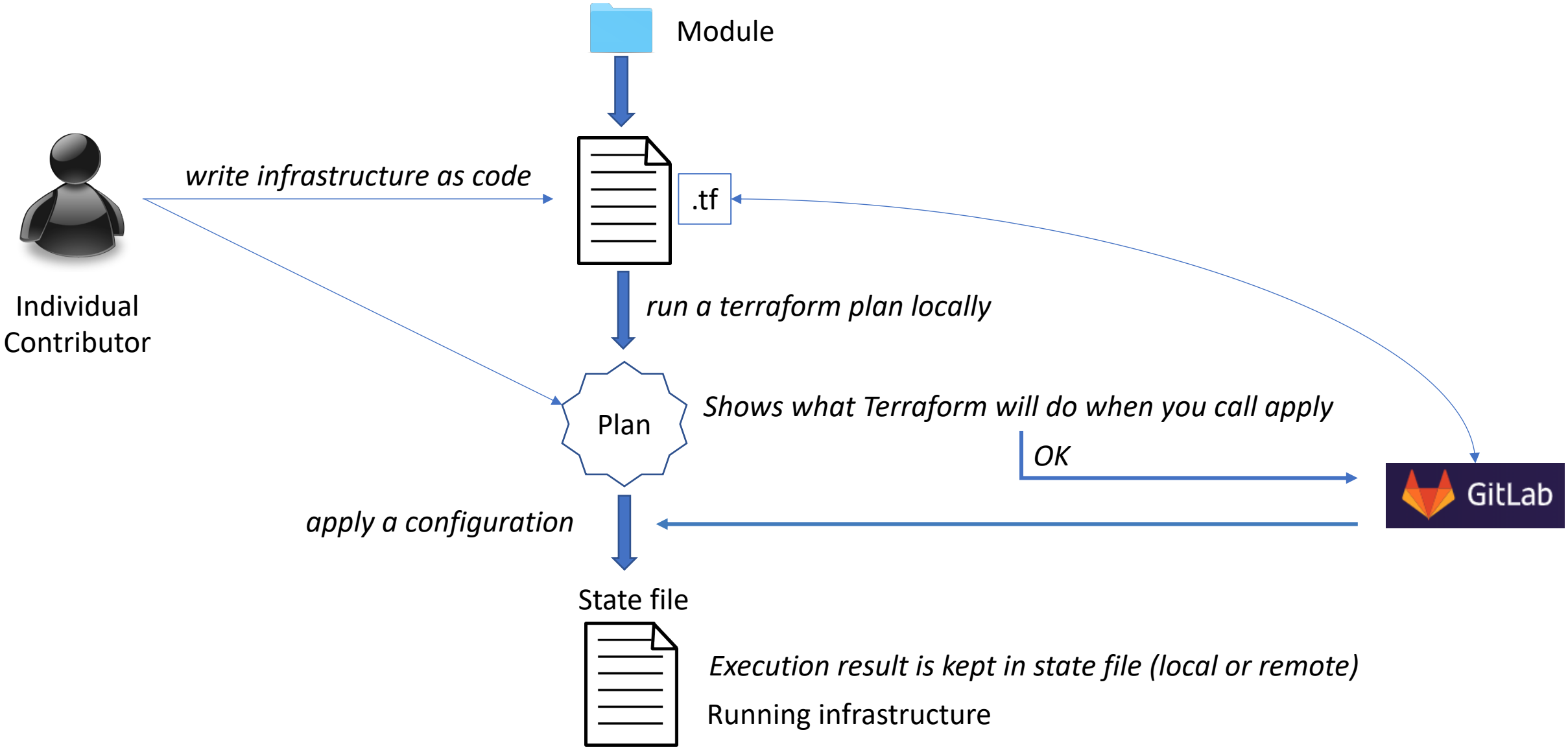
GitLab and GitHub ?

- Both, GitLab and GitHub are web-based Git repositories. A git repository is a central place where developers store, share, test and collaborate.
- Written in Ruby and Go, GitLab offers some similar features for issue tracking and project management as GitHub.
- With GitLab you can set and modify people's permissions according to their role. In GitHub, you can decide if someone gets a read or write access to a repository. With GitLab you can provide access to the issue tracker without giving permission to the source code
- GitLab offers its very own CI for free. No need to use an external CI service.
- GitLab provides service to import and export projects
- GitLab focus more on DevOps providing tools for more efficient workflows
- GitLab can be installed locally

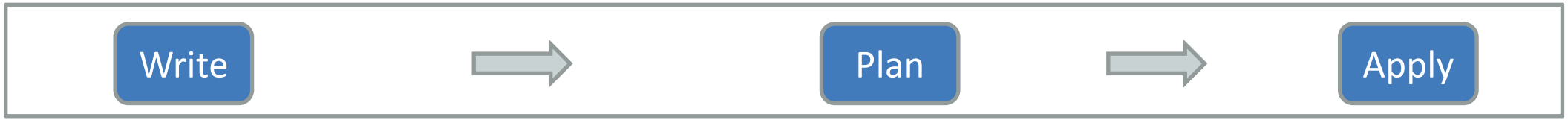
Git, Terraform and Devops

The good the bad and and the ugly

Terraform workflow …. working with Git



Terraform workflow …. working with Git



Create git repository

Write new configuration

Clone existing configuration

Initialize terraform

Initialize providers plugin

Terraform plan

Review plan

OK

Edit Configuration

Git add

To be included in the next commit

Git commit

For stable version

Git tag

Terraform apply

Remote state locked

Git push --tag

Safekeeping

Git checkout

Create a branch for a new development (*)

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

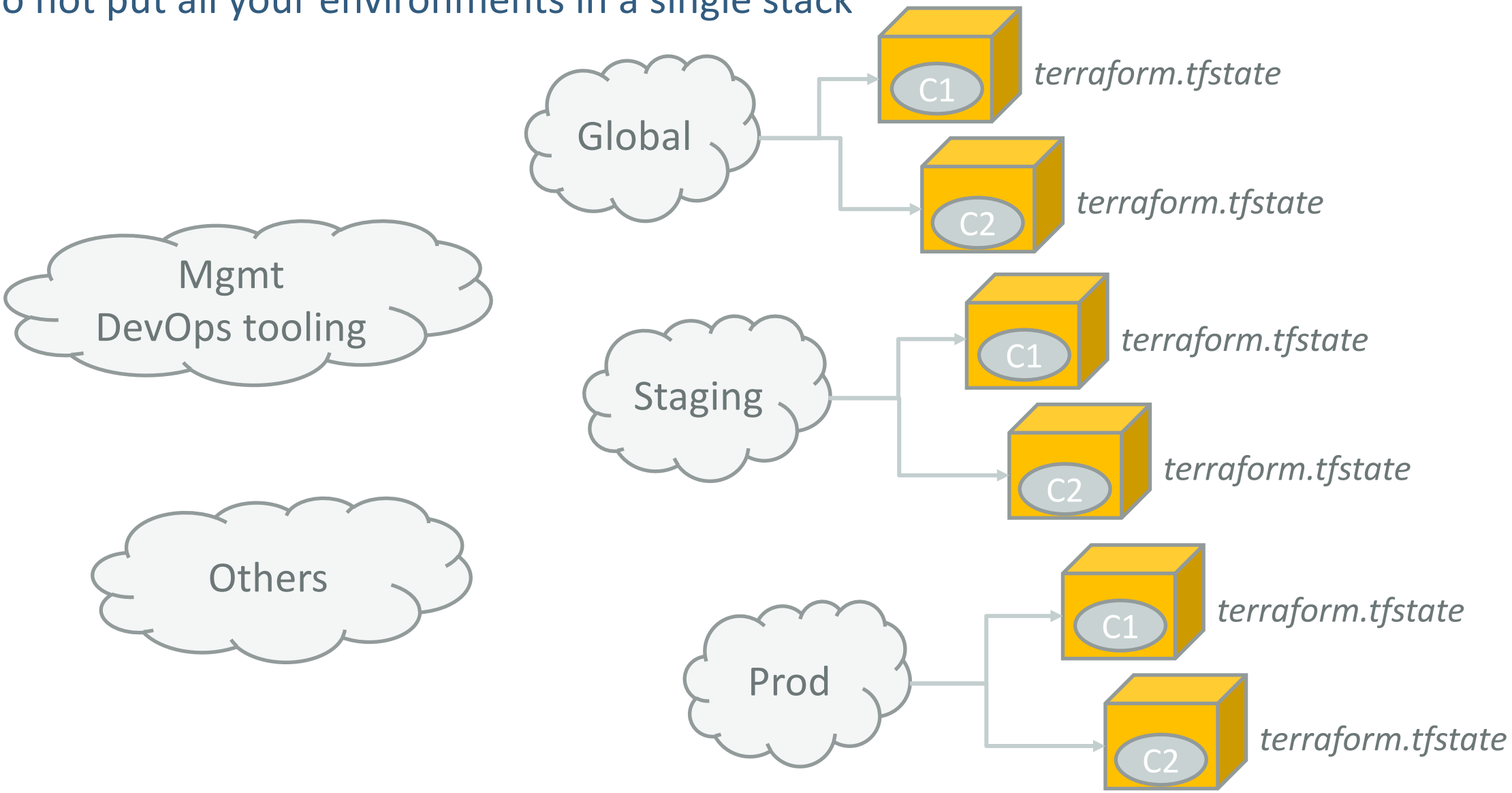
Trouble with branches

- 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

Components (….terraform modules)

Do not put all your environments in a single stack



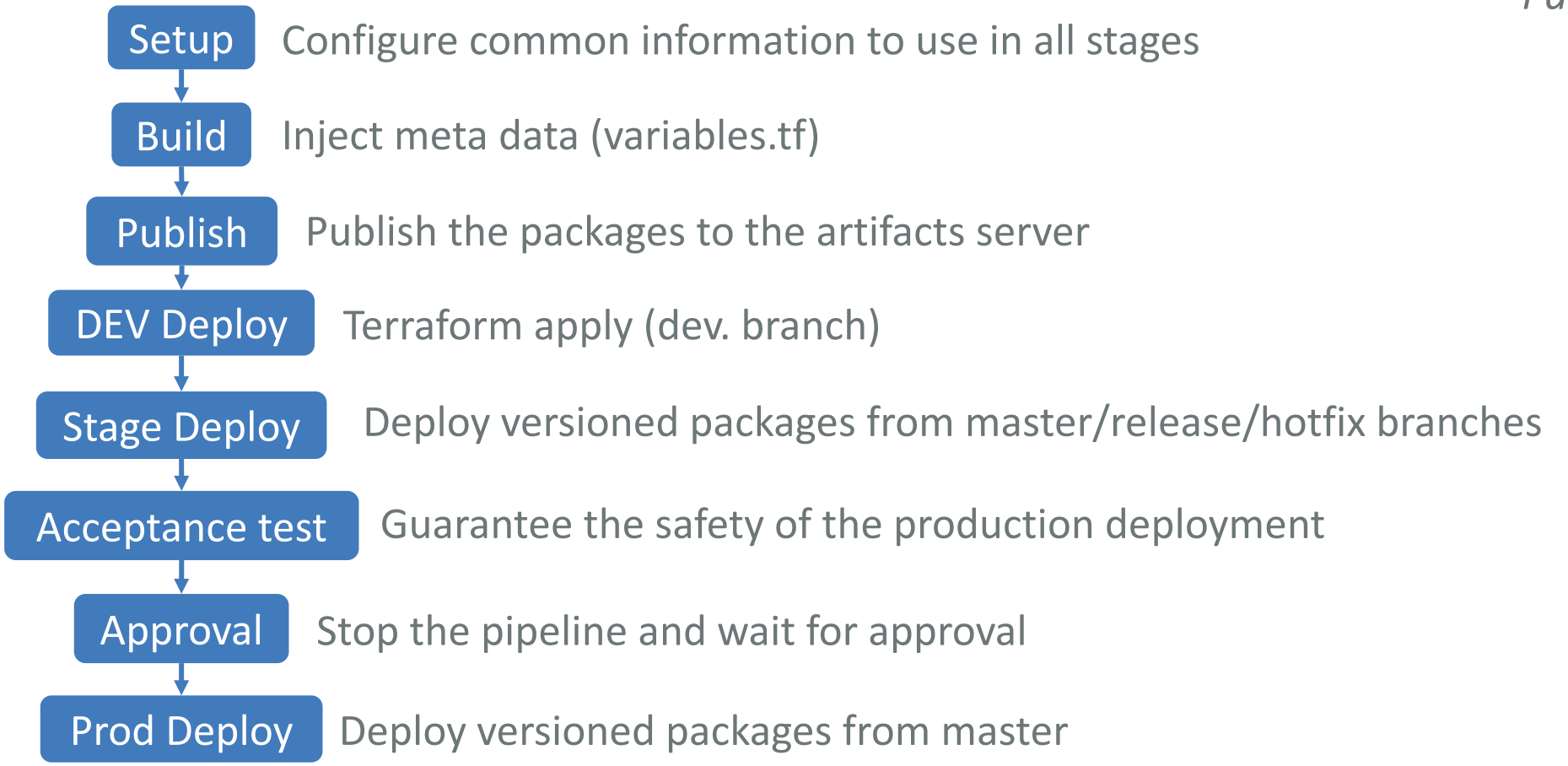
Pipeline

Keep code base consistent

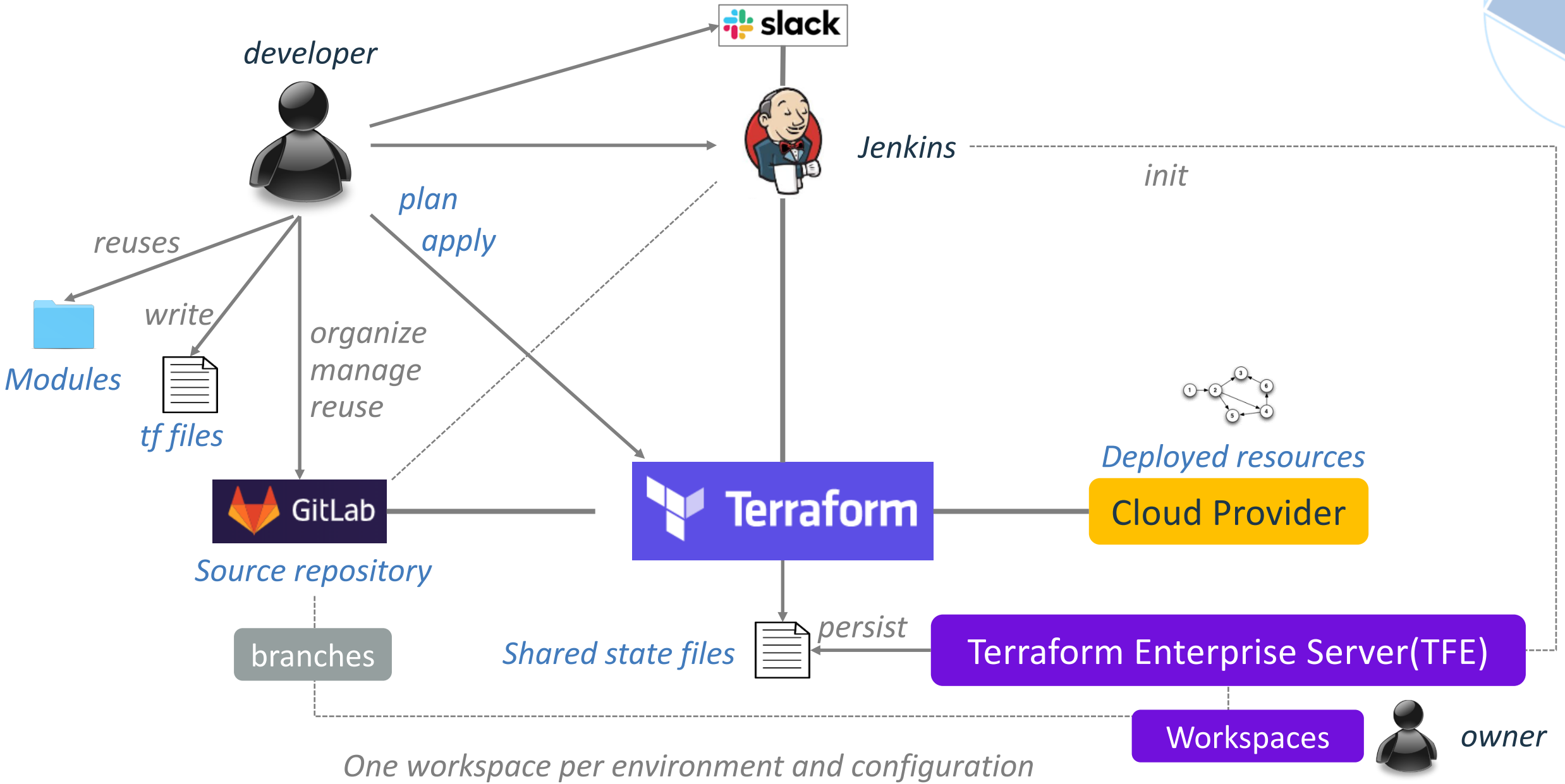
Simple: Define separate infra. component *(1 terraform state file)* for each environment

Complex: Create a single infra. component definition and promote it through a pipeline

Parametrized

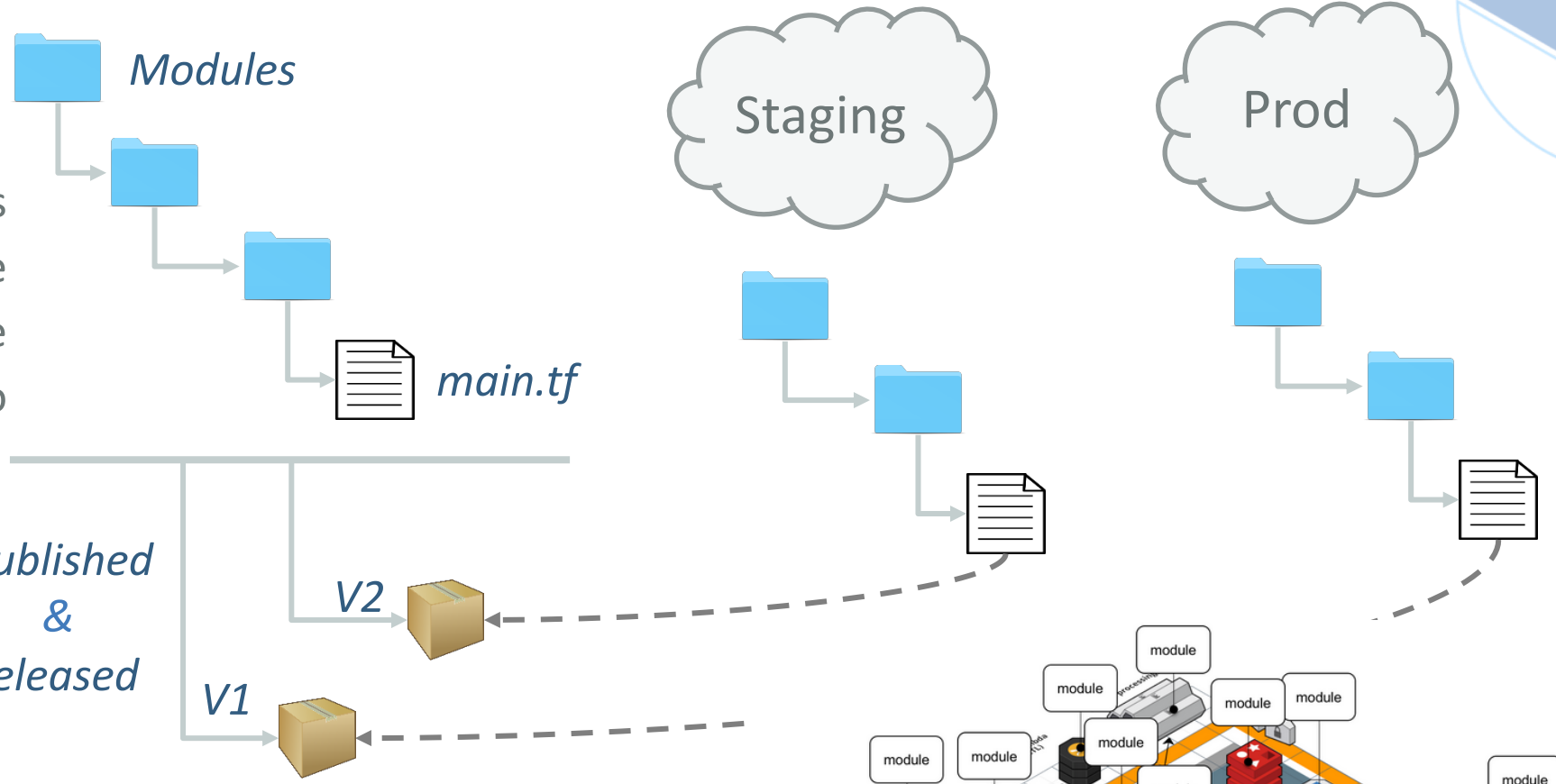


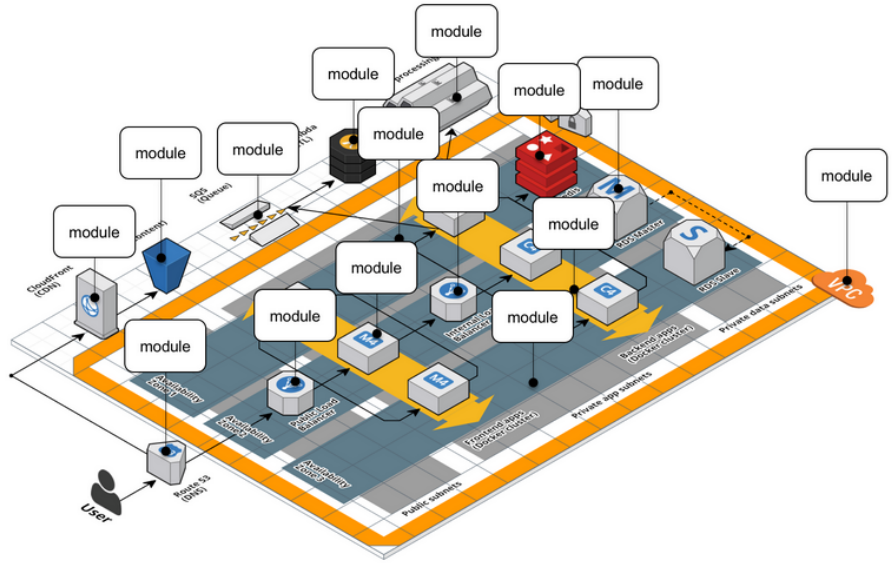
Pipeline tools example



Reuse Terraform modules

If the code for all environments references modules in the same repository => module changes must be deployed to all environments => delays





➡ **You need a repository for your modules**

➡ **But you also need a live repository for infrastructure deployed in each environment**

Repositories

- Modules must be maintained and versioned independently of the files for live environments which allow different environment to **simultaneously** reference different versions of the modules
- Separate terraform workspaces and repositories must be considered for live infrastructure deployments

Pipeline

Terraform project