Git & Github - A primer

Suryakumar Sudar, iQuanti

Git - Installation Instructions

For Linux :

```
sudo apt-get install git
```

For Windows:

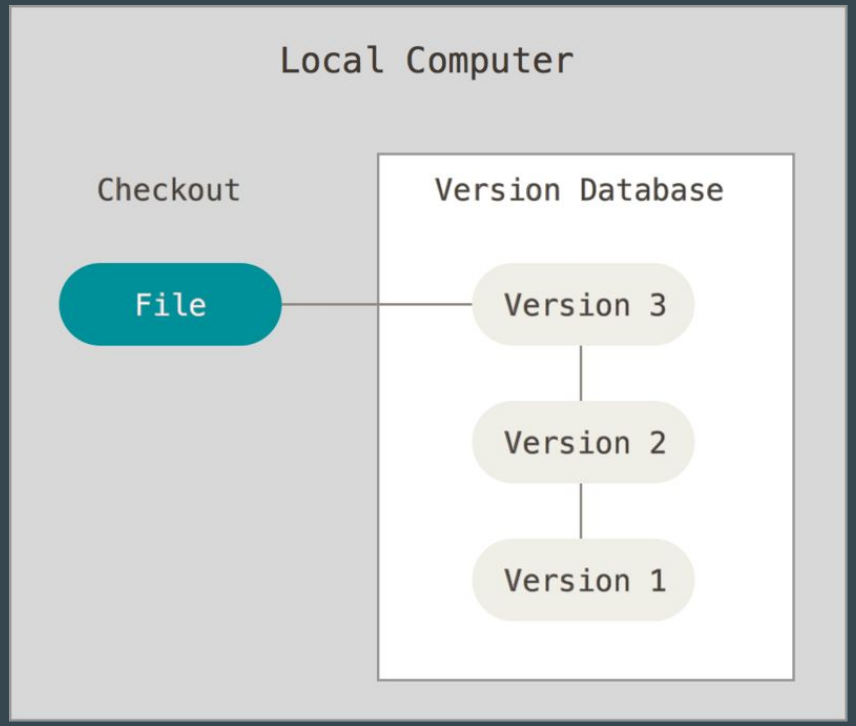
```
https://git-scm.com/download/win
```

Version Control Systems - an Introduction

Version control is a system that records changes to a file or set of files over time so that you can recall specific versions later.

It acts as a backup system as well as a revision tool.

**What features would you want in your ideal VCS?

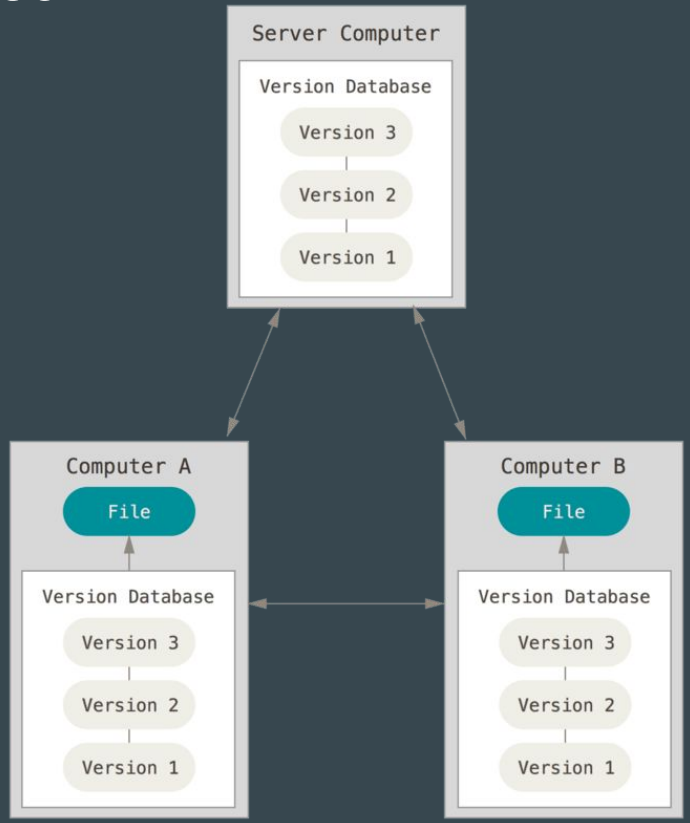


Version Control System - Essential Functions

- Should support reversion of a project/file to a previous state
- Should support Branching/Merging
- Should aid Traceability
- Should be distributed, not centralized

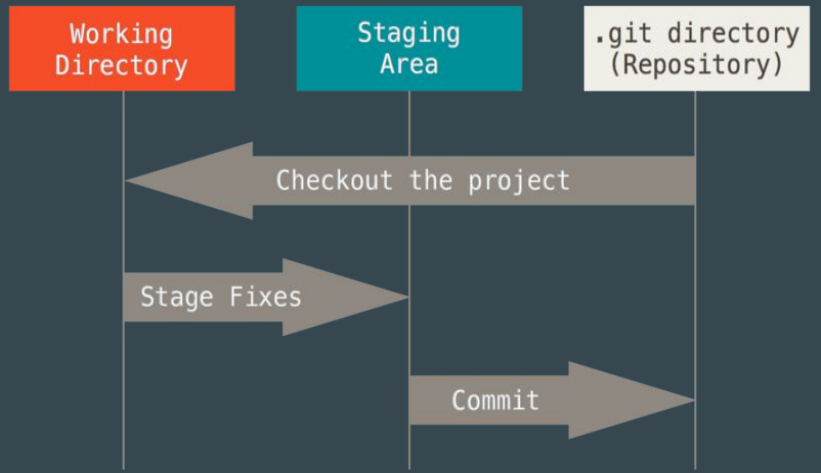
Git - Architecture & Salient Features

- Entire history is present locally
- Fast operations with no need of a network
- Distributed architecture
- Supports parallelism at scale, eg: thousands of feature branches



Workflow - Three States [Modified - Staged - Committed]

- **Committed** means that the data is safely stored in your local database
- **Modified** means that you have changed the file but have not committed it to your database yet.
- **Staged** means that you have marked a modified file in its current version to go into your next commit snapshot



** the current working directory is referred to as HEAD

To create a new repository

```
git init
```

Create a new directory and execute the command to initialize a repository

To add files to repository and commit the changes

Create a new file and add it to the staging area:

```
git add --all
```

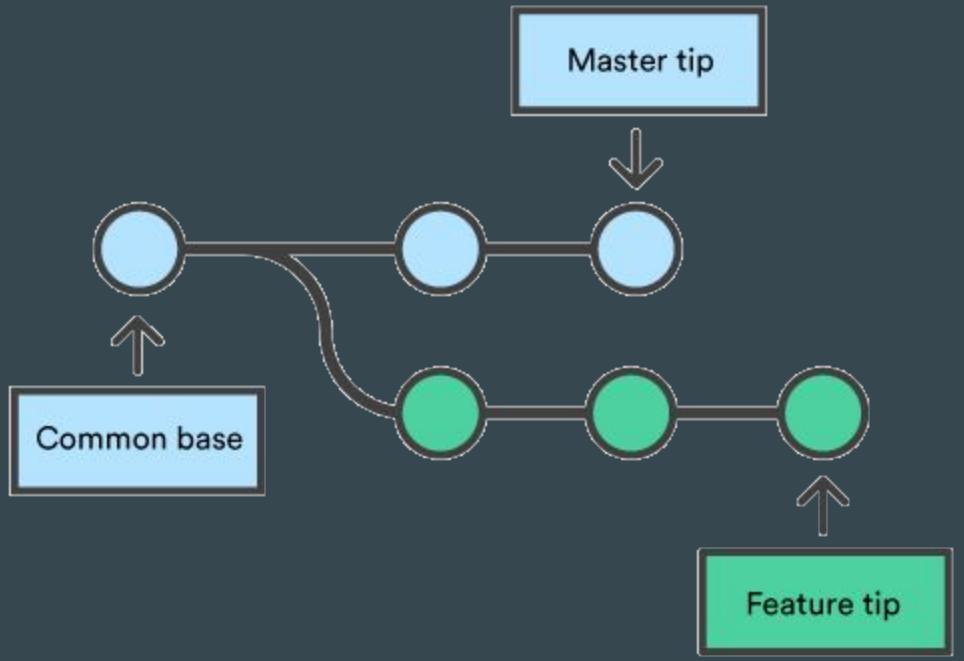
Commit the changes and add a log message:

```
git commit -a
```

Git - Branching

Branches are used to develop features in isolation without affecting the primary branch (master*)

`git branch <branch_name>`
Creates a new branch



*By default, the primary branch is named “master” by git.

To switch between states*

*States can refer to either branches or commits

Create a new branch from the current state of the project:

```
git checkout -b <branch name>
```

To switch to an already existing branch:

```
git checkout <branch_name>
```

To switch to a different commit ID:

```
git checkout <commit_id>
```

To inspect a repository

Lists commit history with additional information including author, commit ID and log message:

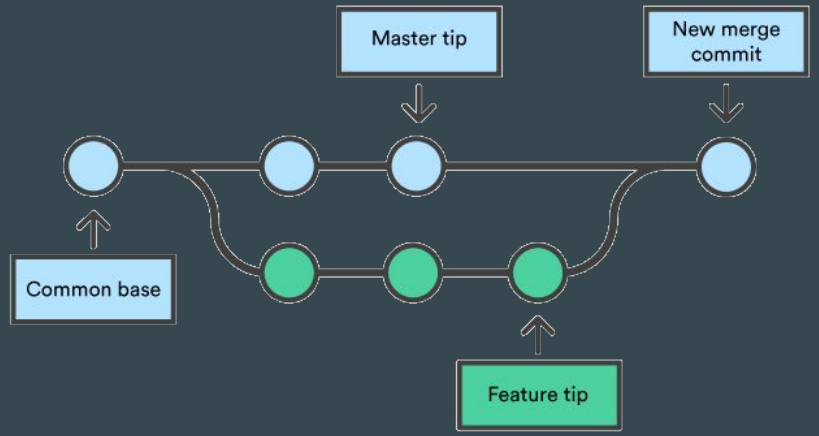
```
git log
```

Check the status of working directory and the staging area:

```
git status
```

Git - Merging

Merging is done to combine the changes made in one branch to another.



Command to merge:

“`git merge <branch1>`“ will merge branch1 with the current branch

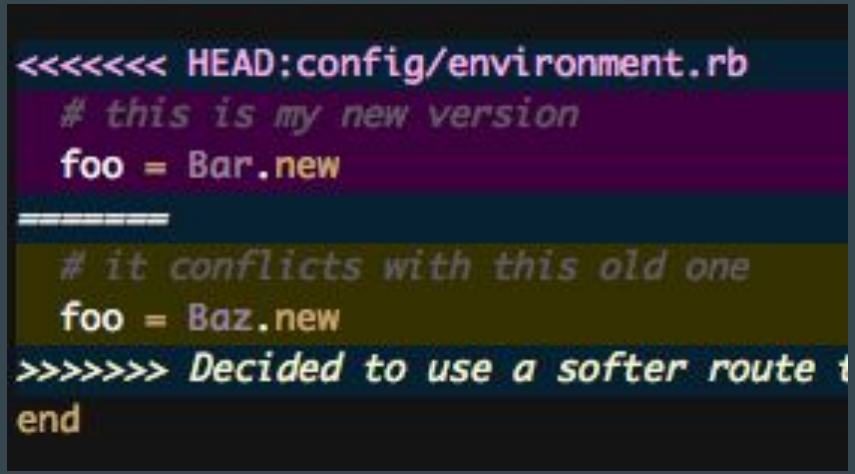
**Do you foresee any potential pitfalls?

Merge conflicts and resolution

git automatically merges files when possible

Exceptions arise when git tries to merge files where contents are changed in both the branches.

These ‘merge-conflicts’ have to be resolved manually. The code-segment to the right describes how git presents conflicts.



Git remotes and Github

- Remotes refer to servers which host repositories
- Companies which provide such service (Remotes): Github, Bitbucket, AWS CodeCommit etc..
- As convention, we refer to the primary remote as ‘origin’. This is purely conventional and there is no specific importance attached to the term ‘origin’.

Add/List remotes of a repository

Add a remote to an existing repository:

```
git remote add <remote_name>
<remote_URL>
```

```
Eg: git remote add origin
https://github.com/user/repo.git
```

List remotes of a repository:

```
git remote -v
```

Working with remotes

To download/clone a repository:

```
git clone <github_URL>
```

To push changes from local to remote:

```
git push
```

To pull changes from remote to local:

```
git pull [will merge local branch with remote]
```

Additional Tips

- Commit often
- Branch whenever required
- Decide upon a workflow with your team
- Always pull before you push code to remote
- Write meaningful commit messages
- “`git stash`” and “`git stash pop`” to save intermediate changes
- “`git reset HEAD --hard`” to reset local changes

References and further reading

- https://git-scm.com/book/en/v2/Getting-Started-About-Version-Control
- https://in.udacity.com/course/how-to-use-git-and-github--ud775
- https://www.atlassian.com/git/tutorials/learn-git-with-bitbucket-cloud
- https://github.com/pluralsight/git-internals-pdf