



Introduction to Git

Git is a **version control system (vcs)** designed to track changes in Source code and collaborate efficiently with others it is widely used for software development due to its speed, flexibility and support for non-linear workflows (eg.branching and merging) this what a typical git workflow in a startup or enterprise application code.

What is VCS

VCS stands for version control system is a tool that helps manage and track changes to source code or other files over time vsc is essential for software development and other projects where maintaining a history of change collaboration and versioning is critical.

Popular VCS tools

- **Git** :- The most widely used DVCS: support branching and distributed workflows
- **Subversion** :- A CVCS used in enterprise application
- **Mercurial** :- Another DVCS simpler than git in some aspect
- **Perforce** :- A CVCS often used for larger than -scale enterprise projects

Why do we need VSC

Tracking and changing :- it records changes to file over time enabling developer to see who change what and when

Collaboration:- Multiple people can work on the same project simultaneously without overwriting each other's work

Branching and merging:- Developers can create separate branch for different feature or experiment and later merge into the main project

Version History :- It keep a history of all changes making it easy to revert to previous version if needed

Conflict resolution:- Helps manage and resolve conflicts when multiple developer make change to the same file

Backup and recovery:- Acts as a backup for the project



Basic Git commands

command	Description
<code>git init</code>	Initialize a new Git repository
<code>git clone <url></code>	Clone repository from url
<code>git status</code>	Show the status of working directory
<code>git add <file></code>	Stage a file for commit
<code>git add .</code>	Stage all changes in the current directory
<code>git commit -m "message"</code>	Commit stage change with a message
<code>git push</code>	Push commit to remote repository
<code>git pull</code>	Fetch and merge changes from a remote repo
<code>git branch</code>	List branches
<code>git branch <name></code>	Create a new branch
<code>git checkout <branch></code>	Switch to a specific branch

<code>git merge <branch></code>	Merge a branch into the current branch
<code>git log</code>	View commit history
<code>git diff</code>	Show difference between working files
<code>git reset <file></code>	Unstage a file
<code>git stash</code>	Save changes without committing
<code>git stash pop</code>	Reapply stashed changes
<code>git remote add <name> <url></code>	Add a remote repository
<code>git fetch</code>	Download object and refs from another repo
<code>git rebase <branch></code>	Reapply commit on top another branch

How git works

Git manages projects by tracking changes to files and directories within a working directory . when a git repository is initialized ,a hidden **.git** directory is created , which contains all metadata and object databases for the project. This directory is where Git stores information about commit branch tags and other version control data

Here's A breakdown of how git uses the .git directory :

- **Initialization**

when you run **git init** in directory Git creates a .git directory within that directory

This directory serves as the repository for the project.

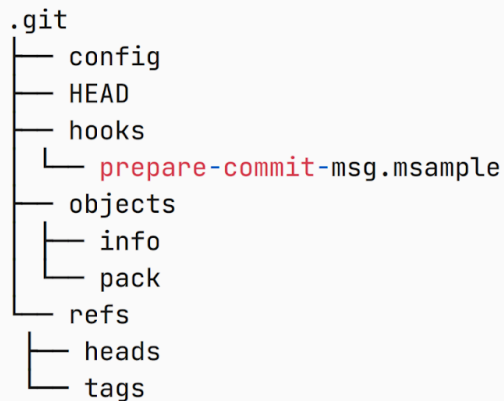
- **Tracking changes:**

Git track changes to file to find within the working directory

What is .git/ Directory ?

As soon as we run `git init` command ,we get following message in the console:

Initialized empty Git repository in /home/coding/shubham-dev/projects



```
.git
├── config
├── HEAD
├── hooks
│   └── prepare-commit-msg.sample
├── objects
│   ├── info
│   └── pack
├── refs
├── heads
└── tags
```

- **Config** is a text file that contains your git configuration for the current repo.
- **Head** contain the current head of the repo
- **hooks** contain any scripts that can be run before/after git does anything.
- **Objects** contain the git object, ie the data about the file ,commit etc in your repo. we will go in depth into this in a blog.
- **Refs** as we previously mentioned, stores references (pointers)

