

# **1. Branching in Git**

## **What is Branching?**

Branching is creating a separate line of development from the main project.

Think of it like **making a copy of your code** so you can work on changes without disturbing the main codebase.

By default, when you create a Git repository, you start with one branch (usually named main or master).

When you create a new branch, Git points to the **same commit** as the branch you branched from, but allows you to move forward independently.

## **Why use Branching?**

- **Work on new features** without affecting stable code.
- **Fix bugs** while other features are still in progress.
- **Experiment safely** — you can delete a branch if it fails.
- **Collaborate** — different people can work on different branches without conflict.

## **Branching Commands**

1. # Create a new branch

```
git branch feature-login
```

2. # Switch to that branch

```
git checkout feature-login
```

```
# or (Git 2.23+)
```

```
git switch feature-login
```

3. # Create and switch in one command

git checkout -b feature-login

## 2.Merging in Git

### What is Merging?

Merging is **combining changes** from one branch into another.  
For example, when your feature is complete, you merge it into main.

### Why use Merging?

- Integrates completed work back into the main codebase.
- Keeps branches in sync.
- Brings all developer contributions together.

### Types of Merging

#### 1. Fast-forward merge

- Happens when no new commits have been made on the target branch since branching.
- Git simply moves the branch pointer forward.

#### 2. Three-way merge

- Happens when both branches have new commits.
- Git uses the last common commit (merge base) to combine changes.
- May create a **merge commit**.

#### 3. Merge with conflicts

- Happens when the same file lines are changed in both branches.
- You must manually resolve them.

### **Merging Commands**

1. # Switch to the branch you want to merge into

`git checkout main`

2. # Merge the feature branch into it

`git merge feature-login`