Day 9, 10, and 11 - Git & GitHub Complete Guide

1. What is a Version Control System (VCS)?

A Version Control System helps you track changes to files, collaborate with others, and revert to earlier versions.

Types:

- Centralized VCS (CVCS): Single server (e.g., SVN)
- Distributed VCS (DVCS): Every user has full project history (e.g., Git)

2. What is Git?

Git is a free, open-source distributed version control system developed by Linus Torvalds.

3. Why Git is Popular?

- Works offline
- Fast and lightweight
- Great branching and merging
- Widely used in DevOps

4. Alternatives to Git

- SVN (Centralized)
- Mercurial (Distributed)
- Perforce (Enterprise)

5. Git vs GitHub

- Git: Local version control

- GitHub: Cloud hosting for Git repositories

6. Git Setup & Basic Commands

```
git init                # Initialize Git repository
git status              # Check file status
git config --global user.name "Your Name"
git config --global user.email "your@email.com"
git add .               # Stage files
git commit -m "msg"     # Save snapshot
git log                 # View history
```

7. Pushing to GitHub

- Using HTTPS:

```
git remote add origin https://github.com/username/repo.git
git push -u origin main
```

- Using SSH:

```
ssh-keygen -t rsa -b 4096 -C "your@email.com"
cat ~/.ssh/id_rsa.pub (Add to GitHub SSH settings)
git remote add origin git@github.com:username/repo.git
git push -u origin main
```

8. Branching and Merging

```
git branch feature
git checkout feature
git checkout -b feature
git checkout main
```

git merge feature

9. Merge vs Rebase

- Merge keeps history intact.

- Rebase creates linear history.

10. Git Cherry-Pick

git cherry-pick <commit-hash>

11. Git Clone

git clone https://github.com/user/repo.git

or

git clone git@github.com:user/repo.git

12. Summary of Commands

git init

git status

git add .

git commit -m "msg"

git remote add origin <url>

git push -u origin main

git branch feature

git checkout feature

git merge feature

git rebase main

git cherry-pick <hash>

git clone <url>

13. Public vs Private Key

- Private Key: id_rsa (keep secret)
- Public Key: id_rsa.pub (share with GitHub)