

Lab Manual: Git Workflow Management Simulation

Objective

To simulate a structured Git workflow for collaborative software development. Students will use task descriptions from a Trello board to create feature branches, make text-based "simulated" changes, and practice the complete branch management, code review, and release process.

Prerequisites

- Git installed on local machine
- Access to a shared Git repository (GitHub/GitLab)
- Access to the course's Trello board with predefined tasks
- Basic knowledge of Git commands

Basic Terminology & Concepts Explanation

- **Repository (Repo):** The project's database. It contains all the files, history, and commits. It exists in two places: a **remote** (hosted on a server like GitHub) and **local** (a clone on your machine).
- **Clone:** The act of creating a full copy of a remote repository on your local machine. This is the first thing you do to get started. `git clone <url>`
- **Commit:** A snapshot of your project at a point in time. It's like a save point in a game. Each commit has a unique ID, a message describing what changed, and a reference to its parent commit(s).
- **Branch:** A lightweight, movable pointer to a specific commit. Think of it as an independent line of development. The default branch is usually **main**. You create new branches to develop features without messing up the main codebase.
 - **main/master:** The production-ready, stable branch.
 - **dev:** The integration branch where completed features are merged for testing.

- `feature/*, hotfix/*`: Short-lived branches for specific tasks.
- **Checkout:** The command to switch between different branches or commits in your working directory. `git checkout <branch-name>`
- **Merge:** The process of combining the changes from one branch into another. For example, merging a `feature` branch into `dev`. This often creates a "merge commit."
- **Pull Request (PR) / Merge Request (MR):** A collaboration tool on platforms like GitHub/GitLab. It's a request to merge one branch into another. It initiates discussion, code review, and automated checks before the merge happens.
- **Pull:** The act of fetching the latest changes from a remote repository and merging them into your current local branch. `git pull origin main` is equivalent to `git fetch origin + git merge origin/main`.
- **Push:** The act of sending your committed changes from your local repository to a remote one. `git push origin <branch-name>`
- **Workflow (Gitflow in this case):** A branching model that defines how branches interact. It provides a rigid framework for managing features, releases, and hotfixes, which is perfect for collaboration.
 - **Feature Branches:** Isolate new work. Born from `dev`, merged back into `dev`.
 - **Hotfix Branches:** For critical bugs in `main`. Born from `main`, merged back into `main and dev`.
 - **Release Branches:** For preparing a new production release. Born from `dev`, merged into `main and dev`.
- **origin:** The default conventional name for the remote repository you cloned from.

Workflow Overview

`feature/* → dev → stage → main (production)`

Simulation Concept

Since no actual code will be written, each "feature" will be simulated by creating or modifying a text file. The content of the change will be the description of the task from Trello.

- **A new feature** = Adding a new section to `PROJECT_FEATURES.md`
- **A bug fix** = Correcting a typo or error in an existing file.
- **A chore** = Updating the `CHANGELOG.md` or `README.md`.

The value is not in the content but in **correctly executing the Git commands and workflow steps**.

Step-by-Step Simulation Instructions

1. Repository Setup

This foundational task will be performed by one member of your 4-person group. The rest of the team will then clone the repository that this student creates.

Objective: To create the central "source of truth" for the project, initialize its basic structure, and establish the core branching strategy.

Step-by-Step Guide for the Setup Lead:

1. Create the Repository on GitHub/GitLab:

- Log in to your GitHub/GitLab account.
- Click the "**New repository**" button.
- **Repository name:** `project-simulator-[YourTeamName]` (e.g., `project-simulator-team-alpha`).

- **Description:** A simulation repository for practising Git workflow management.
- Set the repository to **Public** (or Private if your organization requires it).
- **DO NOT** initialize the repository with a README, .gitignore, or license. We want to start completely empty. This is crucial.
- Click "**Create repository**".

2. Initialize the Repository Locally and Create the Structure:

Open your terminal/command prompt and run the following commands:

```
# 1. Create a new directory for the project and navigate into it
mkdir project-simulator
cd project-simulator

# 2. Initialize a new Git repository in this directory
git init

# 3. Create the initial, basic files that every project needs
echo "# Project Simulator" > README.md
echo "# Changelog" > CHANGELOG.md
echo "# Implemented Features" > PROJECT_FEATURES.md

# 4. Stage all the newly created files to be committed
git add README.md CHANGELOG.md PROJECT_FEATURES.md

# 5. Make the first commit to the repository's default branch (often 'master')
)
git commit -m "chore: initial project setup and documentation"
```

3. Rename the Default Branch and Create the Workflow Branches:

The industry standard is to use **main** as the primary branch instead of the historical **master**.

```
# 1. Rename the current branch from 'master' to 'main'
git branch -M main

# 2. Create the 'dev' (development) branch
git branch dev
```

```
# 3. Create the 'stage' (staging/pre-production) branch  
git branch stage  
  
# 4. Verify all branches have been created. You should see: main, dev, stage  
git branch
```

4. Connect the Local Repository to the Remote and Push All Branches:

Now, link your local repo to the empty one you created on GitHub/GitLab.

```
# 1. Add the remote repository URL. Copy this URL from your GitHub/GitLab page.  
git remote add origin https://github.com/your-username/project-simulator-team-alpha.git  
  
# 2. Push the main branch to the remote 'origin' and set it as the upstream  
git push -u origin main  
  
# 3. Push the dev branch to the remote  
git push -u origin dev  
  
# 4. Push the stage branch to the remote  
git push -u origin stage
```

5. Verify Success:

- Refresh the page of your repository on GitHub/GitLab.
- You should now see the three files (`README.md`, `CHANGELOG.md`, `PROJECT_FEATURES.md`).
- Click on the branch selector dropdown. You should see three branches: `main`, `dev`, and `stage`.
- The default branch should be `main`.

6. Onboard Teammates:

- Share the repository URL with your teammates.
- They can now follow the "Student Setup - Clone and Configure" steps from the main manual.

2. Student Setup - Clone and Configure

Each student (except the first student who created step one successfully) should:

```
# 1. Clone the team's repository
git clone <your-team's-repository-url>
cd project-simulator

# 2. Configure your identity for this project
git config user.name "Your Name"
git config user.email "your@email.edu"

# 3. Verify all branches are available and up-to-date
git checkout main
git pull origin main
git checkout dev
git pull origin dev
git checkout stage
git pull origin stage

# 4. Return to the development branch to start working
git checkout dev
```