GIT

Git is a distributed version control system (DVCS) used for tracking changes in source code during software development.

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Version Control System (VCS)

• Git allows multiple developers to collaborate on the same project.

• It tracks changes to files, allowing you to revert to previous stages, compare changes over time, and see who last modified something.

Distributed

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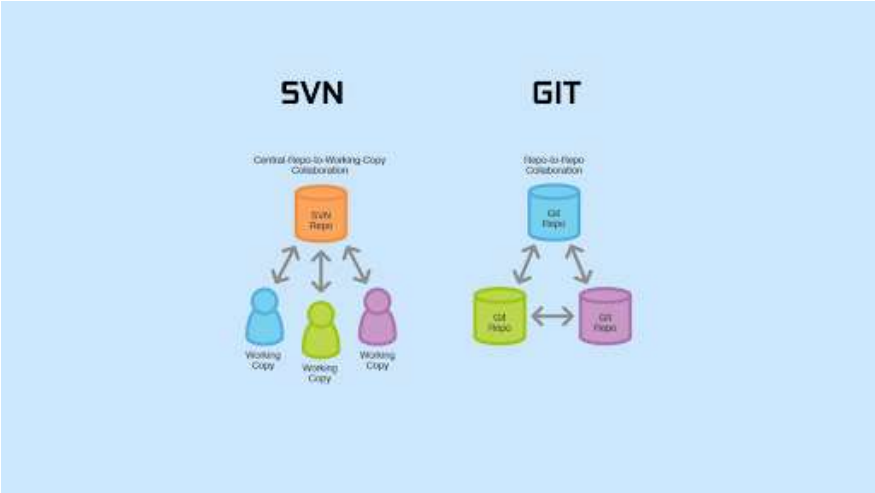
• Git is a distributed version control system, meaning that each developer has a complete copy of the repository (including its entire history).

• This is different from centralized version control systems (like SVN), where developers must be online to access the repository.



Key Concepts

- **Repository**: The collection of all files and folders in your project, along with the history of changes.
- **Commit**: A snapshot of your repository at a point in time.
- **Branches**: Independent lines of development. You can create branches to work on new features without affecting the main codebase.
- **Merge**: Combining changes from one branch into another.
- **Pull Request (PR)**: In platforms like GitHub, GitLab, etc., this is a way to propose changes and request that someone else review and merge your changes into their branch.

Basic Workflow

1. **Clone**: Create a local copy of a repository.
2. **Modify**: Make changes to files.
3. **Add**: Stage your changes for commit.
4. **Commit**: Save your changes with a message describing the changes.
5. **Push**: Send your changes to a remote repository (like GitHub, GitLab, etc.).
6. **Pull**: Get the latest changes from the remote repository to your local repository.
7. **Merge**: Combine changes from different branches.
8. **Stash**: Save changes locally and apply them on this or another branch later

Popular Platforms for Git Hosting

• GitHub: A web-based platform for hosting Git repositories and collaboration. Widely used in open-source projects.

• GitLab: Similar to GitHub but provides both cloud-hosted and self-hosted options.

• Bitbucket: Offers both Git and Mercurial repositories. Owned by Atlassian, it's often used for private repositories.

• DevOps (Azure): Azure DevOps is a set of cloud services provided by Microsoft that offers a full-featured platform for managing the entire software development lifecycle. It includes a range of tools for agile planning, development, testing, and deployment.

• other (many)

Why Use Git?

- **Collaboration**: Multiple developers can work on the same project simultaneously.
- **History**: Detailed history of changes, who made them, and why.
- **Branching and Merging**: Safe environment for trying out new features without affecting the main codebase.
- **Backup**: Having a remote repository acts as a backup for your code.
- **Open Source**: Many open-source projects use Git, making it easier to contribute to them.

Git is powerful but can have a steep learning curve, especially for beginners. However, once you get the hang of it, it becomes an invaluable tool for managing and collaborating on software development projects.

GitHub

GitHub is a web-based platform built around Git, the distributed version control system. It provides a hosting service for software development and version control using Git. GitHub offers a variety of features to help developers and teams collaborate on projects, manage code repositories, track issues, and more.

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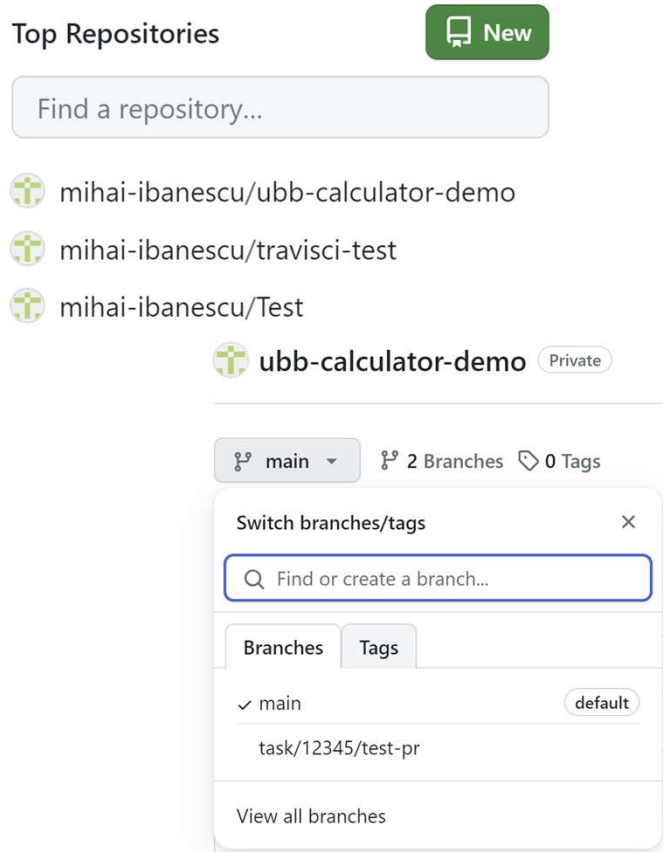
Hosting Git Repositories

- **Repository Hosting**: GitHub allows users to host their Git repositories online. This means developers can push their local Git repositories to GitHub to make them accessible from anywhere with an internet connection.

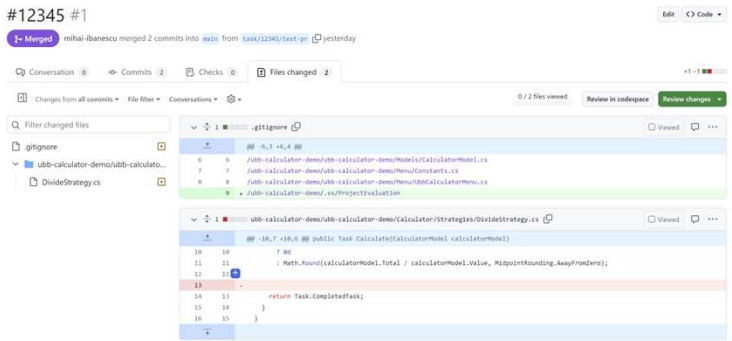
- **Remote Collaboration**: Multiple developers can work on the same project by cloning repositories, making changes, and pushing those changes back to GitHub.

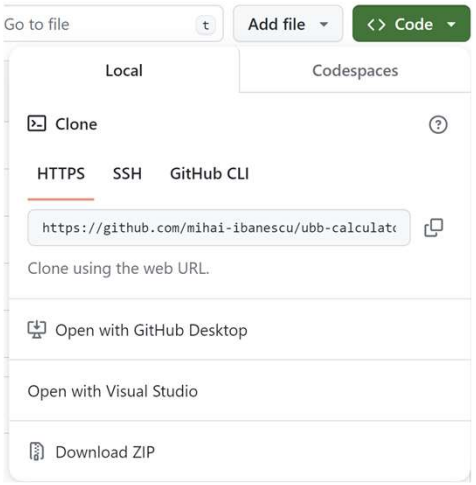


Collaboration and Code Review

- **Pull Requests (PRs)**: A fundamental feature of GitHub, PRs allow developers to propose changes to a repository and request that someone else review and merge their changes. This is widely used for code review and collaboration.

- **Branching**: GitHub supports creating branches, which enables developers to work on features or fixes without impacting the main codebase until they're ready to merge changes.





Why Use GitHub?

- **Centralized Repository**: A single place for hosting code, documentation, and collaboration.
- **Collaboration**: Multiple developers can work on the same project with ease.
- **Visibility**: Public repositories can be accessed by anyone, making it great for open-source projects.
- **Code Review**: PRs facilitate code review and quality control.
- **Community**: Access to a vast community of developers, projects, and resources.

GitHub has become the standard platform for hosting and collaborating on Git repositories, particularly in the open-source community. Many companies also use GitHub for their private repositories, leveraging its features for team collaboration and project management.

Branching

Branching in Git is a fundamental operation that allows developers to create divergent lines of development, work on new features, bug fixes, or experiments without affecting the main codebase.

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Create a New Branch

To create a new branch in Git, you use the **git branch** command followed by the name of the new branch. Then, you switch to the new branch using **git checkout** or **git switch**. In newer versions of Git, you can also create and switch to a new branch in a single command with **git switch –c** or **git checkout –b.**

```
# Create a new branch
git branch new-feature

# Or, create and switch to the new branch in one command
git checkout -b new-feature
# Or, with newer Git versions
git switch -c new-feature
```

Work on the Branch

After creating the branch, you can start making changes to your code. These changes will be isolated to the new branch.

```
# Edit files
vim myfile.js
```

```
# Stage changes
git add .

# Commit changes
git commit -m "Implemented new feature"
```

Switch Between Branches

You can switch between branches using **git checkout** or **git switch**. This allows you to move between different branches in your repository.

```
# Switch to an existing branch
git checkout main

# Or, with newer Git versions
git switch main
```

Merge Changes (Optional)

When you're done with the changes in your new branch and you want to incorporate them back into the main branch (like **main**), you can merge the changes.

```
# Switch to the main branch
git checkout main

# Merge the new-feature branch into main
git merge new-feature
```

Delete a Branch (Optional)

Once you've merged the changes from a feature branch, you might want to delete the branch to keep your repository clean. Be cautious and ensure you've merged all necessary changes before deleting.

```
# Delete a local branch
git branch -d new-feature

# To force delete (if not fully merged)
git branch -D new-feature
```

Push a Branch to Remote (Optional)

If you've created a new branch locally and want to share it with others or work on it from a different machine, you can push the branch to a remote repository.

```
# Push the new-feature branch to remote (origin)
git push origin new-feature
```

Here are some common mistakes when working with Git

Committing Everything at Once

- **Mistake**: Committing all changes with git add . or git add -A.
- **Issue**: Creates large, messy commits that are hard to review and understand.
- **Solution**: Stage and commit related changes in smaller, logical chunks. Use git add <file> or git add -p for selective staging.

Not Pulling Before Pushing

- **Mistake**: Pushing changes without pulling latest changes from the remote repository.
- **Issue**: Can cause conflicts with others' changes, leading to merge conflicts.
- **Solution**: Always pull (git pull) before pushing (git push) to ensure your local branch is up to date.

Ignoring Code Reviews

- **Mistake**: Merging branches without proper code reviews.
- **Issue**: Missed bugs, quality issues, and lack of knowledge sharing.
- **Solution**: Always conduct code reviews (via pull requests) to ensure quality, readability, and knowledge transfer.

Not Using Branches

- **Mistake**: Making changes directly on main or master branch.
- **Issue**: Risk of breaking the main codebase, especially in team environments.
- **Solution**: Use feature branches for development, keeping main or master stable and deployable.

Poor Commit Messages

- **Mistake**: Writing vague, non-descriptive commit messages.
- **Issue**: Difficult to understand changes later, especially during code reviews or when looking through history.
- **Solution**: Write clear, concise commit messages that describe what was changed and why.

Branching Strategies

Branching strategies in Git are methodologies or patterns that teams use to manage branches in a repository. These strategies help organize code development, coordinate teamwork, and facilitate the integration of changes.

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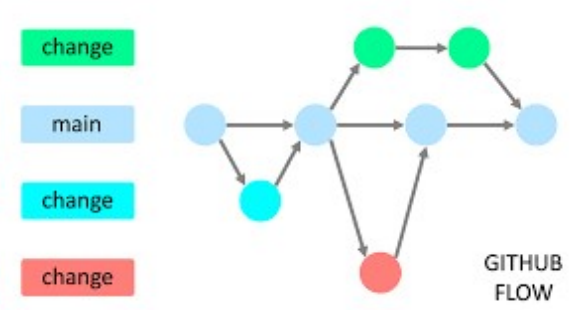
GitHub Flow

Description: Lightweight workflow designed around GitHub's pull requests.

• **Workflow**:

1. Create a new branch (**main** is the default)
2. Develop the feature in the branch
3. Open a pull request (PR) to merge changes into **main**
4. Review code, discuss, and make changes as necessary
5. Merge the PR into **main**



•**Advantages**:

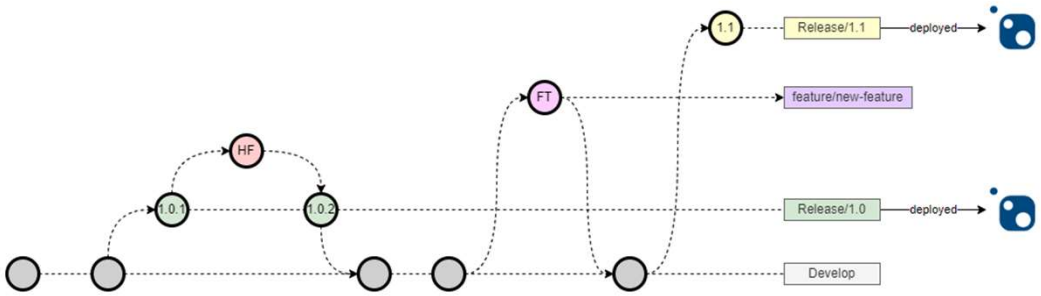
- Simple and easy to understand.
- Encourages code review and collaboration.

•**Disadvantages**:

- Less suited for larger, more complex projects.
- May result in a fast-moving **main** branch

Feature Branching

- **Description**: Each new feature or task is developed in its own branch.
- **Workflow**:
1. Create a new branch for the feature/task (**feature/<feature-name>, task/<task-name>)**
2. Develop the feature in the branch
3. Merge the branch back into the main branch (**main**, **develop**) when the feature is complete
- **Advantages**:
    - Isolates work on a specific feature, preventing conflicts with other changes.
    - Allows for code review of individual features.
- **Disadvantages**:
    - If many features are being developed simultaneously, it can lead to a large number of open branches.
    - May require frequent merging.



Workshop

https://github.com/mihai-ibanescu/ubb-calculator-demo.git

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Questions

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Thank You!