SCM

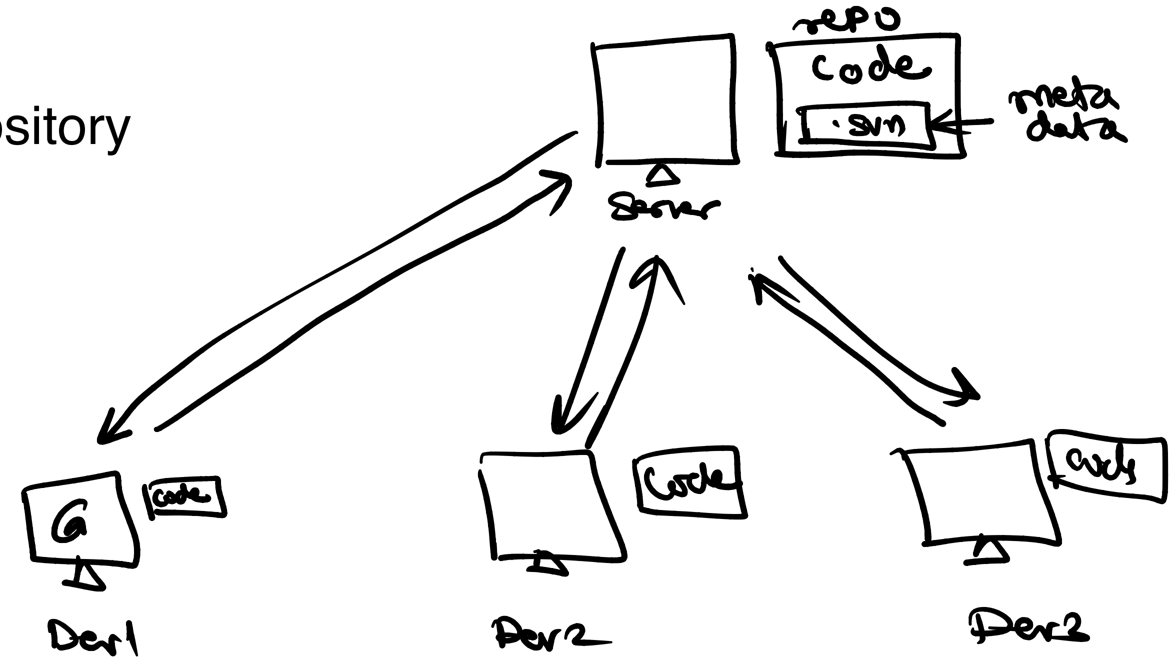
Source Code Management

Version Control System (VCS)

- Also known as revision control or source code control system
- Is the management of documents (source code)
- Logical way to organize and control the revisions of source code
- Tracks and provides control over the changes made in the code
- E.g.
  - CVS
  - SVN
  - Git
  - Bazar

VCS Types – Client-Server / Centralized

- Only one server maintains shared repository
- Every developer sends the changes to the same repository
- Disadvantages
  - not scalable
  - dependency on the server
- E.g.
  - Open source
    - CVS (Concurrent Version System)
    - SVN (Subversion
  - Proprietary
    - AccuRev
    - Razor
    - TeamCity
    - Vault
    - Visual SourceSafe



VCS Types – Distributed

- Takes peer-to-peer approach to version control
- Synchronizes repositories by exchanging patches from peer to peer
- There is no single server which maintains the code, rather user has a working copy and full change history
- Disadvantages
  - Allows users to work productively even when not connected to internet
  - Common operations like commit, version history etc. are faster because there is no need to communicate with server
  - Communication with server is necessary only when developer wants to share the changes with others
  - Allows private work, users don't need to publish the changes for early drafts
  - Working copies function effectively as backups
  - Permits centralized control of the release version of code

Git

Overview

- Git is a distributed revision control and source code management system
- Git was initially designed and developed by Linus Torvalds for Linux kernel development
- Git is a free software distributed under the terms of the GNU General Public License version 2

History

- The development of Git began on 3 April 2005
- Torvalds announced the project on 6 April
- It became self-hosting as of 7 April
- The first merge of multiple branches took place on 18 April
- Torvalds achieved his performance goals on 29 April
- On 16 June Git managed the kernel 2.6.12 release
- Torvalds turned over maintenance on 26 July 2005 to Junio Hamano, a major contributor to the project

Characteristics

- Strong support for non-linear development
- Distributed development
- Compatibility with existent systems and protocols
- Efficient handling of large projects
- Cryptographic authentication of history
- Toolkit-based design
- Pluggable merge strategies

Advantages

- Free and open source
- Fast and small
- Implicit backup
- Security
- No need of powerful hardware
- Easier branching

Terminologies

- Repository
  - Directory containing .git folder
- Object
  - Collection of key-value pairs
- Blobs (**B**inary **L**arge **Ob**ject)
  - Each version of a file is represented by blob
  - A blob holds the file data but doesn’t contain any metadata about the file
  - It is a binary file, and in Git database, it is named as SHA1 hash of that file
  - In Git, files are not addressed by names. Everything is content-addressed
- Clone
  - Clone operation creates the instance of the repository
  - Clone operation not only checks out the working copy, but it also mirrors the complete repository
  - Users can perform many operations with this local repository
  - The only time networking gets involved is when the repository instances are being synchronized

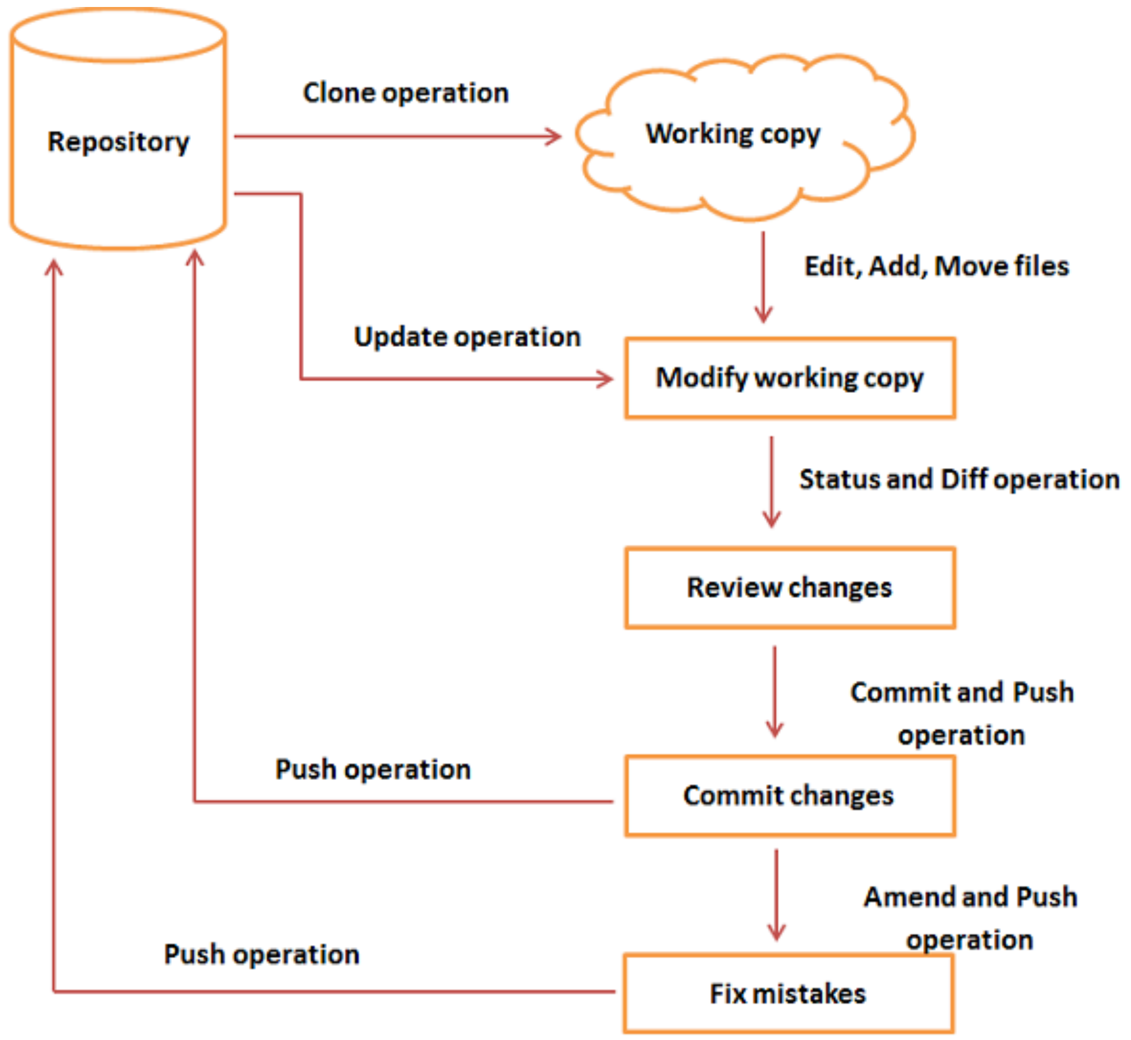
Terminologies

- Pull
  - Pull operation copies the changes from a remote repository instance to a local
  - The pull operation is used for synchronization between two repository instances
- Push
  - Push operation copies changes from a local repository instance to a remote
  - This is used to store the changes permanently into the Git repository
- HEAD
  - HEAD is a pointer, which always points to the latest commit in the branch
  - Whenever you make a commit, HEAD is updated with the latest commit
  - The heads of the branches are stored in **.git/refs/heads/** directory

Terminologies

- Commits
  - Commit holds the current state of the repository.
  - A commit is also named by **SHA1** hash
  - A commit object as a node of the linked list
  - Every commit object has a pointer to the parent commit object
  - From a given commit, you can traverse back by looking at the parent pointer to view the history of the commit
- Branches
  - Branches are used to create another line of development
  - By default, Git has a master branch
  - Usually, a branch is created to work on a new feature
  - Once the feature is completed, it is merged back with the master branch and we delete the branch
  - Every branch is referenced by HEAD, which points to the latest commit in the branch
  - Whenever you make a commit, HEAD is updated with the latest commit

Life Cycle


Repository
Clone operation
Working copy
Edit, Add, Move files
Update operation
Modify working copy
Status and Diff operation
Review changes
Commit and Push operation
Push operation
Commit changes
Amend and Push operation
Push operation
Fix mistakes

Installation and first time setup

- **Install git on ubuntu**

```
> sudo apt-get install git
```

- **List the global settings**

```
> git config --global --list
```

- **Setup global properties**

```
> git config --global user.name <user name>
> git config --global user.email <user email>
> git config --global core.editor <editor>
> git config –global merge.tool vimdiff
```

Basic Commands

- **Initialize a repository**

```
> git init
```

- **Checking status**

```
> git status
```

- **Adding files to commit**

```
> git add .
```

- **Committing the changes**

```
> git commit –m ’<log message>’
```

Basic Commands

- **Checking logs**

```
> git log
```

- **Checking difference**

```
> git diff
```

- **Moving item**

```
> git mv <source> <destination>
```

Basic Commands

- **Rename item**

```
> git mv <old> <new>
```

- **Delete Item**

```
> git rm <item>
```

- **Remove unwanted changes**

```
> git checkout file
```

Branch

- Allows another line of development
- A way to write code without affecting the rest of your team
- Generally used for feature development
- Once confirmed the feature is working you can merge the branch in the master branch and release the build to customers

Why is it required ?

- So that you can work independently
- There will not be any conflicts with main code
- You can keep unstable code separated from stable code
- You can manage different features keeping away the main line code and there wont be any impact of the features on the main code

Branch management commands

- **Create a branch**

```
> git branch <branch name>
```

- **Checkout a branch**

```
> git checkout <branch name>
```

- **Merge a branch**

```
> git merge <branch name>
```

- **Delete a branch**

```
> git branch –d <branch name>
```

GitHub

Overview

- GitHub is a web-based hosting service for version control using Git
- It provides access control and several collaboration features
  - bug tracking
  - feature requests
  - task management
  - wikis for every project
- Developer uses github for sharing repositories with other developers

Workflow

- Create a project on GitHub
- Clone repository on the local machine
- Add/modify code locally
- Commit the code locally
- Push the code to the GitHub repository
- Allow other developers to get the code by using git pull operations

Workflow commands

- **Add remote repository**

```
> git remote add <name> <url>
```

- **Clone remote repository**

```
> git clone <url>
```

- **Push the changes**

```
> git push <name> <branch>
```

- **Pull the changes**

```
> git pull
```

Thank You !!