# **Version Control Systems**

Module Code: ELEE1149

Module Name: Software Engineering

Credits: 15

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## What are Version Control Systems (VCS)

- Tracking and managing changes:
  - Work faster and more reliably
- Keeps track of all code modifications:
  - Specialised Database (Repository)
- Solves Common Team Problems:
  - Conflicitng concurrent work,
  - incompatiables due to concurrent working,
  - having unstable releases

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### **Common Benefits of VCS**

**Historical information**: Looking at the history of changes it is a lot easier to find where bugs have originated. Also, it might be easier to find the right team member best suited to fix an error.

**Branching**: Working concurrently on multiple issues, without interference. Working on different types of releases.

**Merging**: Making sure that team members work does not interfere with each other.

**Traceability**: Team members work more fluently together.

**Testing and Documentation**: Comments for each change and its association help producing better documentation. Creating tests is easier.

## Types of VCS

#### • Local:

Creates a database on the your hardware

#### Centralised:

- History of changes kept in a single database in a central server.
- Clients need to constantly communicate with the database and receive a partial working copy.

#### Distributed:

- Single database in a central server that is also distributed among all clients
- Each client has a full working copy of the repository

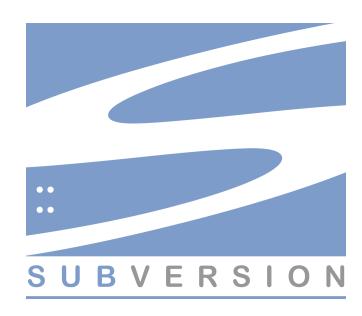
### **VCS - List**

#### **Local Data Model**

- Revision Control System (RCS) [OS]
- Source Code Control System (SCCS) [OS]
- The Librarian [P]
- Panvalet [P]

#### **Client Server model**

- Concurrent Versions System [OS]
- Subversion (SVN) [OS]
- Vesta [OS]
- AccuRev [P]
- ...
- Vault [P]
- Visual Source Safe [P]



### **VCS - List**

#### **Distrubted Model**

- ArX [OS]
- Bazaar [OS]
- BitKeeper [OS]
- Fossil [OS]
- Git [OS]
- GNU Arch [OS]
- Mecurial [OS]
- Code Co-op [P]
- Sun WorkShop TeamWare [P]







### **Git Characteristics**

- A very popular VCS
- Performance
  - Better performance compared to competitors
  - Deals with the data in the file rather than the file properties
- Security
  - Designed to provide security
  - Uses SHA-256 encryption
- Flexibility
  - Non-linear development



### **VCS Hosts - List**

- TaraVault
- BitBucket
- SourceForg
- GitLab
- Gogs
- GitBucket
- GitHub
- AWS CodeCommit
- BeanStalk
- Phabricator











### GitHub - What is it and features?

- Web-based graphical user interface (GUI)
- Features
  - Can act as a project manager
  - Hosts Git repositories
  - Secure with keys

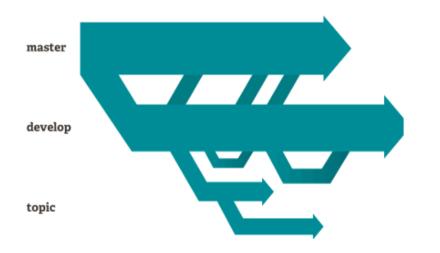


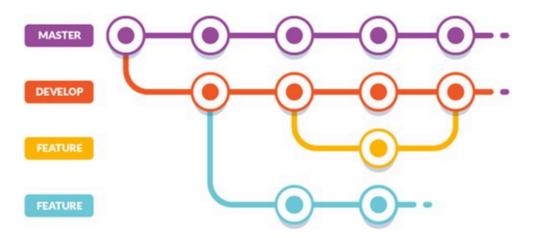
#### **Fundemental Git Functions**

All commands are prepended with git

- fetch, pull: Get a working copy of a repository
- add, commit, push: Record a change or changes in at least one of the files stored in the repository.
- branch: Create a copy of a repository to be worked independently.
- merge: Collates changes of two different copies of a repository.
- log: Records information of each change within a repository

### **Git - Branching**





- Main: The default development branch. Whenever you create a Git repository, a branch named "master" is created, and becomes the active branch.
- **Develop**: This is another branch, which is a way to edit/develop/test code without changing the Master branch. T
- **Topic**: A regular Git branch that is used by a developer to identify a conceptual line

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## **Git Commands Explained**

clone: Get a working copy of the repository

fetch: Update the working copy of the repository without copying or removing any files.

pull: Update the working copy of the repository with copying and removing any files necessary.

commit: Update the working copy with all changes

push: to the main repository all changes that have been committed to the local working copy.

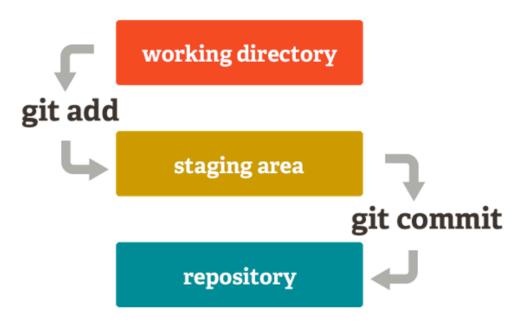
branch: Creates a copy of the repository that can be worked independently from the main branch

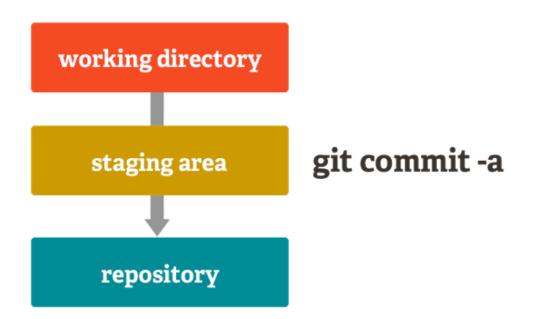
Merge: Combine two copies of a repository. Conflicts may be present.

## **Git Repository Staging Area**

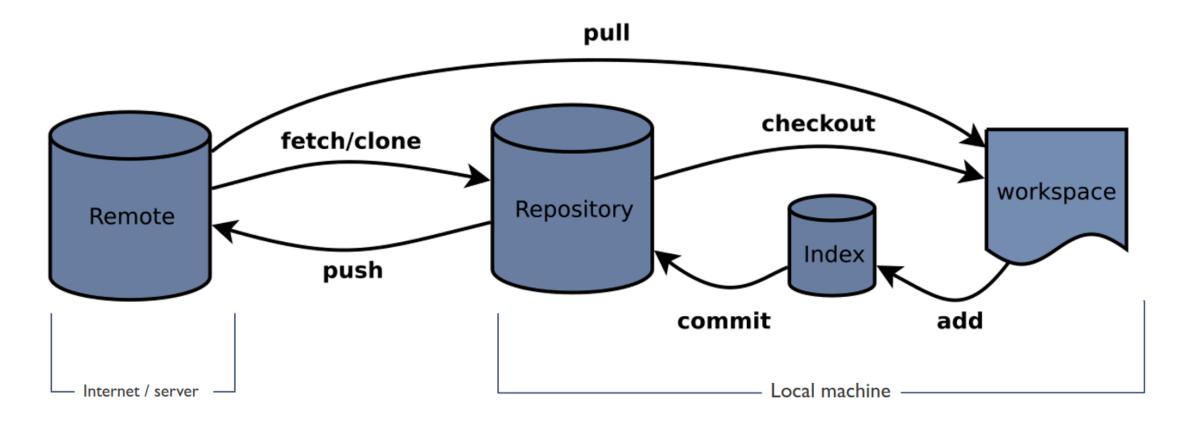
As part of the version control features there is the **Staging Area**.

This is feature enables the developer to move files independently of each other <code>git</code> add <code><filename></code> to the repository. Of course you can do this all in one go with <code>git</code> <code>commit -a</code>





## **Git Flow Diagram**



## **Git Beyond Software Development**

- Developers
- Marketing
- Management
  - Human Resources
  - Product Management
  - Project Budget
- Customer Support

## **Learning Git**

https://learngitbranching.js.org/

