

Version Control Systems

Course Code: ELEE1119

Course Name: Advanced Computer Engineering

Credits: 30

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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:
 - Conflicting concurrent work,
 - incompatibilities due to concurrent working,
 - having unstable releases

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 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

Git

- Version Control Systems: How to safely organise and backup your software code
- Git: Most popular Version Control System
- GitHub: Version Control System host



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 provided security
 - Uses SHA-256
- Flexibility
 - Non-linear development
 - Detailed log information



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

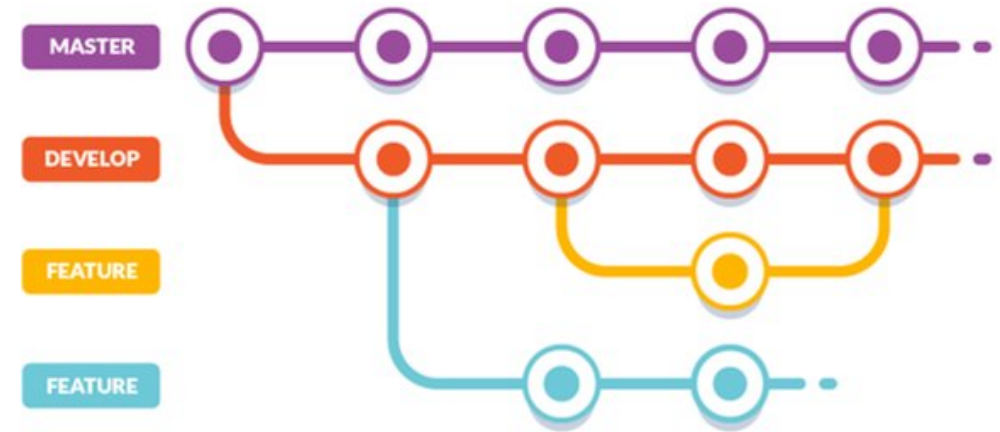


Fundamental Git Functions

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 of development.

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.

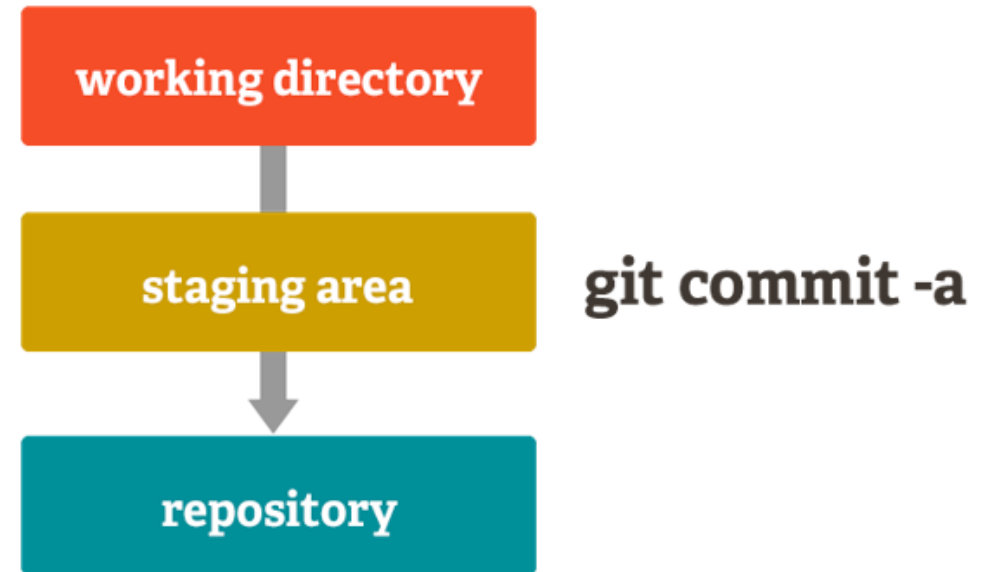
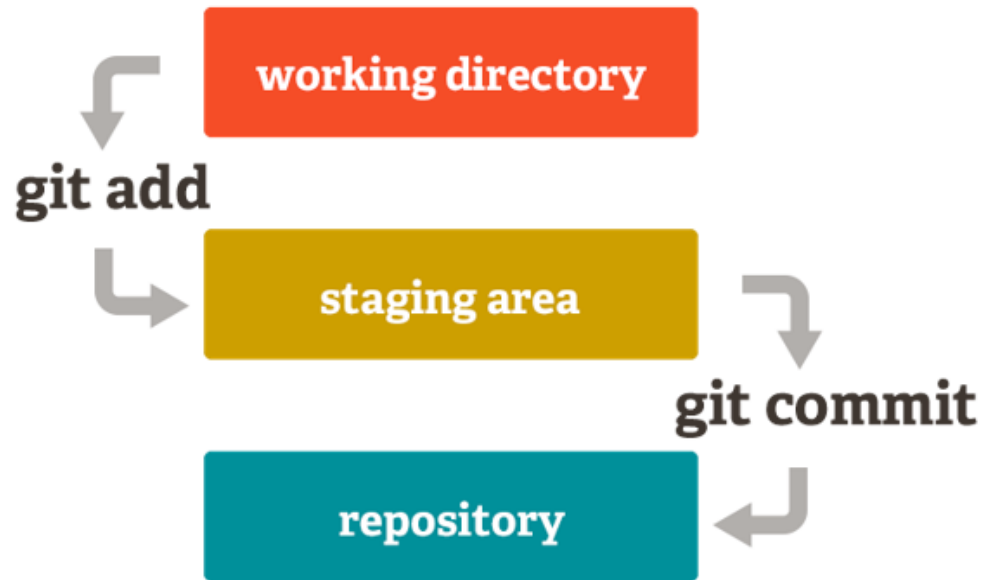
`branch` : Creates a copy of the repository that can be worked independently from the main branch

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

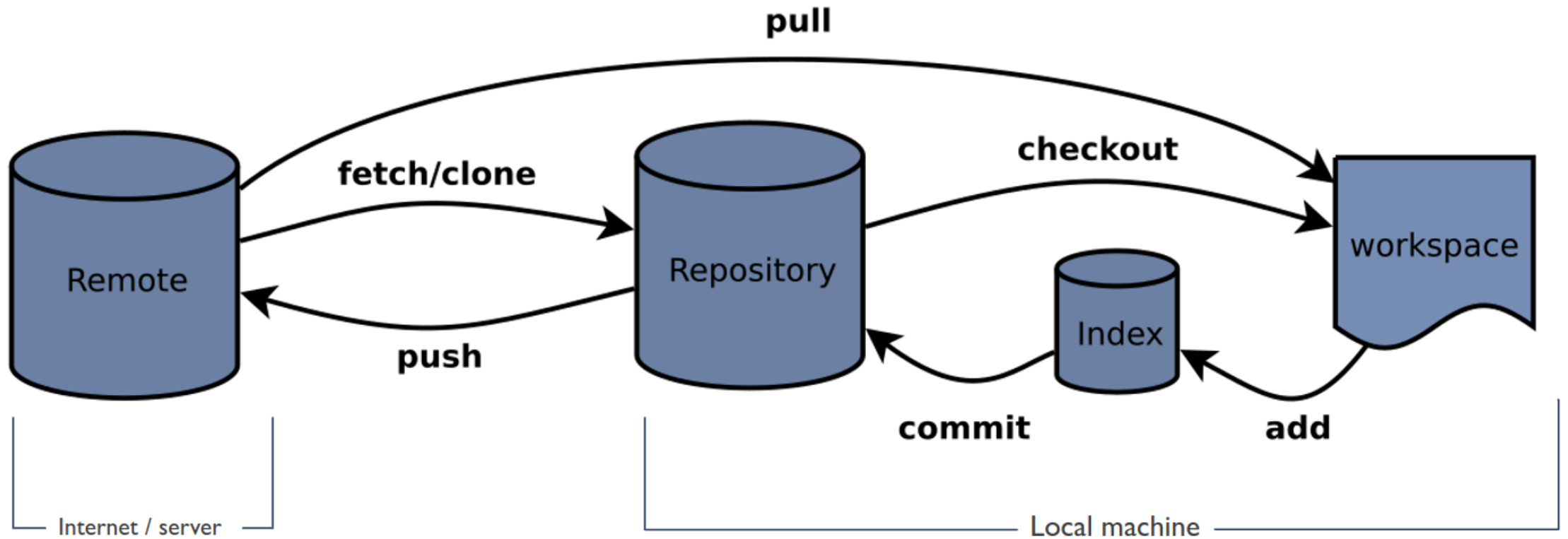
Git Repository Staging Area

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 `git add <filename>` to the repository. Of course you can do this all in one go with `git commit -a`



Git Flow Diagram



Git Beyond Software Development

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

Learning Git

<https://learngitbranching.js.org/>

