

Distributed Version Control System

- A distributed version control system (DVCS) brings a local copy of the complete repository to every team member's computer, so they can commit, branch, and merge locally.
- The server doesn't have to store a physical file for each branch, it just needs the differences between each commit

Advantagaes of DVCS

- Reliable backup copies
- Fast merging and flexible branching
- Rapid feedback and fewer merge conflicts
- Flexibility to work offline
- Enhanced Security
- Reduced Dependency on Central Server
- Enhanced Collaboration

Repository

- A repository is the place where all the files of a project are stored, organized and maintained. They contain a change history, giving teams transparency and control over different possible versions.

Mono Repository

- It's a software development strategy in which a company's entire code base is stored in a single repository.

Prime behaviour of a Mono repository

- **Centralisation:** The codebase is contained in a single repository encompassing multiple projects.
- **Visibility:** Code is visible and accessible for all intended users
- **Synchronisation:** The development process is trunk-based; engineers commit to the head of the repo.
- **Completeness:** Any project in the repo can be built only from dependencies also checked into the repo. Dependencies are un-versioned; projects must use whatever version of their dependency is at the repo head.
- **Standardisation:** A shared set of tooling governs how engineers interact with the code, including building, testing, browsing, and reviewing code

Benefits

- Single Source of Truth
- Coding Styles / Architectural Patterns
- Simplified Dependency Management
- Simplified Code Sharing
- Large-Scale Code Refactoring
- Diamond Dependency Problem

Disadvantages

1. Scaling Issues

- The repo can become very large and difficult to manage as projects grow.

2. Increased Build Times

- Build times can become extensive; may require specialized tools.

3. Complexity in Version Control

- Managing branches and pull requests can become challenging in a huge codebase.

Multi Repository

- In a multi-repo model, each service or module is in its own repository, providing a modular structure.

Prime behaviour of a Multi repository –

- **Repo per module:** Separate repository per service/module
- **Simplifies Polyglot:** if there is a mix of languages and teams, multi-repo is a pretty great structure to adopt
- **Simplified DevOps Pipeline:** New configurations required for each of the new repositories added, but it does simplify the CI pipeline execution.

Advantages

1. Modularity

- Each repo focuses on a single service or module.

2. Team Independence

- Teams can develop, test, and deploy independently.

3. Fine-grained Access Control

- Different access controls for each repo.

4. Customizable CI/CD

- Separate CI/CD pipelines for each repo.

Disadvantages

1. Dependency Management

- Dependencies across repos can become complex.

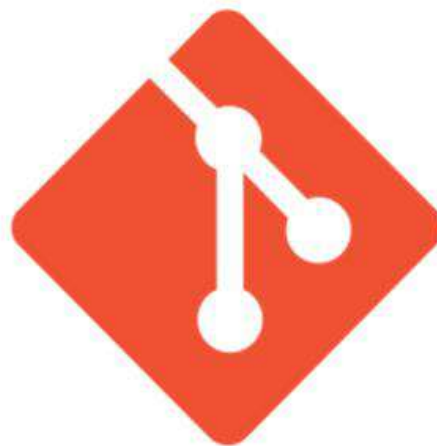
2. Cross-repo Coordination

- Changes affecting multiple services require coordination.

3. Higher Management Overhead

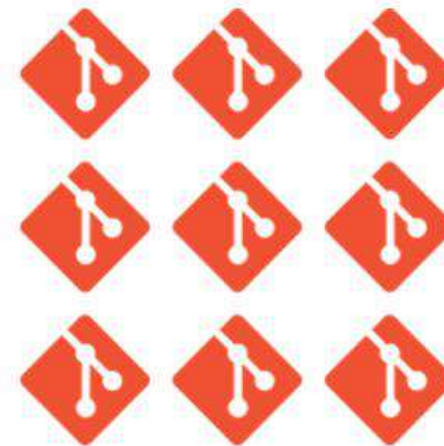
- Separate version control, permissions, and CI/CD setups for each repo.

Difference



Mono Repo

VS



Multi-Repo

Feature	Mono Repo	Multi Repo
Codebase Structure	Single, unified	Distributed, modular
Team Collaboration	Integrated, high	Isolated, independent
Dependency Management	Simplified, consistent	Complex, potentially inconsistent
CI/CD Pipelines	Unified, but complex	Separate, simpler for individual components
Scalability	Limited with large teams	Scalable across independent services

Choosing the Right Model

- Factors to Consider:

1. Project Size and Complexity

- Mono repo for smaller, tightly integrated projects; multi-repo for modular systems.

2. Team Structure and Independence

- Distributed teams benefit more from multi-repos.

3. Dependencies and Cross-Module Changes

- Mono repos handle shared dependencies easily.

4. CI/CD Needs and Scalability

- Multi-repos allow flexibility in automation pipelines.