

PROG8850 - Assignment 4: Database Migration and Automation

GitHub Repository: <https://github.com/TwinkleM97/A4-DB-Migration>

Question 1: Analysis and Integration of Database Migration Tools

1.1) Tool Overview and Comparison

Flyway

Flyway is a lightweight, open-source database migration tool that uses SQL-based migrations. It follows a version control approach to managing schema changes and supports a wide range of databases.

Key Features:

- Versioned migrations using SQL or Java
- Zero dependencies and easy setup
- CLI, Java API, Maven, Gradle, and Docker support
- Supports over 20 databases
- Compatible with CI/CD workflows

Liquibase

Liquibase is an open-source database change management tool. It enables tracking, versioning, and deploying database schema changes. Liquibase supports declarative change logs in XML, YAML, JSON, or SQL.

Key Features:

- Supports multiple changelog formats (XML, YAML, JSON, SQL)
- Rollback support for migrations
- Integration with build tools and CI/CD
- Advanced diff and audit features
- Broad database support

Comparison Table

Criteria	Flyway	Liquibase
Ease of Use	Very easy, simple SQL files	Moderate, requires changelog formats
Integration with CI/CD	Excellent - CLI/Docker/Java API	Excellent - Jenkins/Maven/Gradle plugins
Supported Databases	20+ (PostgreSQL, MySQL, SQL Server, etc.)	30+ (Oracle, MySQL, PostgreSQL, etc.)

1.2) Integration Strategy

To integrate Flyway into a CI/CD pipeline, the following strategy was implemented:

1. Flyway was used for both initial schema setup and incremental SQL migrations.
2. Migrations were defined as plain .sql files and stored in the migrations/ folder.
3. GitHub Actions was configured to run Flyway migrations automatically upon each code push using a workflow.
4. Ansible (up.yml) triggered Flyway locally using [nektos/act](#) to simulate the GitHub Actions environment.
5. Docker was used to run the official redgate/flyway image, ensuring consistency across development and CI environments.
6. This assignment contains three Flyway migration scripts (V1, V2, V3) as seen in the migrations/ folder of the repo, executed automatically via Docker and GitHub Actions.