GUIDE TO FLYWAY LIBRARY IN JAVA

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I. Introduction

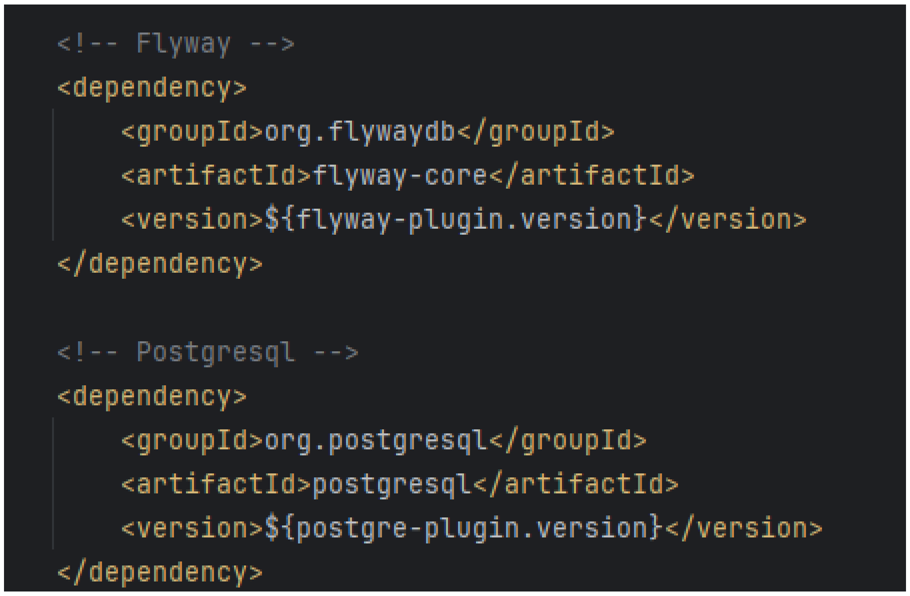
Flyway is a java open-source library that supports migrating data on every applicants, whenever we need:

- Upgrade database because of structure changing or data manipulation.
- Manage database history version.
- Synchronize data structure between servers development.

II. Installation

1. Configurating pom.xml

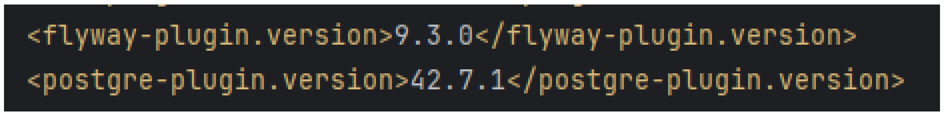
Add **flyway** and **postgresql dependency**



```xml
<!-- Flyway -->
<dependency>
    <groupId>org.flywaydb</groupId>
    <artifactId>flyway-core</artifactId>
    <version>${flyway-plugin.version}</version>
</dependency>

<!-- Postgresql -->
<dependency>
    <groupId>org.postgresql</groupId>
    <artifactId>postgresql</artifactId>
    <version>${postgre-plugin.version}</version>
</dependency>
```

Also, **specify the version** on the properties

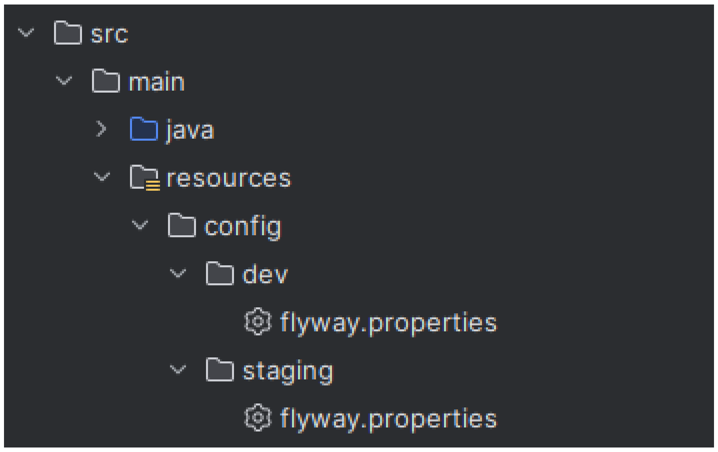


```xml
<flyway-plugin.version>9.3.0</flyway-plugin.version>
<postgre-plugin.version>42.7.1</postgre-plugin.version>
```

Note: this configuration is for flyway version 9.3.0. For the latest version, the setting might be different from above.

2. Adding configurate files

On the **resources folder**, create **configuration folder** and **flyway.properties** file for each server:


```
src
  main
    java
    resources
      config
        dev
          flyway.properties
        staging
          flyway.properties
```

In each properties file, specify 3 parameters:

- **flyway.url**: url link to the database
- **flyway.user**: database username
- **flyway.password**: database password

```
flyway.url=YOUR_DATABASE_URL
flyway.user=YOUR_DATABASE_USER
flyway.password=YOUR_DATABASE_PASSWORD
```

3. Creating profiles id

When we use the command line to run on different server, we have to specify the properties file for each run. **In pom.xml** file, add the following profile for each server

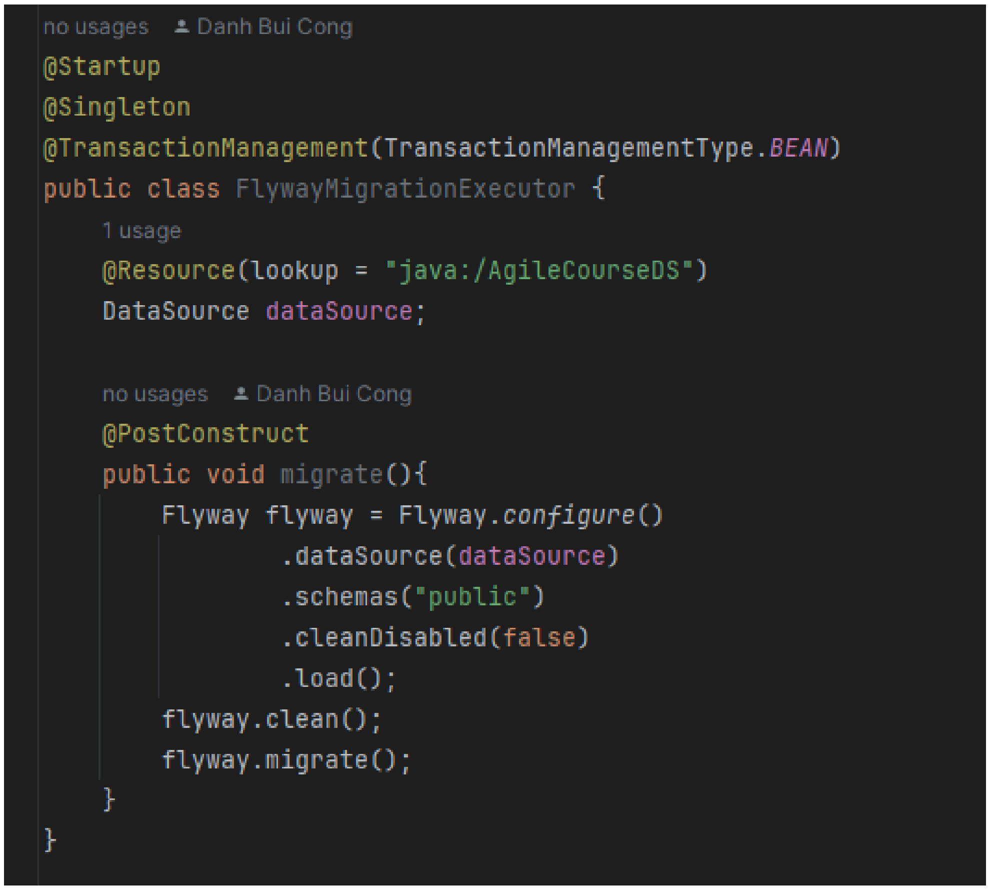
```
<profile>
   <id>local</id>
   <build>
       <plugins>
           <plugin>
               <groupId>org.flywaydb</groupId>
               <artifactId>flyway-maven-plugin</artifactId>
               <version>${flyway-plugin.version}</version>
               <configuration>
                   <configFiles>

<configFile>src/main/resources/config/{SERVER}/flyway.properties</configFile>
                   </configFiles>
               </configuration>
           </plugin>
       </plugins>
   </build>
```

```
</profile>
```

4. Creating FlywayMigrationExecutor

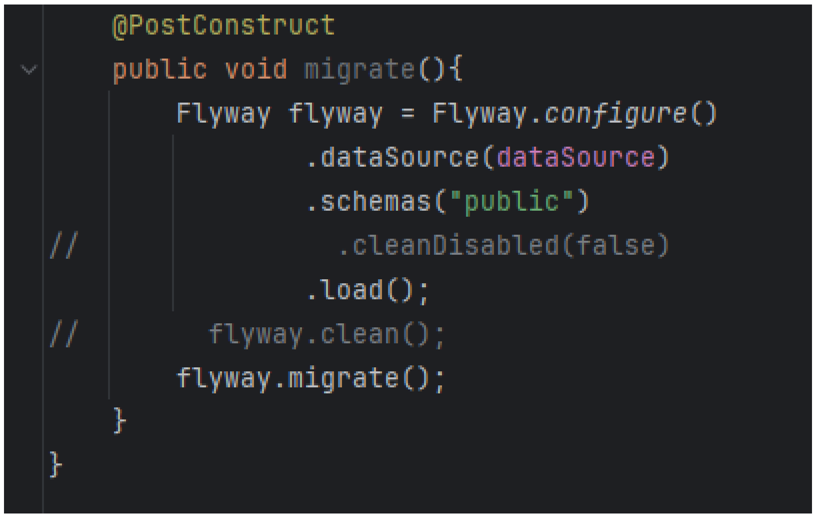
On config folder, create class FlywayMigrationExecutor class to perform the migration everytime we run the project:



```
no usages   Danh Bui Cong
@Startup
@Singleton
@TransactionManagement(TransactionManagementType.BEAN)
public class FlywayMigrationExecutor {
    1 usage
    @Resource(lookup = "java:/AgileCourseDS")
    DataSource dataSource;

    no usages   Danh Bui Cong
    @PostConstruct
    public void migrate(){
        Flyway flyway = Flyway.configure()
                .dataSource(dataSource)
                .schemas("public")
                .cleanDisabled(false)
                .load();
        flyway.clean();
        flyway.migrate();
    }
}
```

Note: after the first run, remove the **cleanDisable()** and **flyway.clean()**, so that Flyway does not clear the data that exists in the database, but not appear in migration files.

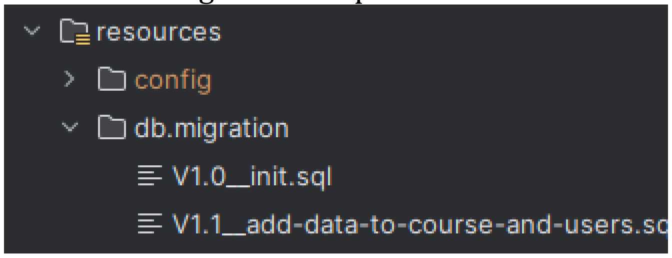


```
    @PostConstruct
    public void migrate(){
        Flyway flyway = Flyway.configure()
                .dataSource(dataSource)
                .schemas("public")
//                .cleanDisabled(false)
                .load();
//        flyway.clean();
        flyway.migrate();
    }
}
```

IV. Database migration

1. Database version script file

The database version will be stored in **db.migration** default folder in an .sql file. By default, Flyway attempts to read database migration scripts from this folder.



```
resources
  config
  db.migration
    V1.0__init.sql
    V1.1__add-data-to-course-and-users.sc
```

2. Convention for database version file naming

V<VERSION_NUMBER>__<NAME>.sql
(2 underscores between <VERSION_NUMBER> and <NAME>)

Convention:

- New versions whenever we **create a new table.**
- Minor versions for **adjust existing table (altering, dropping, indexing)** and **data manipulation (insert, remove, update)**.
- Declare what the script will do in <name>, each word is separated with dash (‘-’) mark.

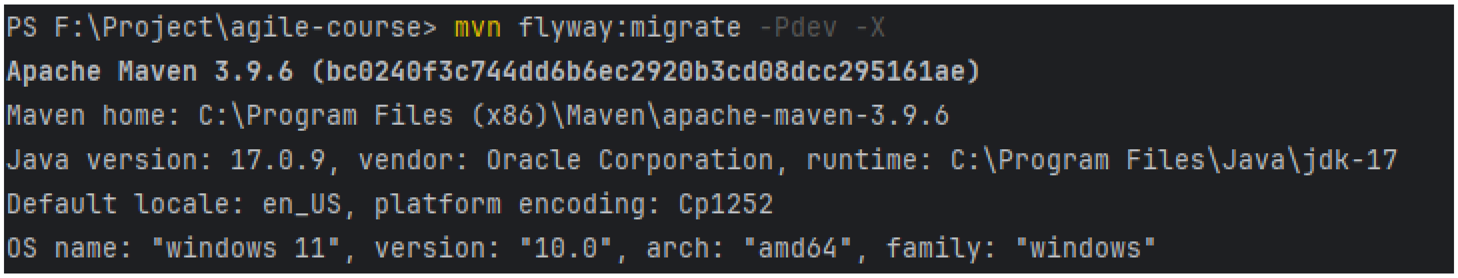
  For example: *V2.0__add-data-to-course.sql*
- We **must not modify the older version script** if we have to change even **just a little bit*, as it resulst in different checksum on the script, and lead to **version collision**. Just create a new script and update anything you want.

3. Executing database migration

Specify the server we want to run migration, and run

mvn flyway:migrate -P{server}

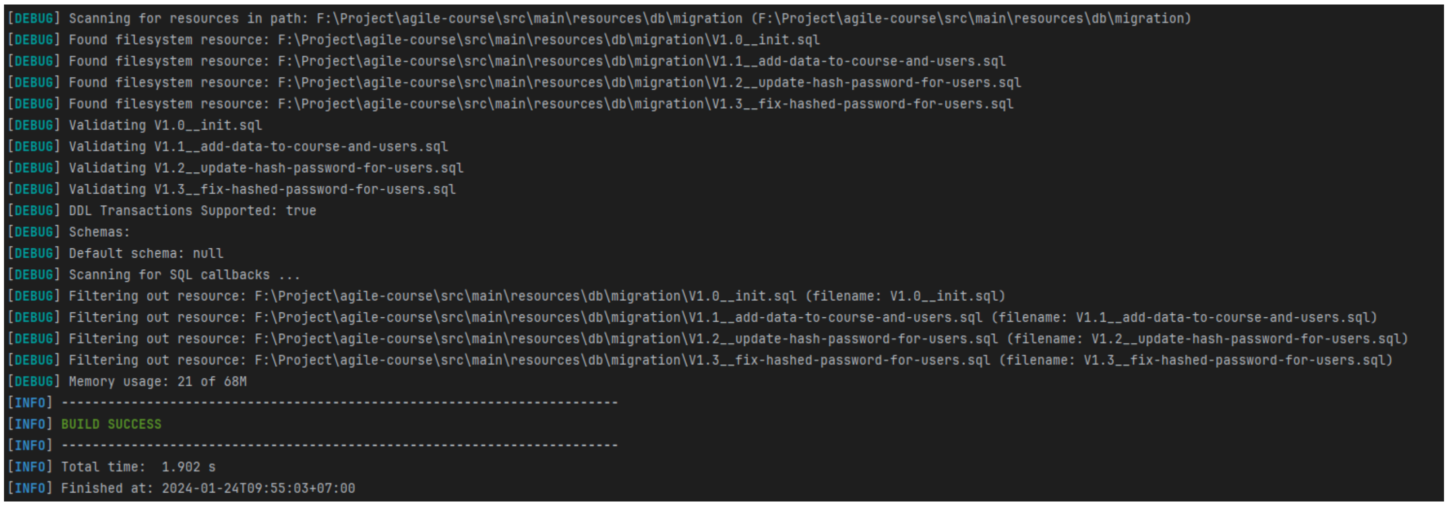
For example: **mvn flyway:migrate -Pdev** to migrate the database on develop server.



```
PS F:\Project\agile-course> mvn flyway:migrate -Pdev -X
Apache Maven 3.9.6 (bc0240f3c744dd6b6ec2920b3cd08dcc295161ae)
Maven home: C:\Program Files (x86)\Maven\apache-maven-3.9.6
Java version: 17.0.9, vendor: Oracle Corporation, runtime: C:\Program Files\Java\jdk-17
Default locale: en_US, platform encoding: Cp1252
OS name: "windows 11", version: "10.0", arch: "amd64", family: "windows"
```

Note: -X option is to enable debugging output.

We can see the result at the end of the run:



```
[DEBUG] Scanning for resources in path: F:\Project\agile-course\src\main\resources\db\migration (F:\Project\agile-course\src\main\resources\db\migration)
[DEBUG] Found filesystem resource: F:\Project\agile-course\src\main\resources\db\migration\V1.0__init.sql
[DEBUG] Found filesystem resource: F:\Project\agile-course\src\main\resources\db\migration\V1.1__add-data-to-course-and-users.sql
[DEBUG] Found filesystem resource: F:\Project\agile-course\src\main\resources\db\migration\V1.2__update-hash-password-for-users.sql
[DEBUG] Found filesystem resource: F:\Project\agile-course\src\main\resources\db\migration\V1.3__fix-hashed-password-for-users.sql
[DEBUG] Validating V1.0__init.sql
[DEBUG] Validating V1.1__add-data-to-course-and-users.sql
[DEBUG] Validating V1.2__update-hash-password-for-users.sql
[DEBUG] Validating V1.3__fix-hashed-password-for-users.sql
[DEBUG] DDL Transactions Supported: true
[DEBUG] Schemas:
[DEBUG] Default schema: null
[DEBUG] Scanning for SQL callbacks ...
[DEBUG] Filtering out resource: F:\Project\agile-course\src\main\resources\db\migration\V1.0__init.sql (filename: V1.0__init.sql)
[DEBUG] Filtering out resource: F:\Project\agile-course\src\main\resources\db\migration\V1.1__add-data-to-course-and-users.sql (filename: V1.1__add-data-to-course-and-users.sql)
[DEBUG] Filtering out resource: F:\Project\agile-course\src\main\resources\db\migration\V1.2__update-hash-password-for-users.sql (filename: V1.2__update-hash-password-for-users.sql)
[DEBUG] Filtering out resource: F:\Project\agile-course\src\main\resources\db\migration\V1.3__fix-hashed-password-for-users.sql (filename: V1.3__fix-hashed-password-for-users.sql)
[DEBUG] Memory usage: 21 of 68M
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  1.902 s
[INFO] Finished at: 2024-01-24T09:55:03+07:00
```

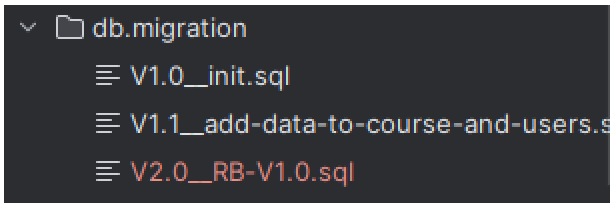
The run is completed, we can see how Flyway retrieves and migrates the SQL files

4. Rollback

Since rollback is an enterprise feature of Flyway, sadly we are not able to use it.

Instead, we are going to create a newer version of the database migration file, but we are implementing the rollback on it. For every rollback, specify the version we want to roll back, and also add the 'RB' mark after double slash mark:

V<VERSION_NUMBER>__RB-V<ROLLBACK_VERSION_NUMBER>.sql



```
db.migration
    V1.0__init.sql
    V1.1__add-data-to-course-and-users.s
    V2.0__RB-V1.0.sql
```

V. References

Migration data với Flyway sử dụng Maven cho multiple database servers (viblo.asia)

GitHub - manhnv118/flyway-maven-sample: Flyway migrations using maven plugin

Database Migrations with Flyway | Baeldung