Università di Trento

Web Architectures

Assignment 5

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February 1, 2022

1 Introduction

The fifth assignment is about creating an application where tourists can book and aprtmand or a hotel room, depending on its availability. On this application, the user can search for accommodtions by giving the start- and end-date, and the number of persons. Then, the user should see a list of all available results, where the user can select one accommodation and confirm the reservation.

The application is composed of the following parts:

- Business-logic
- Web-application
- Database

The business-logic is supposed to be implemented using EJB and EJB-patterns. All EJBs must be deployed on a wildfly application server. The web-application must be implement using Servlets. It should not be deployed using wildfly and must run outside of the wildfly application server. H2 must be used as the database. A routine must be implemented to write default data to the database.

2 Implementation

This section describes the most important parts of the implementation of the application. It highlihtes the databse structure, and the behaviour of the Beans.

2.1 Database

2.1.1 Entities

Figure 1 visualizes the UML diagram of the entities, used for the database. Overall, the database is used to save the following information:

- Accommodations which represent either an apartment or a hotel
- Occupancy, represents the availability of an accommodation entity for a specific day
- Reservation which represent a single reservation made by a user

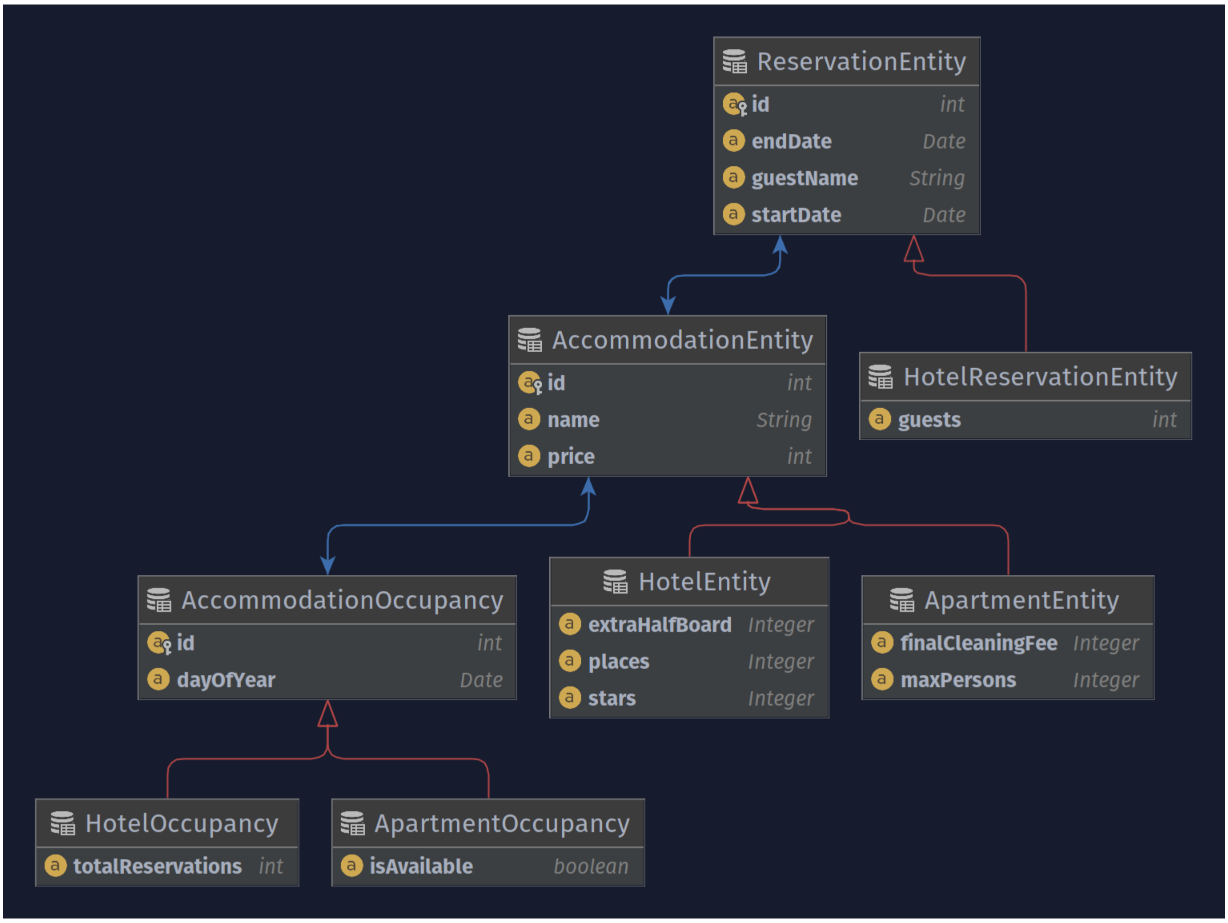


Figure 1: UML diagram of all database entities

Accommodations Two types of accommodations exists for this application: Apartments and Hotels. All accommadtions have a name, and a daily price. Additionally, an apartment has a final cleaning fee, an a number of maximum persons. A hotel has a rating of start, a number of free places, and a price for extra half-board.

To implement the entities, an ApartmentEntity, and a HotelEntity have been implemented. Both classes inherit from the abstract AccommodationEntity class.

Occupancies Each accommodation needs an occupancy information for a specific date. The occupancy information describes if an accommodation is available on a specific date. The difference between an apartment and a hotel is, that a hotel has a specific number of reservation, and an aprtment is either available or unavaible, independetly of the number of persons.

To implement the occupancies, a parent class called HotelOccupancy exists, that includes only the date. Additionally, a class called ApartmentOccupancy saves the occupancies information for a hotel, which includes a boolean value called isAvailable that specifies, if the aprtment is avaiable for the specific date or not. Furthemore, a class called HotelEntity represent the occupancy of a hotel, which is a number of reservation for a specific date.

Reservations A user can make reservation that are saved to the database. A reservation consists of a start date and an end date that represent the date interval of the stay, and the name of the guest. These informations are saved by the ReservationEntity. Additionally, a classes called HotelReservationEntity, which inherits the ReservationEntity, is used to save the number of guests for on reservation of a hotel. An apartment does not need extra information, because it is either avaible or not, which is represented by the existance of a ReservationEntity in the table for the specific apartment for a specific date interval.

2.1.2 Structure

The database consists of three tables:

- Accommodation
- Occupancy
- Reservation

Each table is associated with an entity that are described in SEC XY.

Accommodation FIG AB describes the structure of the Accommodation table. It is used to save the AccommodationEntity, as well as the child entities ApartmentEntity and HotelEntity. To accomplish inheritance, the Single Table per Class Hierarchy strategy is used.

Occupancy FIG BH describes the structure of the Occupancy table. It is used to save the OccupancyEntity and the HotelOccupancyEntity. The Single Table per Class Hierarchy strategy is used as well to enable inheritance.

Reservation FIG HJ describes the structure of the Reservations table. It saves the ApartmentEntity and the HotelEntity. For inheritance, it uses the Single Table per Class Hierarchy as well.

2.1.3 Database Routine

A database routine needs to be implemented to seed the database, that is supposed to be used in the application. This routine is not implemented as a EJB, instead, it will run as a standalone Java application. The accommodations, as well as the occupancies of accommodatios are given by the task description.

The following technologies are used to implement the database routine:

- Hibernate
- JPA

2.2 Enterprise Java Beans

The business logic of this application is implemented using EJB 3. It is composed of three parts:

- `LocalDatabaseBean`
- `AccommodationService`
- `ReservationService`

All services are part of a single Maven project called *WebServices*.

Each part (service) is an independent Baen. The client is able to lookup the Bean given an address and invoke methods on it. Only the Accommodation Service and the Reservation Service is available for the client. The Database Service is implemented using a local bean, because it is not intended, for the user, to interact with the database directly.

2.2.1 LocalDatabaseBean

The `LocalDatabaseBean` is used to interact with the H2 database. It initiates the `EntityManager`, given by JPA, bu establishing a connection to a JTA datasource. Other services can use the Database Service to send queries and receive results from the database.

As mentioned before, the Database Service is implemented as a `LocalBean`. Other Beans can interact with the Database Service using the Code-Injection pattern, which is shown in Listing 1.

```
@Stateless
@Remote(ReservationService.class)
public class ReservationBean implements ReservationService  {

    @EJB()
    private LocalDatabaseBean databaseBean;

    ...

}
```

Listing 1: Usage of the `LocalDatabaseBean` using Code-Injection

2.2.2 AccommodationService

The Accommodation is used by the client to interact with the `AccommdationEntity` and its child classes `ApartmentEntity`, and `HotelEntity`. It uses the LocalDatabaseBean to send HQL queries to the H2 database.

Except from receiving accommodations based on specific properties, the most interesting part about the AccommodationService is how it receives available accommodations in a specific date range, given a number of guests. The idea is, that the number of occurencies of an accommadtion which is available in the specific date range, has to be qual the number of days of the given date range.

```
SELECT a.accommodation
FROM AccommodationOccupancyEntity a
WHERE (
  ((a.isAvailable IS TRUE AND a.accommodation.maxPersons >= 2)
  OR
  ((a.accommodation.places - a.totalReservations) >= 2))
)
AND a.dayOfYear BETWEEN '2022-02-01' AND '2022-02-09'
GROUP BY a.accommodation.id
HAVING COUNT(*) = 9
```

Listing 2: Example of a HQL query to receive all available accommodations

Listing 2 show an example HQL query implementation to get all available accommodations between 1. February 2022 and 10. February 2022 for 2 guests. As described before, the `AccommodationOccupancyEntity` saves the occupancies of each accommodation for specific dates. Therefore, it is necessary to check for apartments if it is available, and has enough places for the number of guests. For hotels, it is necessary to check if the existing number of reservations minus the available places of that hotel is lower or equal the number of guests. These constraints are checked for the range between the start date (1. February 2022) and the end date minus one day (9. February 2022). It is necessary to substract one day, because the guests will not stay for that day, and therefore the availability information for that day is unrelated. After that it is important, thte the count of numbers of the accommodation, in that specific date range, is euqal to the number of days between the start and end date.

2.2.3 ReservationService

To read from and write to the reservation table of the database, the ReservationService is used. It allows to persist new reservations to the database, and to get all reservations for a specific customer name.

When adding a new reservation to the database, the `ReservationService` is also responsible to update the occupancies (mentioned in XY) of the selected accommodation. Then, it is necessary to add the number of guests, of the new reservation, to each entry of the accommodation occupancy.

Additionally, the ReservationService provides an interface to calculate the price of a reservation for either a Hotel or an Apartment.

2.2.4 Build Process

The project is build using the `maven-ejb-plugin` maven plugin to create a EJB-Jar file. Then, the artifact can be built using the `mvn clean build` command.

Listing 3 shows the configuration of the `maven-ejb-plugin` plugin.

```
<packaging>ejb</packaging>
...
<build>
  <finalName>${artifactId}.${version}</finalName>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-ejb-plugin</artifactId>
      <version>3.1.0</version>
    </plugin>
  </plugins>
</build>
```

Listing 3: `maven-ejb-plugin` plugin configuration

2.3 Web Application

2.3.1 Search

2.3.2 Results

2.3.3 Reservation Summary

2.3.4 Reservation Confirm

2.3.5 My Reservations

3 Deployment

This section explains the deployment of the application. The requirements to run all applications are the following (the versions correspond to the local system of the author):

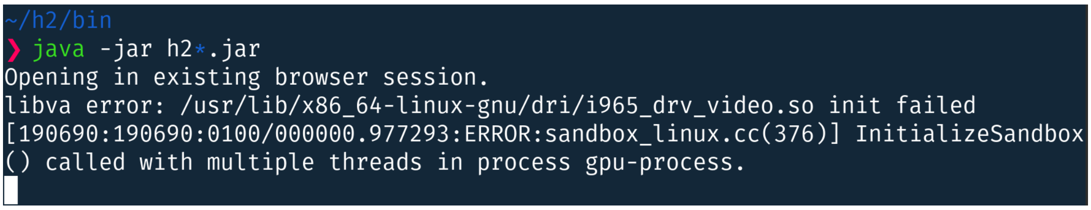
- H2 2.0.202
- WildFly 20.0.1.Final
- Java 11.0.11 (AdoptOpenJDK-11.0.11+9)
- Apache Tomcat 9.0.56
- Apache Maven 3.8.4

3.1 H2 Database

As mentioned before, this application uses a local H2 database, that is not integrated in the project itself, but is located somewhere, locally, on the users computer.

3.1.1 Start H2

At first, it is important to start the H2 service via the terminal. This can be accomplished by executing the command `$ java -jar h2*.jar` in the directory `\$H2/bin`, where `$H2` is the path of the H2 database. This process is shown in Figure 2. After executing this comman, the H2 console is automatically started in the default web browser, which is needed later.

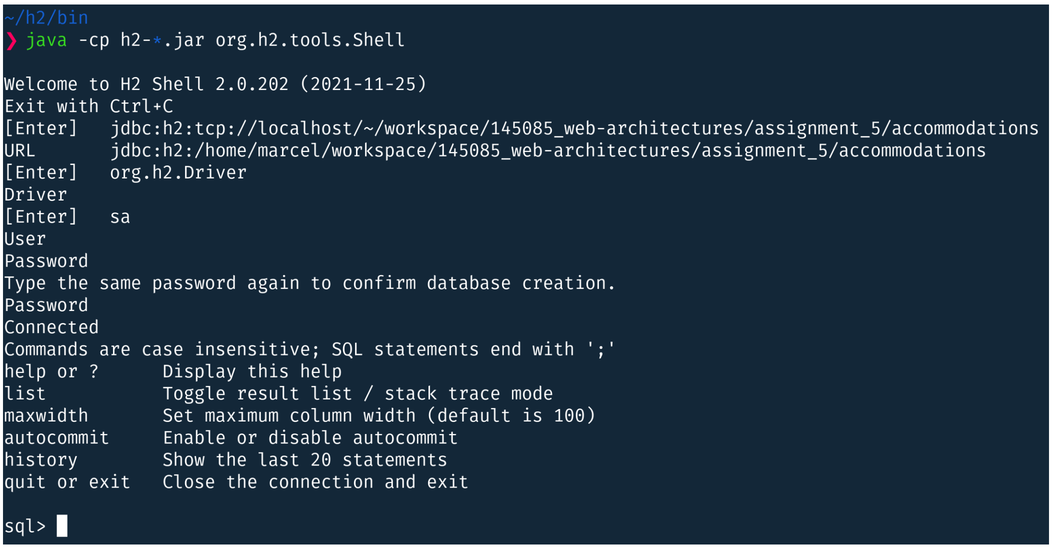


```
~/h2/bin
❯ java -jar h2*.jar
Opening in existing browser session.
libva error: /usr/lib/x86_64-linux-gnu/dri/i965_drv_video.so init failed
[190690:190690:0100/000000.977293:ERROR:sandbox_linux.cc(376)] InitializeSandbox
() called with multiple threads in process gpu-process.
```

Figure 2: H2 database start process

3.1.2 Create a Database

After the H2 service has been started, it is possible to create a new local database using the shell tool of H2. This process is shown in Figure 3, where the command `$ java -cp h2-*.jar org.h2.tools.Shell` needs to get executed in the `\$H2/bin` directory. It is important, that the databse is called *accommodations*, and the username is *sa*, and the the password is *sa* as well.

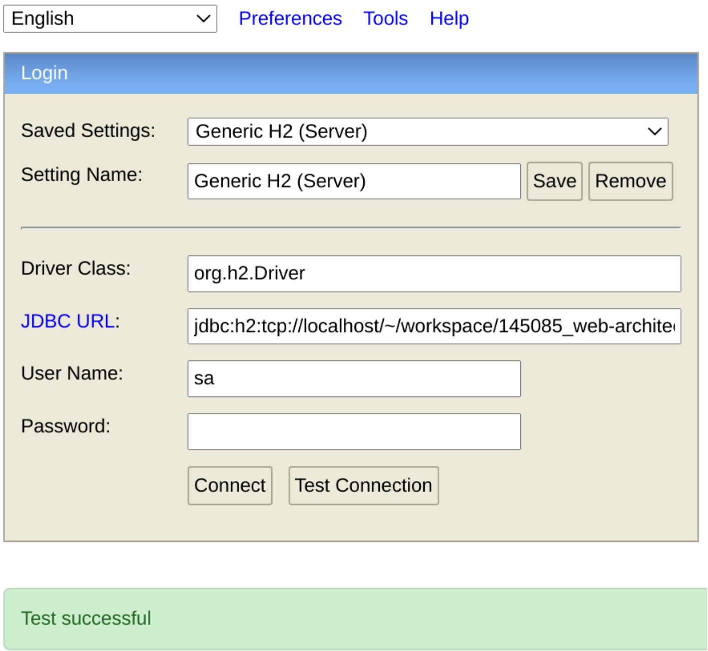


```
~/h2/bin
❯ java -cp h2-*.jar org.h2.tools.Shell

Welcome to H2 Shell 2.0.202 (2021-11-25)
Exit with Ctrl+C
[Enter]   jdbc:h2:tcp://localhost/~/workspace/145085_web-architectures/assignment_5/accommodations
URL       jdbc:h2:/home/marcel/workspace/145085_web-architectures/assignment_5/accommodations
[Enter]   org.h2.Driver
Driver
[Enter]   sa
User
Password
Type the same password again to confirm database creation.
Password
Connected
Commands are case insensitive; SQL statements end with ';'
help or ?      Display this help
list           Toggle result list / stack trace mode
maxwidth       Set maximum column width (default is 100)
autocommit     Enable or disable autocommit
history        Show the last 20 statements
quit or exit   Close the connection and exit

sql> █
```

Figure 3: H2 database start process

3.1.3 Test Database Connection

After creating the *accommodations* database, it is possible to test the connection using the H2 console mentioned in Section 3.1.1. First, it is necessary to fill in the correct informations: The JDBC URL in the format `jdbc:h2:tcp://localhost/PATH_TO_DATABASE` and the previously used username and password from Section 3.1.2 (username: `sa`, password: `sa`). Then, by clicking on *Test Connection*, a status message is shown, as illustrated in Figure 4. If the connection is successful, the database can be used in the application.



Saved Settings: Generic H2 (Server)

Setting Name: Generic H2 (Server)

Driver Class: org.h2.Driver

JDBC URL: jdbc:h2:tcp://localhost/~/workspace/145085_web-archite

User Name: sa

Password:

Test successful

Figure 4: Successfull connection test for the H2 database

3.2 Seeding the Database

After the database has been created, it is important to write dummy data to it using the *DatabaseRoutine* application.

3.2.1 Set up the DatabaseRoutine application

It is important to set the path to the database in the `persistance.xml` of the *DatabaseRoutine* application. Listing 4 shows a correct configuration. The property `hibernate.connection.url` has to be set to the URL used in Section 3.1.2.

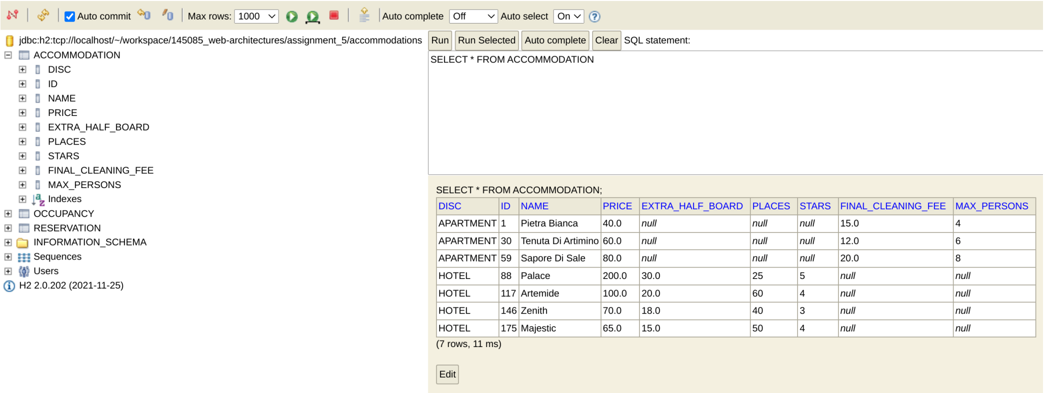
```
...
<persistence-unit name="default">
  <properties>
    <property name="hibernate.connection.url"
              value="jdbc:h2:tcp://localhost/~/workspace/145085
   _web-architectures/assignment_5/accommodations"/>
  </properties>
</persistence-unit>
...
```

Listing 4: Default data source configuration

3.2.2 Execute the DatabaseRoutine application

To execute the DatabaseRoutine application, open the project in IntelliJ, right-click on the `DataRoutine.java` file, and select *Run 'DataRoutine.main()'*. Then, the file gets executed and writes dummy data to the database.

After that, it is possible to check if the data has been written to the database by connecting to the database using the H2 console, introduced in Section 3.1.2. Figure 5 shows the newly created tables in the database.



☑ Auto commit Max rows: 1000 Auto complete Off Auto select On

jdbc:h2:tcp://localhost/~/workspace/145085_web-architectures/assignment_5/accommodations

SQL statement:

```
SELECT * FROM ACCOMMODATION
```

SELECT * FROM ACCOMMODATION;

DISC	ID	NAME	PRICE	EXTRA_HALF_BOARD	PLACES	STARS	FINAL_CLEANING_FEE	MAX_PERSONS
APARTMENT	1	Pietra Bianca	40.0	*null*	*null*	*null*	15.0	4
APARTMENT	30	Tenuta Di Artimino	60.0	*null*	*null*	*null*	12.0	6
APARTMENT	59	Sapore Di Sale	80.0	*null*	*null*	*null*	20.0	8
HOTEL	88	Palace	200.0	30.0	25	5	*null*	*null*
HOTEL	117	Artemide	100.0	20.0	60	4	*null*	*null*
HOTEL	146	Zenith	70.0	18.0	40	3	*null*	*null*
HOTEL	175	Majestic	65.0	15.0	50	4	*null*	*null*

(7 rows, 11 ms)

Figure 5: Successfull connection test for the H2 database

3.3 Setting up WildFly

After the H2 database is created, the EJB‘s can be deployed to the WildFly application server.

It is important to mention, that at this point the H2 database (explained in Section 3.1) has to be running.

3.3.1 Add H2 database datasource

To give the EJB‘s the ability to access the database, the *accommodations* database has to be defined as a datasource in the configuration file of WildFly. The configuration file is located at `\$JBOSS\_HOME/standalone/configuration/standalone.xml`, where `$JBOSS_HOME` is the path to WildFly. Listing 5 shows how the in Section ?? created H2 database can be added as a datasource in WildFly.

```
...
<subsystem xmlns="urn:jboss:domain:datasources:6.0">
  <datasources>
    <datasource jndi-name="java:jboss/datasources/AccommodationsDS" pool-name="AccommodationsDS" enabled="true" use-java-context="true" statistics-enabled="${wildfly.datasources.statistics-enabled:${wildfly.statistics-enabled:false}}">
      <connection-url>jdbc:h2:tcp://localhost/~/workspace/145085_web-architectures/assignment_5/accommodations;DB_CLOSE_DELAY=-1;DB_CLOSE_ON_EXIT=FALSE</connection-url>
      <driver>h2</driver>
      <security>
        <user-name>sa</user-name>
        <password>sa</password>
      </security>
    </datasource>
    ...
  </datasources>
</subsystem>
...
```

Listing 5: Default data source configuration

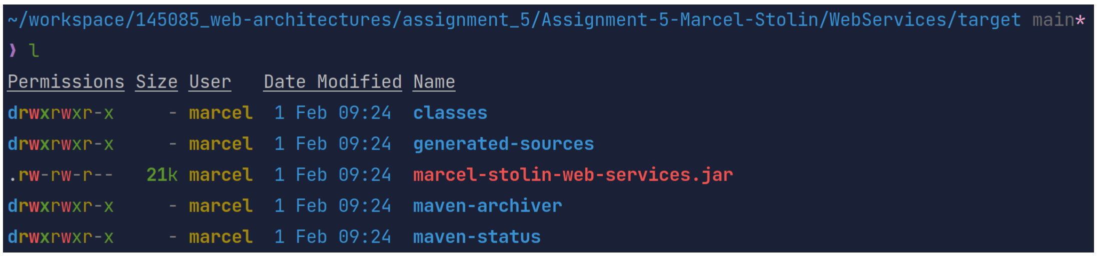
Additionally, this datasource has to be defined in the `persistance.xml` configuration file of the WebServices project as well, which is shown in Listing 6.

```
...
<persistence-unit name="default">
  <jta-data-source>java:jboss/datasources/AccommodationsDS</jta-data-source>
  <properties>
    <property name="hibernate.show_sql" value="true"/>
    <property name="hibernate.format_sql" value="true"/>
    <property name="hibernate.use_sql_comments" value="true"/>
  </properties>
</persistence-unit>
...
%
```

Listing 6: Default data source configuration

3.3.2 Compile EJB Jar

Third, the EJB‘s need to to be deployed to the Wildfly server. Therefore, it is necessary to run the command `$ mvn clean package` in the directory of the *WebServices* project, which builds the `.jar` artifact containing all EJB‘s. After that, a new directory called `/target` was created in the root folder of the *WebServices* project, where the EJB JAR `marcel-stolin-web-services.jar` is located, which is shown at Figure 6.



```
~/workspace/145085_web-architectures/assignment_5/Assignment-5-Marcel-Stolin/WebServices/target main*
❯ l
Permissions Size User   Date Modified Name
drwxrwxr-x     - marcel  1 Feb 09:24  classes
drwxrwxr-x     - marcel  1 Feb 09:24  generated-sources
.rw-rw-r--   21k marcel  1 Feb 09:24  marcel-stolin-web-services.jar
drwxrwxr-x     - marcel  1 Feb 09:24  maven-archiver
drwxrwxr-x     - marcel  1 Feb 09:24  maven-status
```

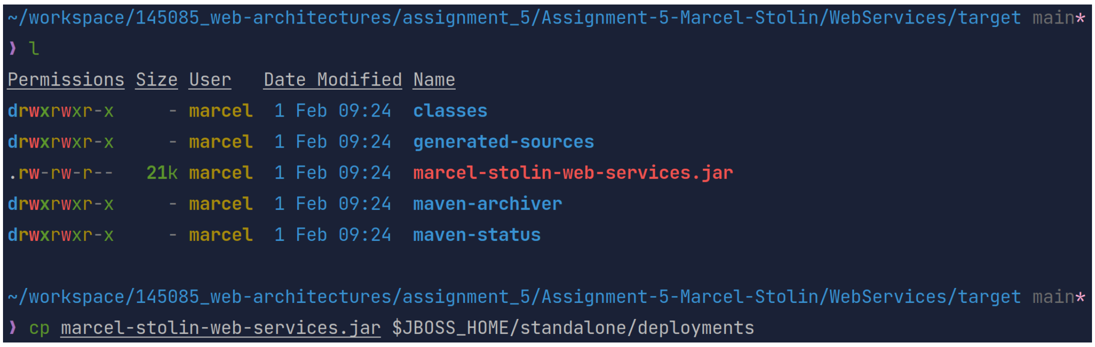
Figure 6: Successfull connection test for the H2 database

3.3.3 EJB JAR Deployment

After the `.jar` artifact has been created, it needs to be copied to the deployment directory of the Wildfly server. The artifact can be deployed using the command shown in Listing 7, where `$JBOSS_HOME` is the path to the local Wildfly directory. This command needs to be executed in the project folder of the *WebServices* project, which is shown in Figure 7.

```
$ cp target/marcel-stolin-web-services.jar $JBOSS_HOME/standalone/
    deployments
```

Listing 7: Default data source configuration



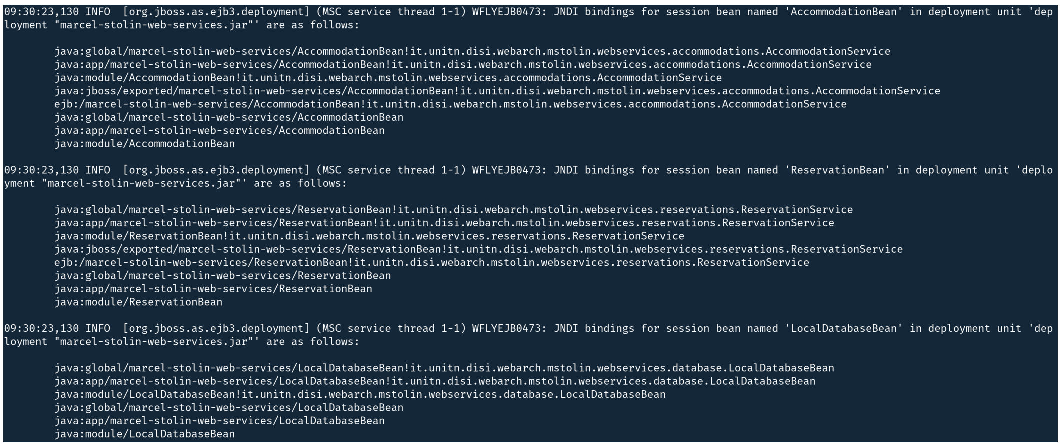
```
~/workspace/145085_web-architectures/assignment_5/Assignment-5-Marcel-Stolin/WebServices/target main*
❯ l
Permissions Size User   Date Modified Name
drwxrwxr-x     - marcel  1 Feb 09:24  classes
drwxrwxr-x     - marcel  1 Feb 09:24  generated-sources
.rw-rw-r--   21k marcel  1 Feb 09:24  marcel-stolin-web-services.jar
drwxrwxr-x     - marcel  1 Feb 09:24  maven-archiver
drwxrwxr-x     - marcel  1 Feb 09:24  maven-status

~/workspace/145085_web-architectures/assignment_5/Assignment-5-Marcel-Stolin/WebServices/target main*
❯ cp marcel-stolin-web-services.jar $JBOSS_HOME/standalone/deployments
```

Figure 7: Successfull connection test for the H2 database

3.3.4 Start Wildfly Application Server

Finally, the Wildfly server can be started using the command `$ bin/standalone.sh`. Additionally, the log shows the lookup address of both the *AccommodationSer-*

vice (mentioned in Section 2.2.2) and the *ReservationService* (mentioned in Section **??**), which is illustrated in Figure 8.



```
09:30:23,130 INFO  [org.jboss.as.ejb3.deployment] (MSC service thread 1-1) WFLYEJB0473: JNDI bindings for session bean named 'AccommodationBean' in deployment unit 'dep
loyment "marcel-stolin-web-services.jar"' are as follows:

        java:global/marcel-stolin-web-services/AccommodationBean!it.unitn.disi.webarch.mstolin.webservices.accommodations.AccommodationService
        java:app/marcel-stolin-web-services/AccommodationBean!it.unitn.disi.webarch.mstolin.webservices.accommodations.AccommodationService
        java:module/AccommodationBean!it.unitn.disi.webarch.mstolin.webservices.accommodations.AccommodationService
        java:jboss/exported/marcel-stolin-web-services/AccommodationBean!it.unitn.disi.webarch.mstolin.webservices.accommodations.AccommodationService
        ejb:/marcel-stolin-web-services/AccommodationBean!it.unitn.disi.webarch.mstolin.webservices.accommodations.AccommodationService
        java:global/marcel-stolin-web-services/AccommodationBean
        java:app/marcel-stolin-web-services/AccommodationBean
        java:module/AccommodationBean

09:30:23,130 INFO  [org.jboss.as.ejb3.deployment] (MSC service thread 1-1) WFLYEJB0473: JNDI bindings for session bean named 'ReservationBean' in deployment unit 'deplo
yment "marcel-stolin-web-services.jar"' are as follows:

        java:global/marcel-stolin-web-services/ReservationBean!it.unitn.disi.webarch.mstolin.webservices.reservations.ReservationService
        java:app/marcel-stolin-web-services/ReservationBean!it.unitn.disi.webarch.mstolin.webservices.reservations.ReservationService
        java:module/ReservationBean!it.unitn.disi.webarch.mstolin.webservices.reservations.ReservationService
        java:jboss/exported/marcel-stolin-web-services/ReservationBean!it.unitn.disi.webarch.mstolin.webservices.reservations.ReservationService
        ejb:/marcel-stolin-web-services/ReservationBean!it.unitn.disi.webarch.mstolin.webservices.reservations.ReservationService
        java:global/marcel-stolin-web-services/ReservationBean
        java:app/marcel-stolin-web-services/ReservationBean
        java:module/ReservationBean

09:30:23,130 INFO  [org.jboss.as.ejb3.deployment] (MSC service thread 1-1) WFLYEJB0473: JNDI bindings for session bean named 'LocalDatabaseBean' in deployment unit 'dep
loyment "marcel-stolin-web-services.jar"' are as follows:

        java:global/marcel-stolin-web-services/LocalDatabaseBean!it.unitn.disi.webarch.mstolin.webservices.database.LocalDatabaseBean
        java:app/marcel-stolin-web-services/LocalDatabaseBean!it.unitn.disi.webarch.mstolin.webservices.database.LocalDatabaseBean
        java:module/LocalDatabaseBean!it.unitn.disi.webarch.mstolin.webservices.database.LocalDatabaseBean
        java:global/marcel-stolin-web-services/LocalDatabaseBean
        java:app/marcel-stolin-web-services/LocalDatabaseBean
        java:module/LocalDatabaseBean
```

Figure 8: Successfull connection test for the H2 database

3.4 Starting the Web Application

After the database has been created successfully, and the EJB‘s have been deployed successfully, the web application can be deployed to Apache Tomcat.

One problem is, that *WildFly* already uses port 8080, and *Apache Tomcat* uses port 8080 by default as well. Therefore, *Apache Tomcat* has to be configured to use port 8000 instead.

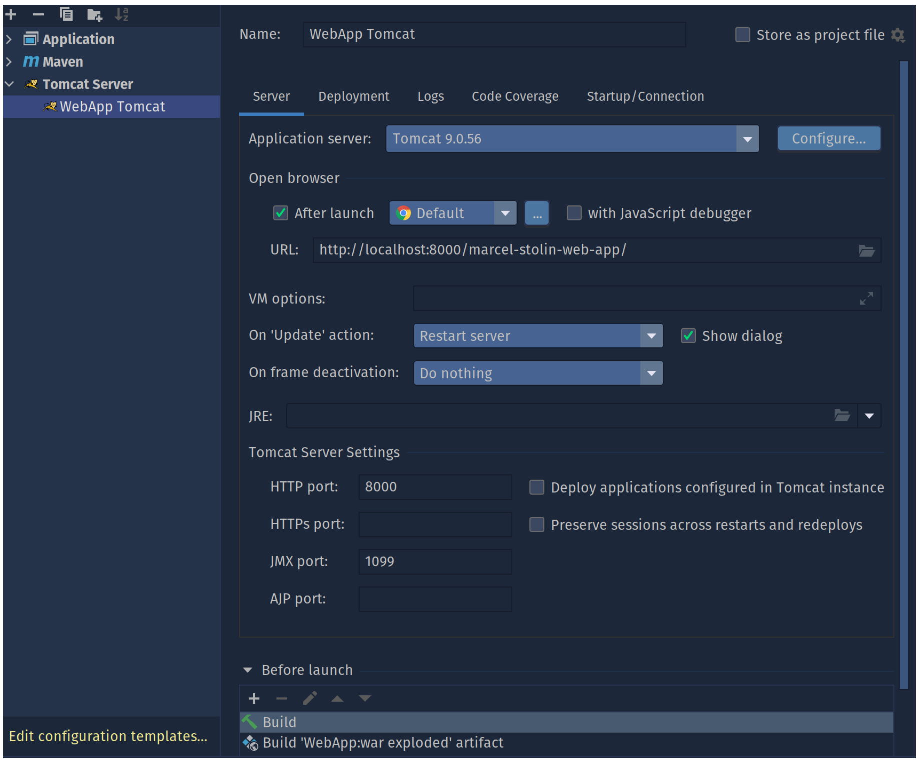
3.4.1 IntelliJ Configuration

To deploy the web application on using *IntelliJ*, it is necessary to create an new *Run Configuration* for *Apache Tomcat* in the *WebApp* project.

Server Settings The *Server* settings for *IntelliJ* are shown in Figure 9. It is important, that the URL is set to `http://localhost:8000/marcel-stolin-web-app/`, and the HTTP port is set to 8000. In addition, under *Before launch* it is import to build the *WebApp:war exploded* artifact.

Deployment Settings Figure 10 shows the settings for the *Deployment* section. It is neccessary to deploy the *WebApp:war exploded* artifact on server startup. Additionally, the *Application Context* need to be set to `marcel-stolin-web-app`.

Accessing the Application After running the *Run Configuration* for *Apache Tomcat* from *IntelliJ*, the web application is available at `http://localhost:8000/marcel-stolin-web-app/`.



Name: WebApp Tomcat
□ Store as project file

Application server: Tomcat 9.0.56

Open browser

☑ After launch Default ... □ with JavaScript debugger

URL: http://localhost:8000/marcel-stolin-web-app/

VM options:

On 'Update' action: Restart server ☑ Show dialog

On frame deactivation: Do nothing

JRE:

Tomcat Server Settings

HTTP port: 8000 □ Deploy applications configured in Tomcat instance

HTTPs port: □ Preserve sessions across restarts and redeploys

JMX port: 1099

AJP port:

Build

Build 'WebApp:war exploded' artifact

Figure 9: Successfull connection test for the H2 database

4 Comments and Notes

This section describes the problems encountered during the development of the application.

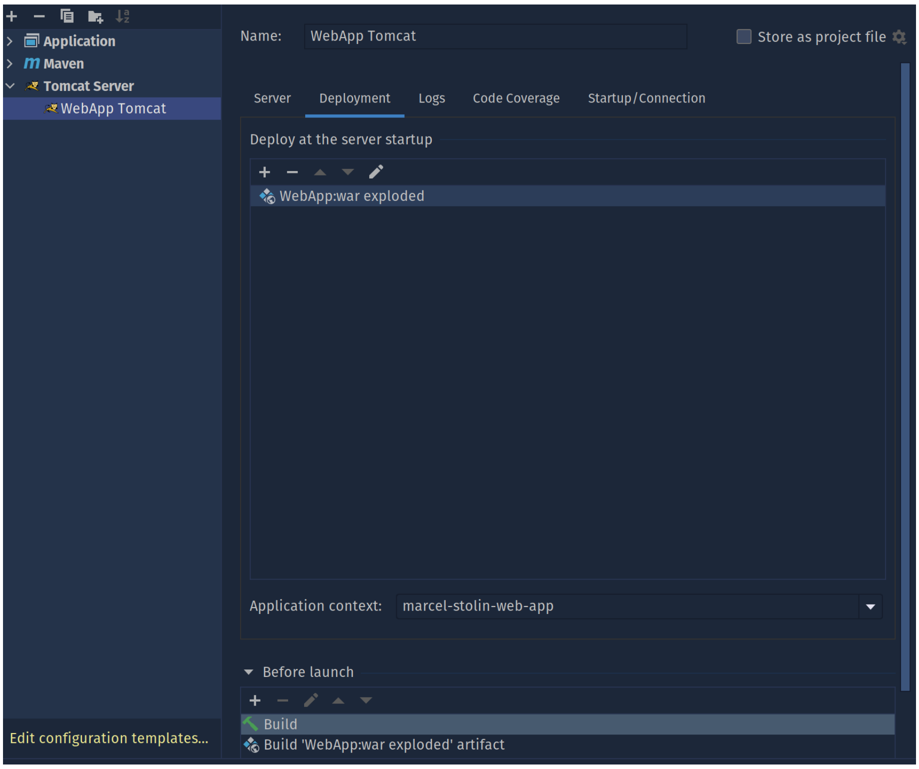
4.1 Routing

A requirement was to deploy the *Angular* application on a *Tomcat* webserver. However, *Angular* redirects all requests to the `index.html`. For example, requesting the page `http://localhost:8080/marcel-stolin/detail/1735` will not work, because a directory `detail/1735` does not exist. Then, the *Tomcat* web server responses a 404 error page.

The solution to this problem, is to use the `HashLocationStrategy`[1]. Listing 8 shows how it is implemented in the application. Then, the previously mentioned URL can be accessed via `http://localhost:8080/marcel-stolin/#/detail/1735`.

```
const routes: Routes = [
  { path: '', component: MemberListComponent },
  { path: 'detail/:memberId', component: MemberDetailComponent }
];

@NgModule({
  imports: [RouterModule.forRoot(routes, {useHash: true})],
```

[1] https://angular.io/api/common/HashLocationStrategy



Name: WebApp Tomcat

□ Store as project file

Deploy at the server startup

WebApp:war exploded

Application context: marcel-stolin-web-app

Before launch

Build

Build 'WebApp:war exploded' artifact

Figure 10: Successfull connection test for the H2 database

```
  exports: [RouterModule]
})
```

Listing 8: Application routing configuration of `app-routing.module.ts`

4.2 Building the Angular Application

Another problem is how to build the *Angular* application. A *JS-Servlet* project requires static files (e.g.: HTML files, Javascript libraries) to be located at `PROJECT\_ROOT/src/main/webapp`. Therefore, whenever the angular application is built, the output has to be saved in this directory.

To solve this issue, *Angular* allows to define the `outputPath` for the application when using `ng build`. Listing 9 shows the `angular.json` configuration.

```
...
"build": {
  "builder": "@angular-devkit/build-angular:browser",
  "options": {
    "outputPath": "../../webapp",
...
```

Listing 9: `angular.json` configuration

Additionally, it is important to define the *base-href*, that defines the path where the application is located on the web server. This application is supposed to be available via the path `/marcel-stolin` (e.g.: `http://localhost:8080/marcel-stolin/`).

Therefore, the command `$ ng build --base-href /marcel-stolin/` has to be used to build the application.