Software Architecture Project 2023/24

Flight tickets

Author: Mattia Dei Rossi

Matricolation: 885768

Year: 2023/24

Index

Topic

Implement an IT system to manage tickets of flights.

Approach

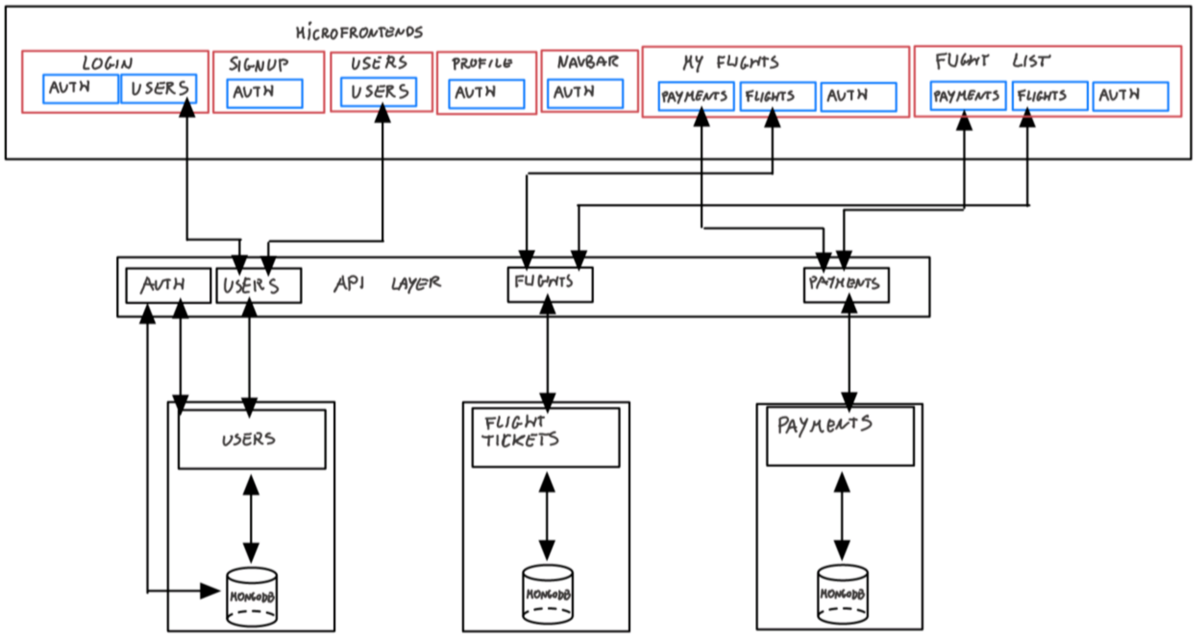
To implement this type of IT system has been decided to use a microservices architecture with microfrontends.

The frameworks chosen are:

- Angular for microfontends.
- Nodejs for microservices.
- MongoDB for databases.
- Docker compose to manage entire IT platform.

Each microfrontend component interact with backend using asynchronous observables components via synchronous communications through REST APIs.

Software architecture schema



Microservices

Microservices are:

- API Layer Gateway: it redirects the requests to the correct services. It manages the Authentication of users, in particular sign up, sign in and auth functions.
- Users: it communicates with a database to manage the users on the IT platform.
- Flights: it communicates with a database to manage the flights on the IT platform.
- Payments: it communicates with a database to manage the payments on the IT platform.

Microfrontends

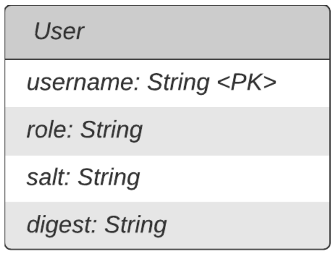
Microfronteds are:

- Components:
  - Flight list: it shows available flights, search and buy flights.
  - Login: it manages the login phase
  - My-flights: it shows the flights ticket purchased by user logged in
  - Navbar: it manages the menu of the entire system
  - Profile: it shows information about the user logged in
  - Signup: it manages the register of new users
  - Users: it is accessible only via “admin” user. It permits to delete users.
- Services:
  - Auth-guard: guarantee the correct authorization in the angular routing system.
  - Auth: it manages the token of user logged in
  - Flights: it communicates with flight service
  - Payments: it communicates with payment service
  - Users: it communicates with users service

Databases

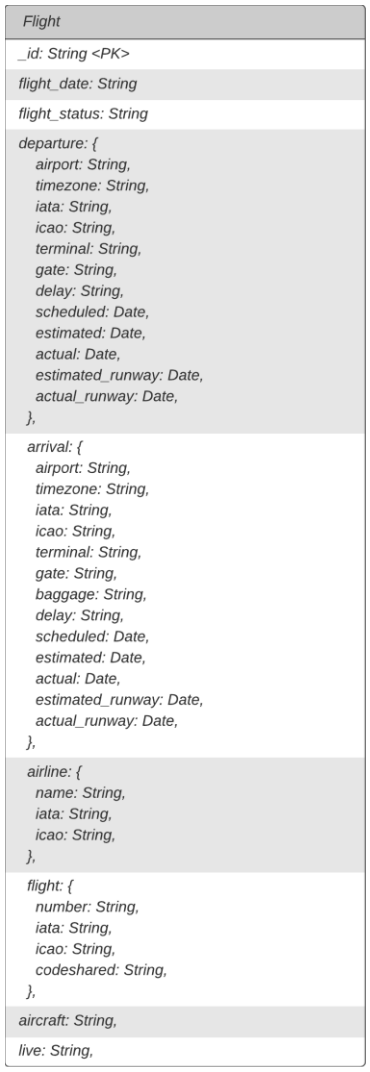
Databases are:

- MongoDB-users:



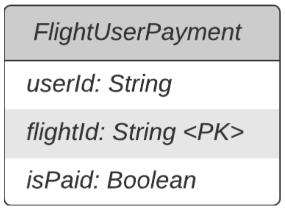
```
User
username: String <PK>
role: String
salt: String
digest: String
```

- MongoDB-flights:



```
Flight
_id: String <PK>
flight_date: String
flight_status: String
departure: {
    airport: String,
    timezone: String,
    iata: String,
    icao: String,
    terminal: String,
    gate: String,
    delay: String,
    scheduled: Date,
    estimated: Date,
    actual: Date,
    estimated_runway: Date,
    actual_runway: Date,
  },
  arrival: {
    airport: String,
    timezone: String,
    iata: String,
    icao: String,
    terminal: String,
    gate: String,
    baggage: String,
    delay: String,
    scheduled: Date,
    estimated: Date,
    actual: Date,
    estimated_runway: Date,
    actual_runway: Date,
  },
  airline: {
    name: String,
    iata: String,
    icao: String,
  },
  flight: {
    number: String,
    iata: String,
    icao: String,
    codeshared: String,
  },
aircraft: String,
live: String,
```

- MongoDB-payments:

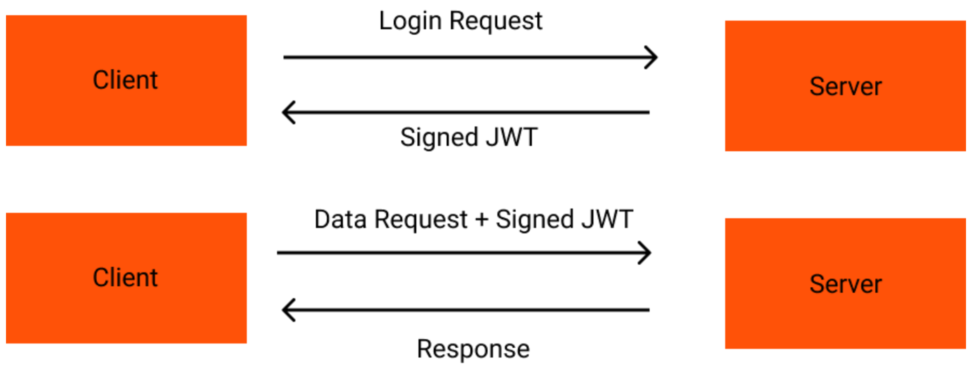


API

Please download the repo and open backend/apidoc/index.html with your favorite browser.

Authentication

Authentication is handled through a JSON Web Token (JWT) generated after logging in by user.



The operations performed for token generation are:

1. Executing a GET request to the /login endpoint with http header containing the field

   authorization: 'Basic ' + btoa(username + ':' + password).

   btoa() creates an ASCII string with Base64 encoding from a binary string.

2. Decoding the **authorization** field using the **passportHTTP.BasicStrategy()** function.
3. Searching the DB for the requested user.
4. Creation of token starting from username, role, id.
5. Signing token using the jsonwebtoken.sign() function that requires a token, a password

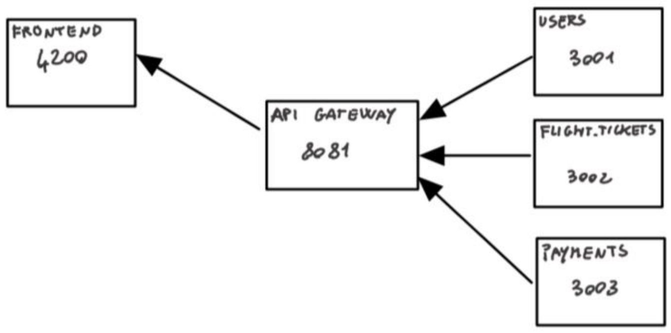
   let **token_signed** = jsonwebtoken.sign(tokendata, JWT_SECRET, { expiresIn: '1h' });

6. After the signed token is generated, it is sent for each future request in the header field

   authorization: 'Barer **token_signed**'.

CORS Policy

Cross-origin resource sharing (CORS) is an extension of the same-origin policy. You need it for authorized resource sharing with external third parties. The actual policy is described in the following schema.



Docker Compose

There are two different docker compose files:

- backend/docker-compose.yaml (backend)
- Docker-compose.yaml (main)

Backend docker compose

It defines the virtual network of the entire system, the volumes to persist database data, the microservices and the relatives DBs.

Ports forwarded to host:

Service	**Host port**	**Service port**	Service	Host port	Service port
Gateway	8081	8081			
Users	3001	3001	UserDB	27017	27017
Flights	3002	3002	FlightsDB	27018	27017
Payments	3003	3003	PaymentsDB	27019	27017

Main docker compose

It describes the deployment of frontend and includes the backend docker compose file.

Ports forwarded to host:

Service	Host port	Service port
Frontend	4200	80