TUNIS BUSINESS SCHOOL
UNIVERSITY OF TUNIS

CarHub

IT325 Web Service
Professor : Montassar Ben Messaoud

Final Project
by

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Declaration of Academic Integrity

I declare that the current project CarHub is the product of my own efforts , and that any use of any sources or ideas has been acknowledged .

I am aware that academic dishonesty and plagiarism are serious charges and I will not participate in such conduct .

In all of my academic activities , I swear to preserve the greatest standards of academic integrity .

Date: January 15th, 2023

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Abstract

This report details the creation and deployment of CarHub, a RESTful API designed to assist drivers locate and reserve available parking spaces and search for nearest gas stations with available fuel.

The API is created in Python using the Flask framework, making use of MongoDB NoSQL database management system.

Additionally, a safe authentication method is used for user permission using JWT.

The performance and functionality of the API were tested. The study also discusses the technical specifics, constraints, and prospective future work.

Overall, CarHub is a helpful tool for drivers because it makes it simple for them to locate and reserve parking and gas stations while they're on the go, saving them time and relieving their tension when they're on the road.

Contents

Chapter 1

Introduction

Using cutting-edge technologies like RESTful APIs, CarHub makes it easy for Tunisian drivers to quickly locate the closest available parking spaces and reserve them in advance, saving valuable time and reducing the stress of parking in crowded cities.

In addition to this, CarHub also helps drivers find the nearest gas stations with fuel, so they don't have to waste time searching for a station with available fuel.

An overview of the CarHub concept will be given in this report. Despite its potential, its development is not without difficulties.The report will also go through the technology's future potential.

Chapter 2

Project Description

2.1 Problematic

We cannot ignore the fact that Tunisia is currently experiencing a challenging economic situation, a lack of essential foods, high living expenses, and a lack of gasoline, which forces people to wait all day for fuel so they may continue to drive their vehicles.

Dozens of cars blocked streets in Tunis on Wednesday as fuel shortages caused long queues at petrol stations across Tunisia.

Motorists expressed their frustration at the petrol crisis, compounding food and other shortages the country is experiencing in an economic decline.

Taha Yassine, a tour guide, says he stopped working for three days as he could not find enough fuel for his car.

“I’ve been waiting since 11am and I still can’t get my car to move through the line,” Mr Yassine told The National at a petrol station in Tunis’ L’Aouina suburb, after a five-hour wait.[1]

Despite the economy, we frequently have difficulty finding a place to park our car whether we are out with the family, at a meeting, or even just having lunch. During peak hours, a lot of cars are improperly or incorrectly parked, or there are no parking spaces available.

2.2 Solution

CarHub is a public RESTful API , that enables its users to search for the closest available parking stations to their locations , reserve a parking station , and to look for the nearest gaz stations with available fuel .

2.3 CRUD Operations

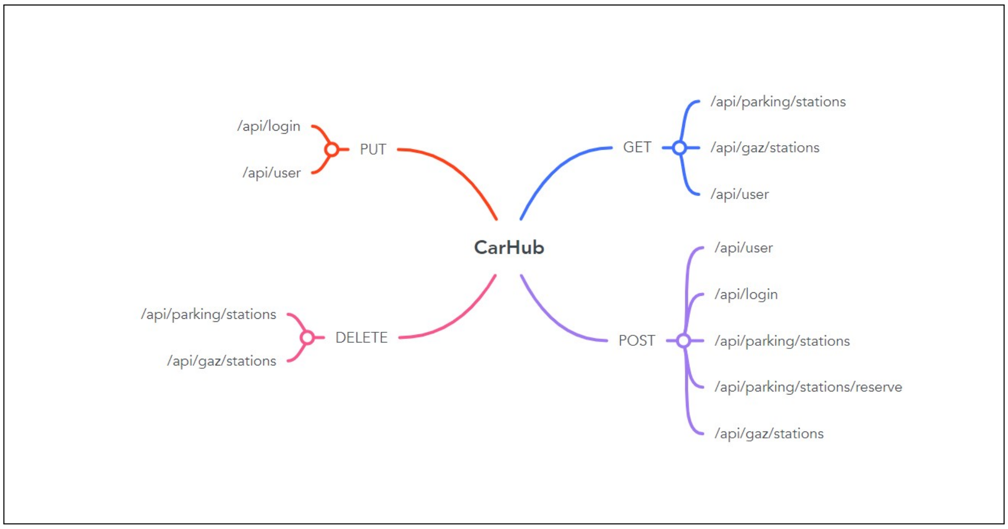


Figure 2.1: CRUD operations

2.4 Design Schema

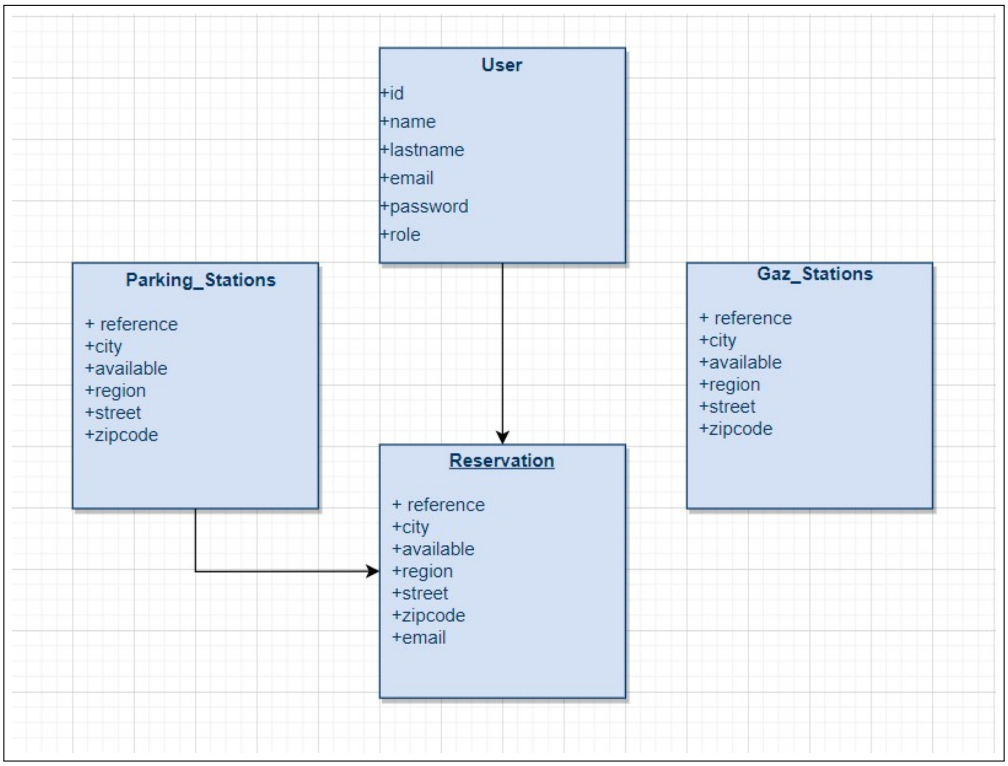


Figure 2.2: Design Schema

2.5 Technical Environment

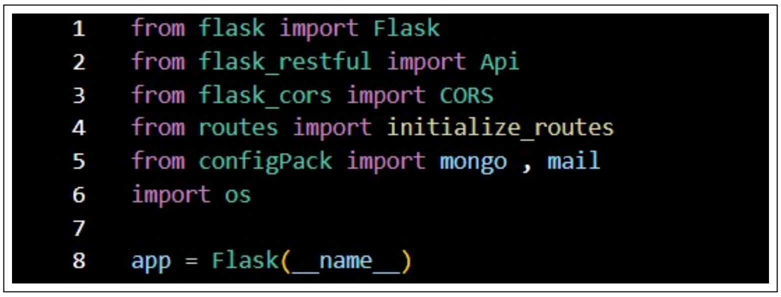
2.5.1 Python-Flask

Python has a compact web framework called Flask. With the potential to scale up to complicated applications, it is made to make getting started quick and simple. Microservices, RESTful APIs, and web applications are frequently created with Flask.

It is simple to develop and deploy an API on a variety of platforms and cloud settings thanks to Python and Flask's open-source and platform-independent nature. Request processing, request routing, and request data handling are all supported by Flask out of the box. This makes it simple for your API to handle a variety of requests and responses.

Python version used : 3.10.8

Flask version used : 2.2.2



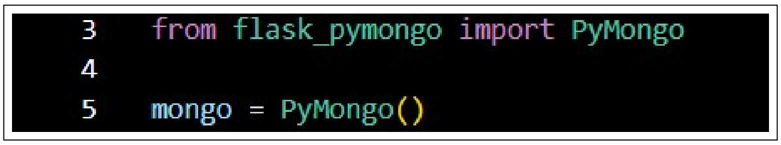
```python
from flask import Flask
from flask_restful import Api
from flask_cors import CORS
from routes import initialize_routes
from configPack import mongo , mail
import os

app = Flask(__name__)
```

Figure 2.3: Python-Flask implementation

2.5.2 MongoDB

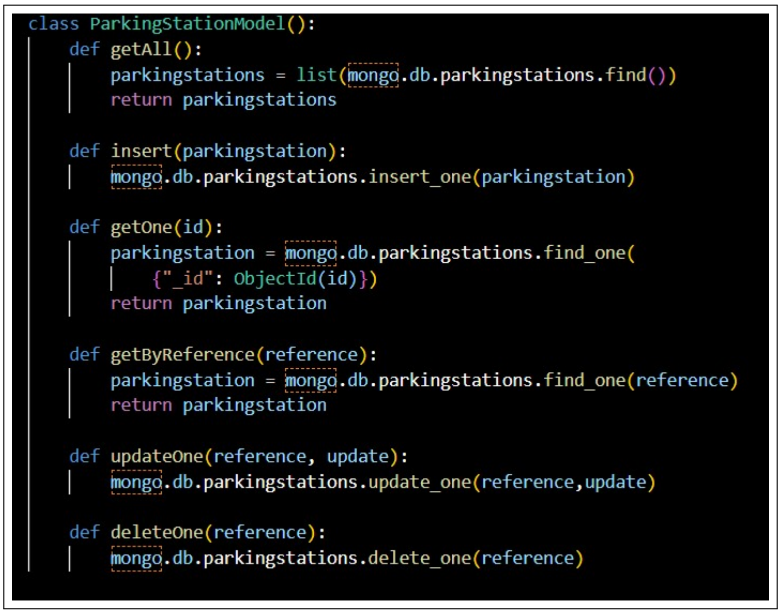
Python and Flask can be paired with the well-liked NoSQL database MongoDB to create web apps. A very well Flask extension called Flask-PyMongo makes using MongoDB with Flask simple. It provides a simple and user-friendly interface for connecting to MongoDB and managing databases.

Pymongo version used : 4.3.3



```python
from flask_pymongo import PyMongo

mongo = PyMongo()
```

Figure 2.4: MongoDB implementation



```
class ParkingStationModel():
    def getAll():
        parkingstations = list(mongo.db.parkingstations.find())
        return parkingstations

    def insert(parkingstation):
        mongo.db.parkingstations.insert_one(parkingstation)

    def getOne(id):
        parkingstation = mongo.db.parkingstations.find_one(
            {"_id": ObjectId(id)})
        return parkingstation

    def getByReference(reference):
        parkingstation = mongo.db.parkingstations.find_one(reference)
        return parkingstation

    def updateOne(reference, update):
        mongo.db.parkingstations.update_one(reference,update)

    def deleteOne(reference):
        mongo.db.parkingstations.delete_one(reference)
```

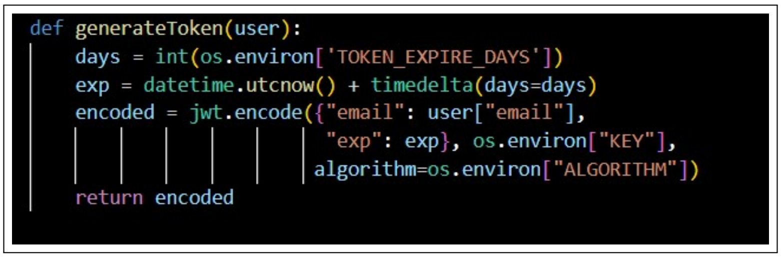
Figure 2.5: MongoDB implementation

2.5.3 JWT

JSON Web Token (JWT) is an open standard (RFC 7519) that defines a compact and self-contained way for securely transmitting information between parties as a JSON object. This information can be verified and trusted because it is digitally signed. JWTs can be signed using a secret (with the HMAC algorithm) or a public/private key pair using RSA or ECDSA.[2]

In CarHub API , a token must be provided in the header , to verify whether the account belongs to a simple user or an admin(any non super user will get an error message each time he will try to manipulate the database and execute operations beyond his granted permissions)

PyJWT version used : 2.6.0



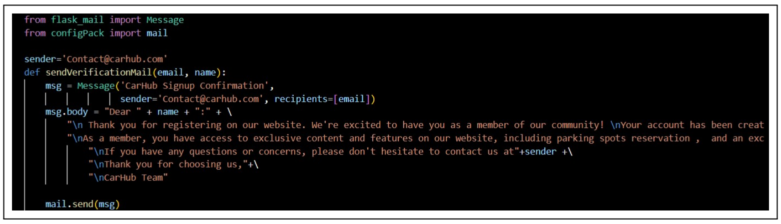
```
def generateToken(user):
    days = int(os.environ['TOKEN_EXPIRE_DAYS'])
    exp = datetime.utcnow() + timedelta(days=days)
    encoded = jwt.encode({"email": user["email"],
                          "exp": exp}, os.environ["KEY"],
                         algorithm=os.environ["ALGORITHM"])
    return encoded
```

Figure 2.6: JSON Web Tokens Implementation

2.5.4 MailTrap

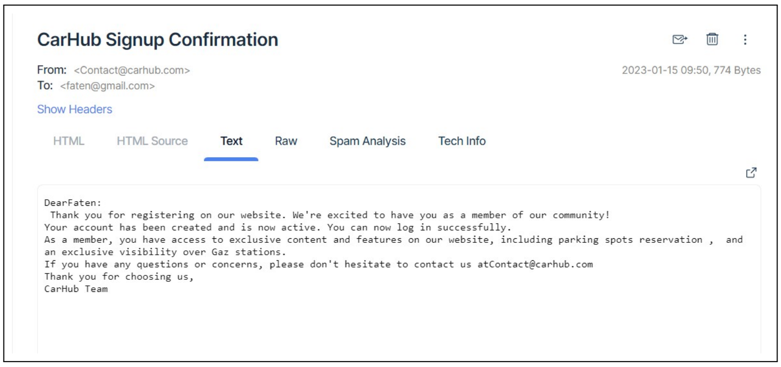
During the development stage of an API, Mailtrap is a testing tool for email notifications. Without actually sending the emails to actual recipients,the functionality of the email notifications can be tested.

Flask-Mail version used : 0.9.1



```python
from flask_mail import Message
from configPack import mail

sender='Contact@carhub.com'
def sendVerificationMail(email, name):
    msg = Message('CarHub Signup Confirmation',
                  sender='Contact@carhub.com', recipients=[email])
    msg.body = "Dear " + name + ":" + \
        "\n Thank you for registering on our website. We're excited to have you as a member of our community! \nYour account has been creat
        "\nAs a member, you have access to exclusive content and features on our website, including parking spots reservation ,  and an exc
            "\nIf you have any questions or concerns, please don't hesitate to contact us at"+sender +\
            "\nThank you for choosing us,"+\
            "\nCarHub Team"

    mail.send(msg)
```

Figure 2.7: MailTrap



CarHub Signup Confirmation

From: <Contact@carhub.com>
To: <faten@gmail.com>

2023-01-15 09:50, 774 Bytes

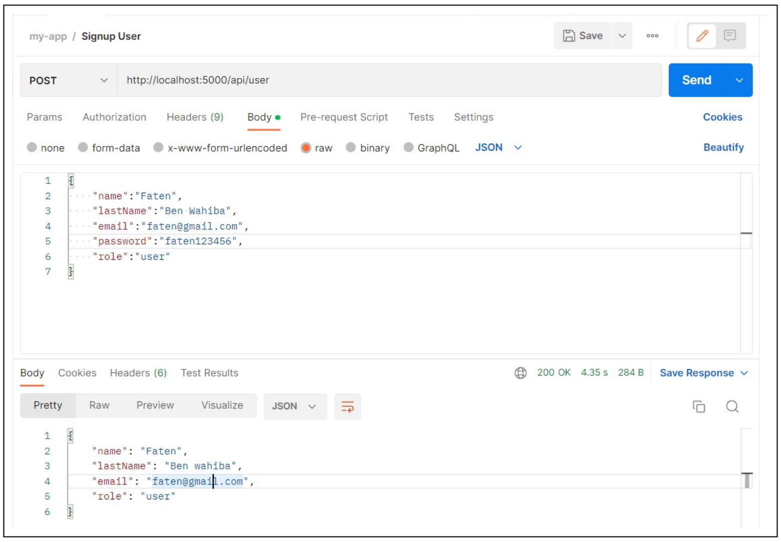
```
DearFaten:
 Thank you for registering on our website. We're excited to have you as a member of our community!
Your account has been created and is now active. You can now log in successfully.
As a member, you have access to exclusive content and features on our website, including parking spots reservation ,  and
an exclusive visibility over Gaz stations.
If you have any questions or concerns, please don't hesitate to contact us atContact@carhub.com
Thank you for choosing us,
CarHub Team
```

Figure 2.8: MailTrap

2.5.5 Postman

Developers may test and document APIs using Postman.

It offers a simple user interface for sending and receiving HTTP requests. Developers can quickly generate, test, and share API queries. Some requests tested in Postman : POST(signup user) , GET (All parking stations) , DELETE(parking stations)



my-app / Signup User

POST http://localhost:5000/api/user

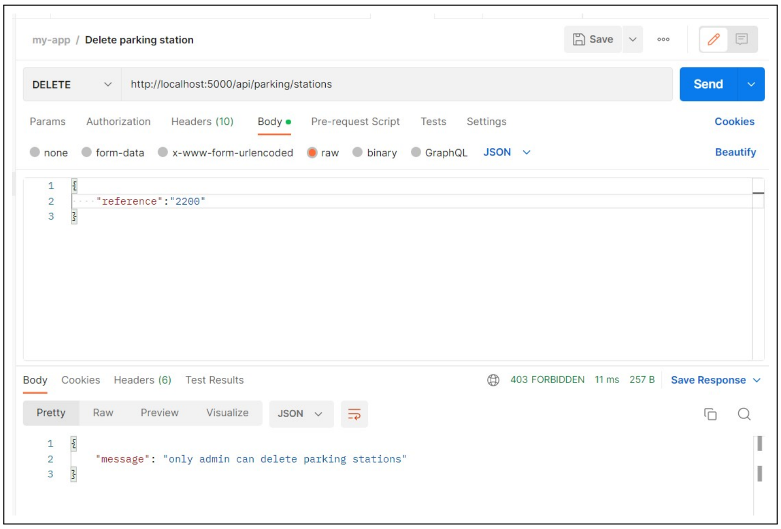
Body: ○ none ○ form-data ○ x-www-form-urlencoded ● raw ○ binary ○ GraphQL JSON

```json
{
    "name":"Faten",
    "lastName":"Ben Wahiba",
    "email":"faten@gmail.com",
    "password":"faten123456",
    "role":"user"
}
```

Body 200 OK 4.35 s 284 B JSON

```json
{
    "name": "Faten",
    "lastName": "Ben wahiba",
    "email": "faten@gmail.com",
    "role": "user"
}
```

Figure 2.9: Postman : Signup User POST request



my-app / Delete parking station

DELETE http://localhost:5000/api/parking/stations

```
{
    "reference":"2200"
}
```

403 FORBIDDEN 11 ms 257 B

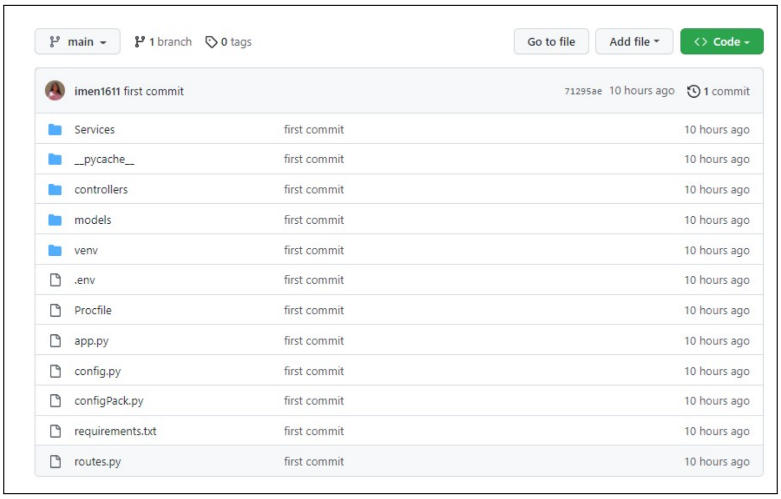
JSON

```
{
    "message": "only admin can delete parking stations"
}
```

Figure 2.10: Postman:Delete a parking station

2.5.6 Git and GitHub

Anyone can manage and work on the development of an API using Git and GitHub. It provide a variety of powerful tools for maintaining various API versions, keeping track of changes to the codebase, and working with other engineers. It can make the development process more efficient and help to maintain the API codebase organized and current.



imen1611 first commit 71295ae 10 hours ago 1 commit

Services	first commit	10 hours ago
__pycache__	first commit	10 hours ago
controllers	first commit	10 hours ago
models	first commit	10 hours ago
venv	first commit	10 hours ago
.env	first commit	10 hours ago
Procfile	first commit	10 hours ago
app.py	first commit	10 hours ago
config.py	first commit	10 hours ago
configPack.py	first commit	10 hours ago
requirements.txt	first commit	10 hours ago
routes.py	first commit	10 hours ago

Figure 2.11: GitHub implementation

2.6 Challenges and Future Enhancement

2.6.1 Swagger

A user-friendly interface for browsing and interacting with an API can be offered by the Swagger UI. It enables developers to quickly learn about and test their API's endpoints, input, and output formats. To make it simple for developers to utilize an API, it may also be used to create Software development kit, client libraries, and server wrappers for many languages.

2.6.2 Docker

Developing apps today requires so much more than writing code. Multiple languages, frameworks, architectures, and discontinuous interfaces between tools for each lifecycle stage creates enormous complexity. Docker simplifies and accelerates your workflow, while giving developers the freedom to innovate with their choice of tools, application stacks, and deployment environments for each project.[3]

2.6.3 Render.com

Render.comis an easy and effective cloud-based method for deploying and managing websites, online apps, and APIs . It enables programmers to quickly create, test, and deploy apps using a range of well-liked frameworks and languages, including Node.js, Python, Ruby, and Go, without having to handle servers or infrastructure.

Chapter 3

Conclusion

In conclusion, CarHub is an API that aims to improve how quickly and easily Tunisian drivers can locate and reserve parking spaces and gas stations. CarHub's major goal is to save Tunisian drivers time and aggravation when it comes to parking and refueling their vehicles.

CarHub has the ability to assist both drivers and the larger community in a number of ways. For drivers, it can speed up daily commutes, lessen stress, and save time. For the neighborhood, it can lessen air pollution and traffic congestion by reducing the number of cars circling around looking for a parking spot or fuel .
A special thank you to Professor Montassar Ben Messaoud for providing the chance to work on such a stimulating and enriching project.

Bibliography

[1] https://www.thenationalnews.com/mena/tunisia/2022/10/13/tunisia-fuel-shortages-spark-long-queues-and-frustration-at-fuel-stations/

[2] https://jwt.io/introduction

[3] https://www.docker.com/why-docker/