Secure Software Development - Team RED Project

Online Retailer

Application Tools & Libraries

The source code for our online retail application is organised and documented according to Python's PEP-8 style guide. The interface is via command line, the application is not network deployed.

The following languages were used in this project,

- Python v3.12.0
- Javascript Object Notation (JSON) v2.10.1

&, the following tools,

- FastAPI v0.103.2
- Uvicorn v0.23.2
- Mkcert v3.1.0
- Chocolatey v2.0.0
- Cryptography fernet v41.0.4

&, the following python modules,

- multipart
- OS
- typing, typing-extensions
- datetime
- sys
- random
- string
- shutil
- inputimeout

Initial setup

1. Download the repository from Github
2. The 'Application' folder must be opened in Visual Studio Code
3. Code must be run in Visual Studio Code on Windows
4. Pre-requisites to install are as follows: pip install fastapi uvicorn, pip install pydantic, pip install python-multipart, pip install inputimeout

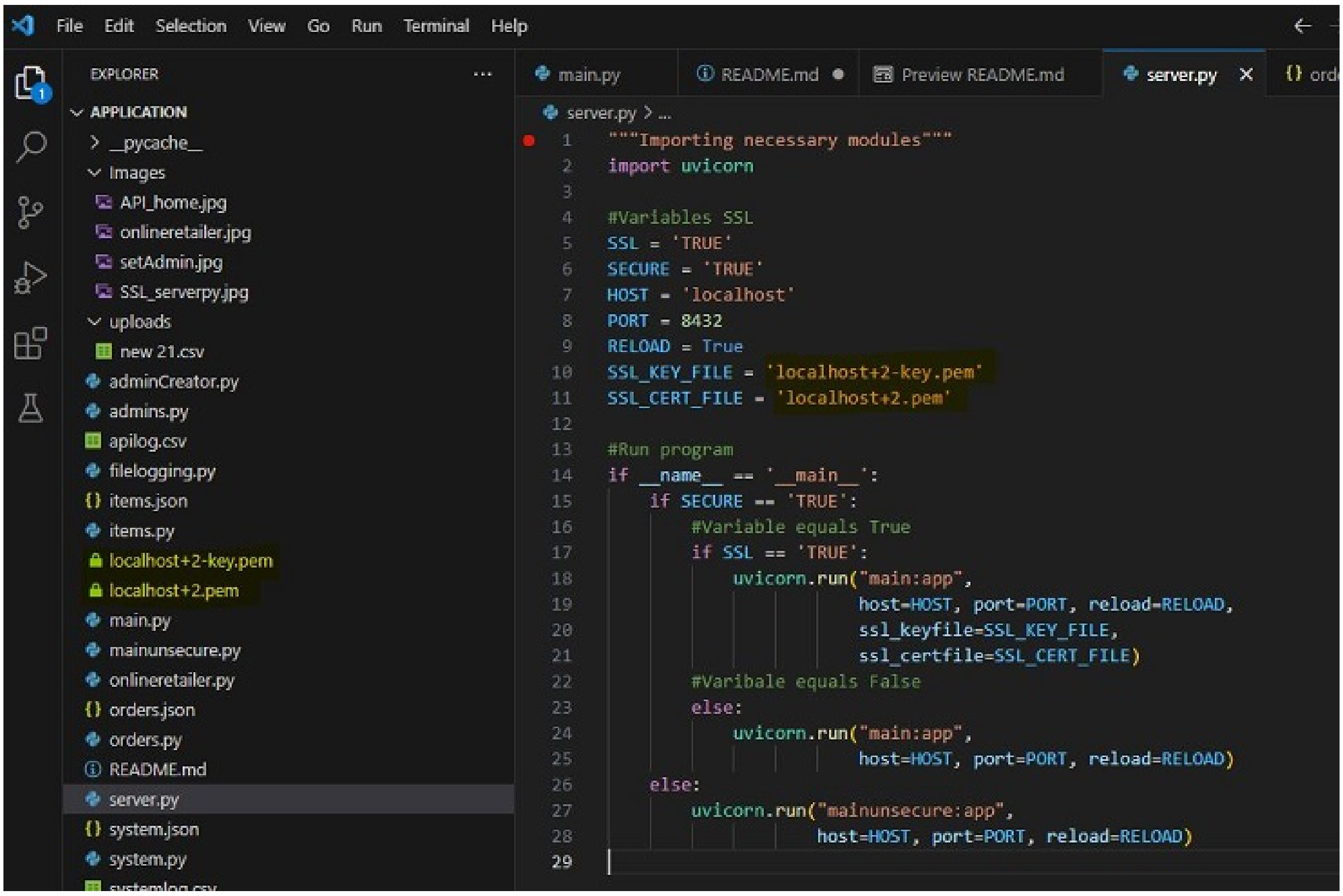
Additional option for SSL

if you wan to use SSL (HTTPS) for the API you will need to generate self certified certificates for local use. This can be done by installing mkcert through choco.

1. run choco install mkcert

2. run mkcert -install
3. run mkcert localhost 127.0.0.1 ::1

Note delete the exisitng .pem keys in the solution. Any certificate generated will be associated with yourlocal machine. Key will be generated with 'localhost+2.pem' and 'localhost+2-key.pem'. Update the file names if needed in server.py against the SSL_KEY_FILE and SSL_CERT_FILE.



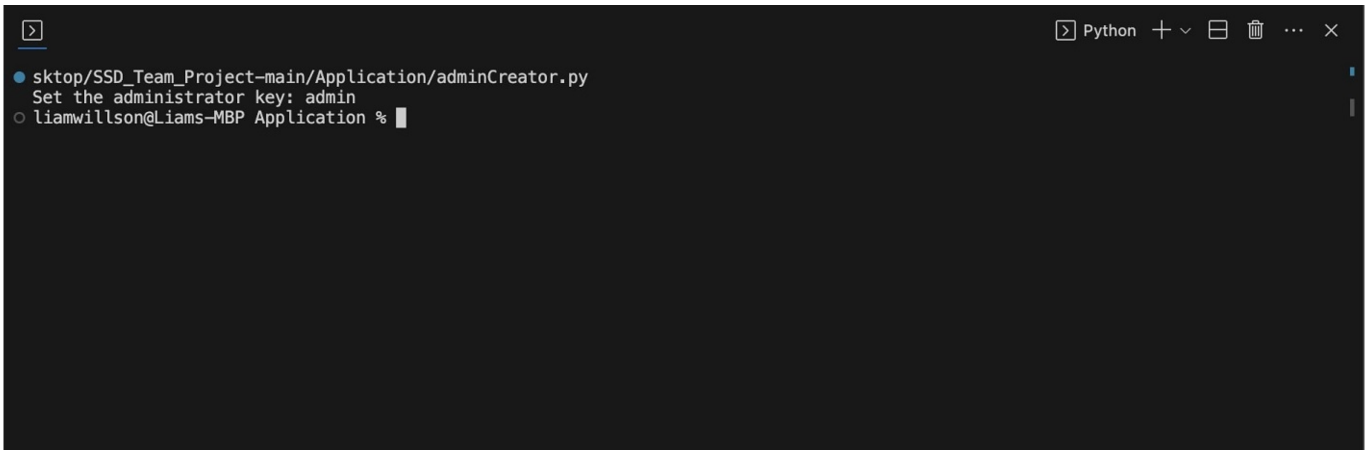
```python
"""Importing necessary modules"""
import uvicorn

#Variables SSL
SSL = 'TRUE'
SECURE = 'TRUE'
HOST = 'localhost'
PORT = 8432
RELOAD = True
SSL_KEY_FILE = 'localhost+2-key.pem'
SSL_CERT_FILE = 'localhost+2.pem'

#Run program
if __name__ == '__main__':
    if SECURE == 'TRUE':
        #Variable equals True
        if SSL == 'TRUE':
            uvicorn.run("main:app",
                        host=HOST, port=PORT, reload=RELOAD,
                        ssl_keyfile=SSL_KEY_FILE,
                        ssl_certfile=SSL_CERT_FILE)
        #Varibale equals False
        else:
            uvicorn.run("main:app",
                        host=HOST, port=PORT, reload=RELOAD)
    else:
        uvicorn.run("mainunsecure:app",
                    host=HOST, port=PORT, reload=RELOAD)
```

Fig 1. server.py

Executing the CLI application -->

Set An Administrator Key (Password)

1. Run the adminCreator.py script 'python3 adminCreator.py'
2. When prompted enter an administrator key to set the administrator key (password)



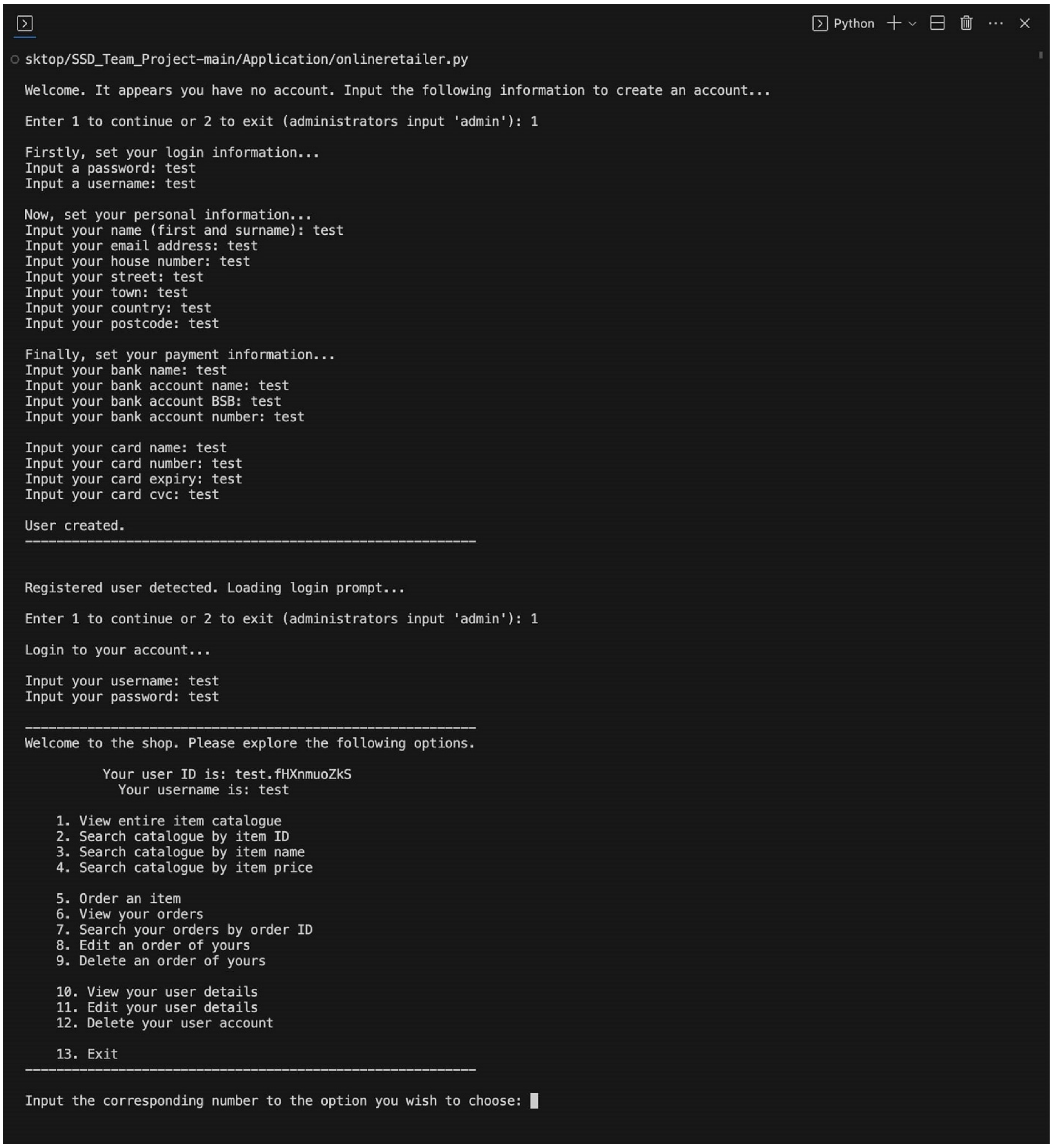
```
sktop/SSD_Team_Project-main/Application/adminCreator.py
Set the administrator key: admin
liamwillson@Liams-MBP Application %
```

Fig 3. adminCreator.py

then, Run The Online Shop Application (onlineretailer.py) Program

1. Run the onlineretailer.py script or in terminal, 'python3 onlineretailer.py'
2. Follow the prompts given to access either the user or administrator menu
3. Run the onlineretailer.py script again to re-access the shop if exited

   Upon login and following the prompts you will reach -->

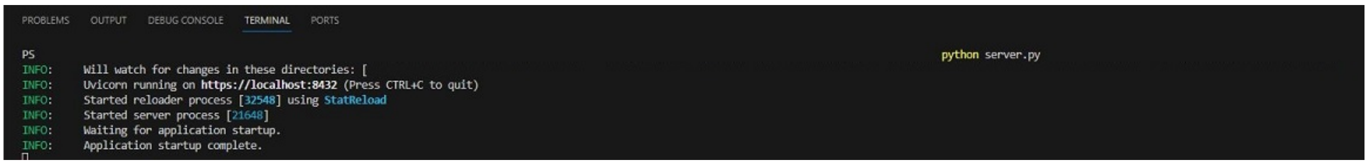


```
sktop/SSD_Team_Project-main/Application/onlineretailer.py

Welcome. It appears you have no account. Input the following information to create an account...

Enter 1 to continue or 2 to exit (administrators input 'admin'): 1

Firstly, set your login information...
Input a password: test
Input a username: test

Now, set your personal information...
Input your name (first and surname): test
Input your email address: test
Input your house number: test
Input your street: test
Input your town: test
Input your country: test
Input your postcode: test

Finally, set your payment information...
Input your bank name: test
Input your bank account name: test
Input your bank account BSB: test
Input your bank account number: test

Input your card name: test
Input your card number: test
Input your card expiry: test
Input your card cvc: test

User created.
----------------------------------------------------------


Registered user detected. Loading login prompt...

Enter 1 to continue or 2 to exit (administrators input 'admin'): 1

Login to your account...

Input your username: test
Input your password: test

----------------------------------------------------------
Welcome to the shop. Please explore the following options.

          Your user ID is: test.fHXnmuoZkS
            Your username is: test

    1. View entire item catalogue
    2. Search catalogue by item ID
    3. Search catalogue by item name
    4. Search catalogue by item price

    5. Order an item
    6. View your orders
    7. Search your orders by order ID
    8. Edit an order of yours
    9. Delete an order of yours

    10. View your user details
    11. Edit your user details
    12. Delete your user account

    13. Exit
----------------------------------------------------------

Input the corresponding number to the option you wish to choose: 
```

Fig 4. onlineretailer.py

Executing the API

1. Set SECURE to TRUE in server.py. This will run main.py which is the script that incorporates all the authentication and security features.
2. Set SECURE to FALSE in server.py. This will run mainunsecure.py which is the script that has no authentication or security features.
3. Set SSL to FALSE in server.py. This will run the server with HTTP. SSL set to true will use HTTPS but only with the self signed .pem certificates in the solution.
4. Run 'python server.py' in the terminal
5. Click the link in the terminal window for the URL to the Uvicorn BASE url.
6. Browse to http://localhost:8432/docs or https://localhost:8432/docs if using SSL. (/docs must be added manually to the url in your browser when API runs.)



```
PS                                                                          python server.py
INFO:     Will watch for changes in these directories: [
INFO:     Uvicorn running on https://localhost:8432 (Press CTRL+C to quit)
INFO:     Started reloader process [32548] using StatReload
INFO:     Started server process [21648]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
```

Fig 2. Running server.py in terminal

Using the API through the FAST API Swagger UI

1. For simplicity use the following credentials:

Username	Password
simonbolder	aJ708/F0M*
liamwillson	hd2_rR3~7g
fergusnugent	{L9C4\Pz8u
cathrynpeoples	30{Ey2@m`S
customer1	99KVC.9Nom
supplier1	£mq6

First step is to authorise yourself. Click the Authorise button.

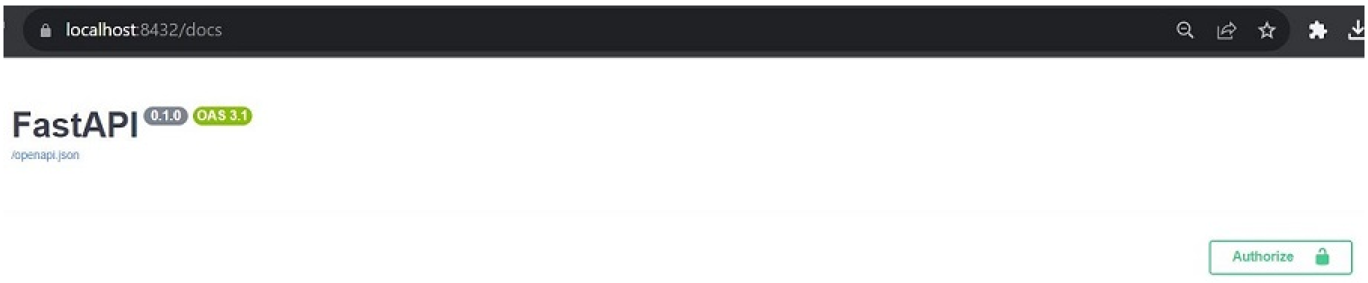
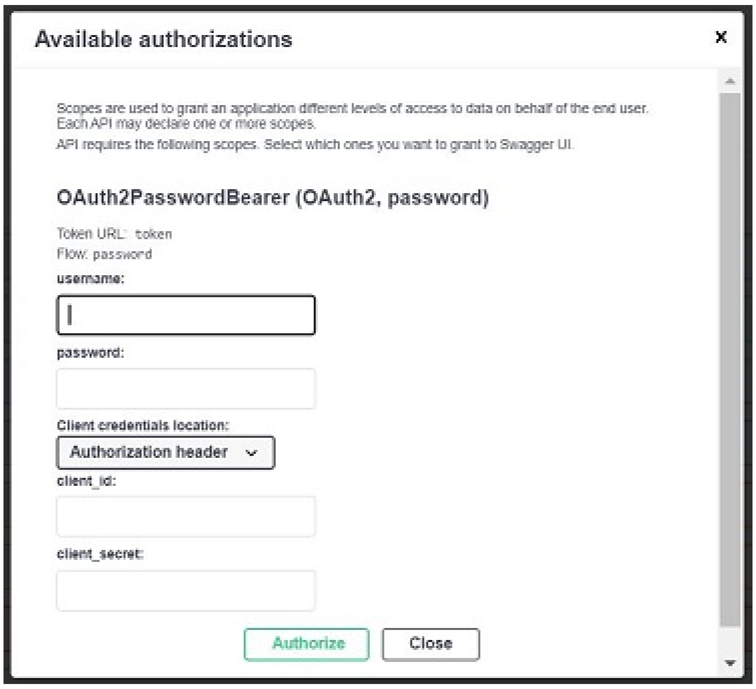


Fig 3. Authorisation

Enter username and password from table above and click authorise.


Available authorizations

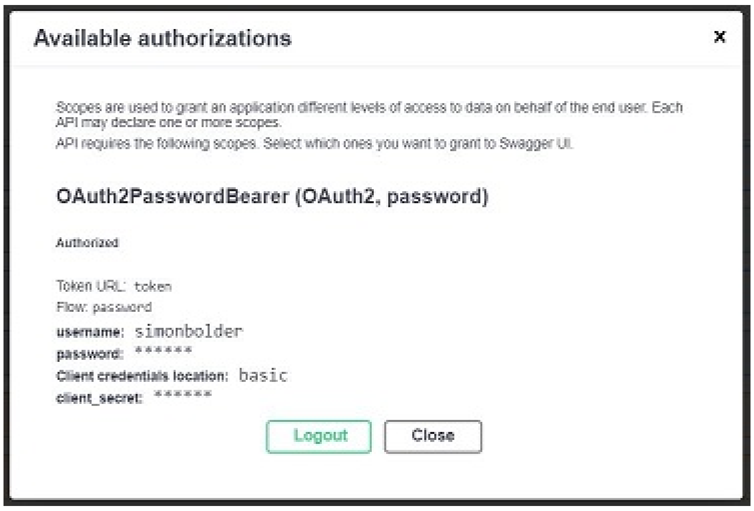
Scopes are used to grant an application different levels of access to data on behalf of the end user. Each API may declare one or more scopes.
API requires the following scopes. Select which ones you want to grant to Swagger UI.

OAuth2PasswordBearer (OAuth2, password)

Token URL: token
Flow: password
username:
password:
Client credentials location: Authorization header
client_id:
client_secret:

Fig 4. Enter credentials

Click close when authorised.


Available authorizations

Scopes are used to grant an application different levels of access to data on behalf of the end user. Each API may declare one or more scopes.
API requires the following scopes. Select which ones you want to grant to Swagger UI.

OAuth2PasswordBearer (OAuth2, password)

Authorized

Token URL: token
Flow: password
username: simonbolder
password: ******
Client credentials location: basic
client_secret: ******

Fig 5. Authorise

Once authenticated you can use any of the following endpoints by clicking on the down arrow next to the padlock (highlighted in yellow):

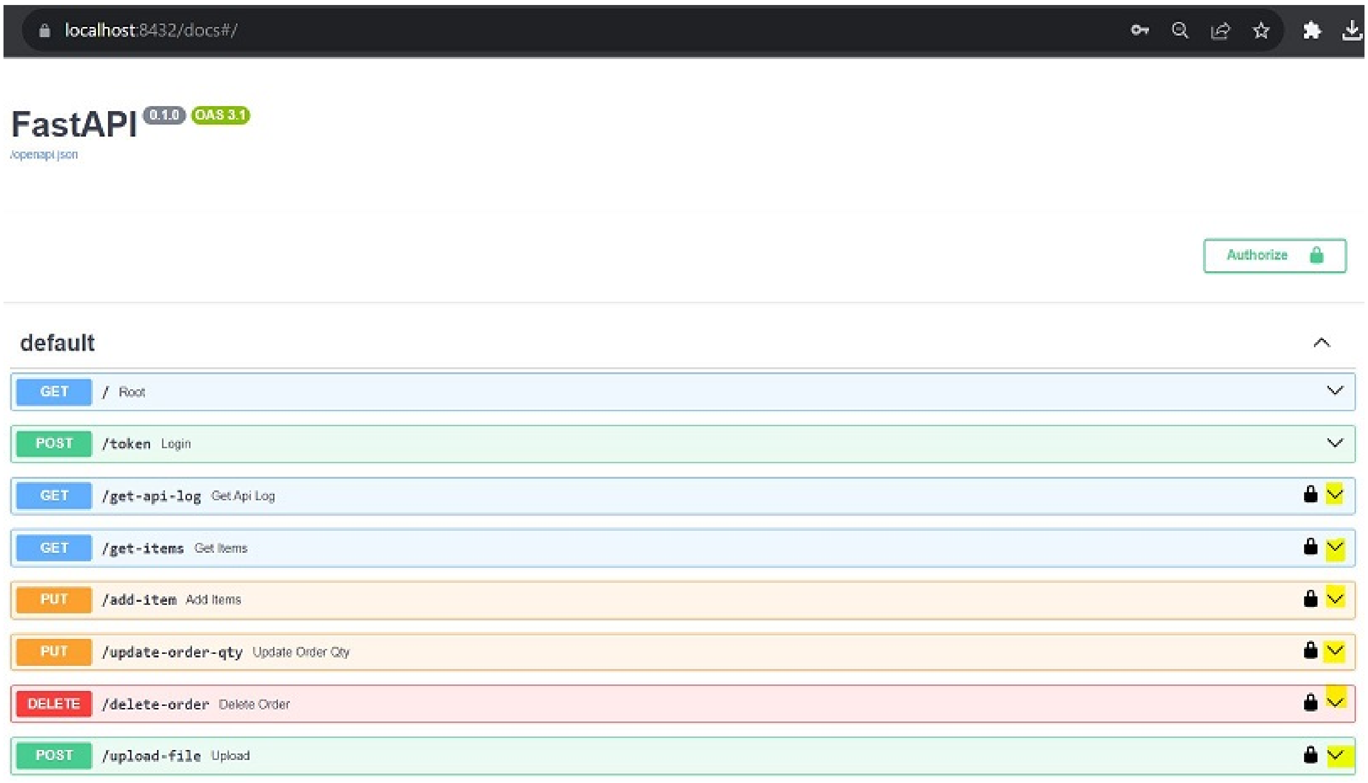


Fig 6. API home/menu

General use of the swagger UI when using the API

To execute any of the API endpoints you will need to enter parameters. To do this you will need to expand each API and tehn click the 'Try it out' button to enable the parameters. Once doen and parameters entered click the execute button to run the API function.

Get API Log

This will require you to input a username parameter. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function.

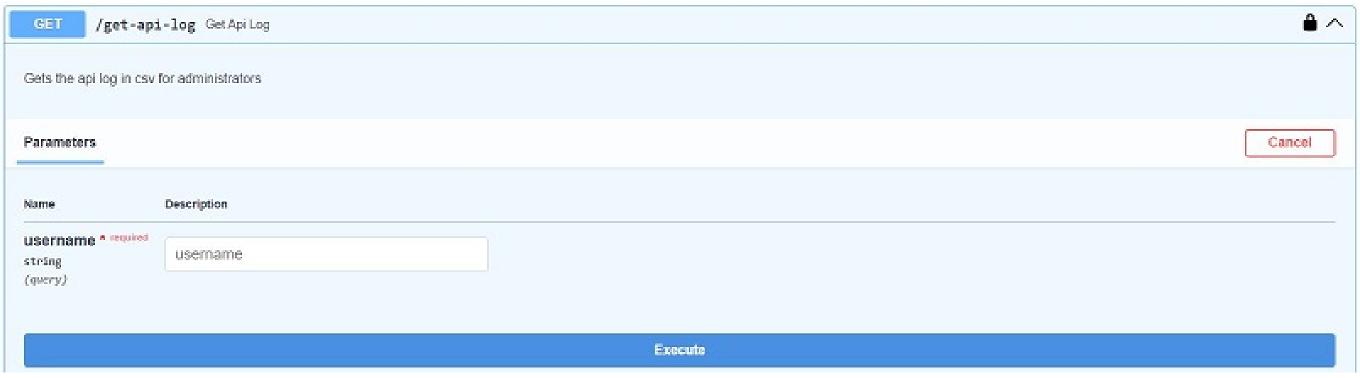
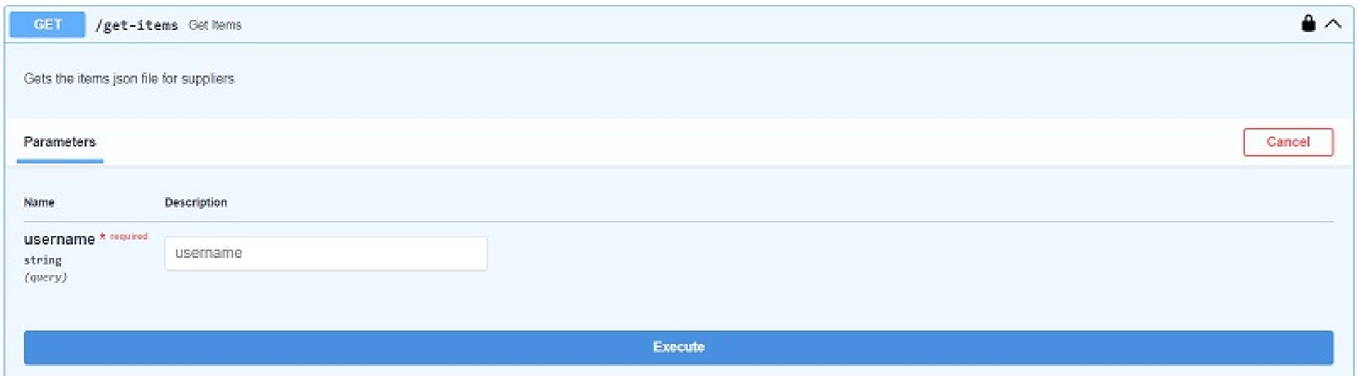


Fig 7. Get API Log

Get Items

This will require you to input a username parameter. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function.


GET /get-items Get Items

Gets the items json file for suppliers

Parameters Cancel

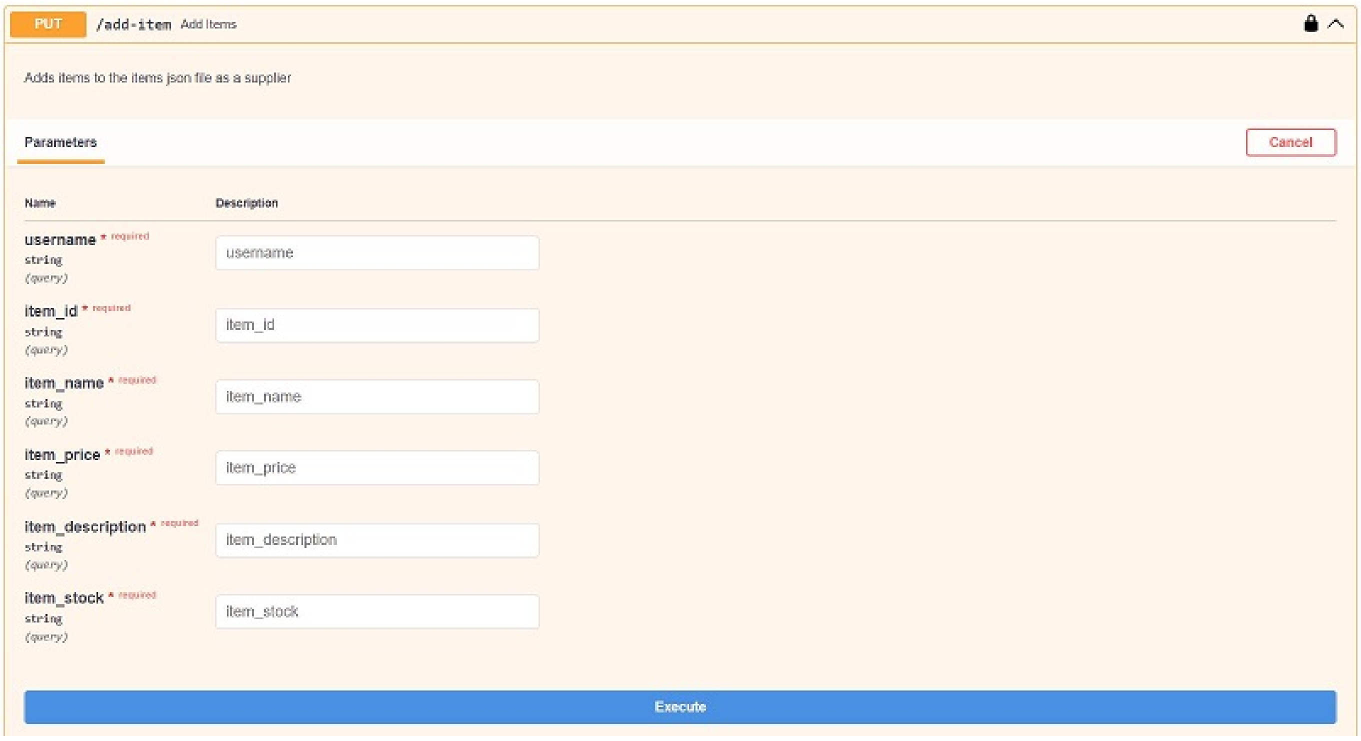
Name	Description
username * required string (query)	username

Execute

Fig 8. Get Items

Add Item

This will require you to input a username, item id, item name, item price, item description and item stock as parameters. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function. The function will check to see if there is already an item. Use items.json file to test as it should have been populated with data by the onlineretailer.py script.


PUT /add-item Add Items

Adds items to the items json file as a supplier

Parameters Cancel

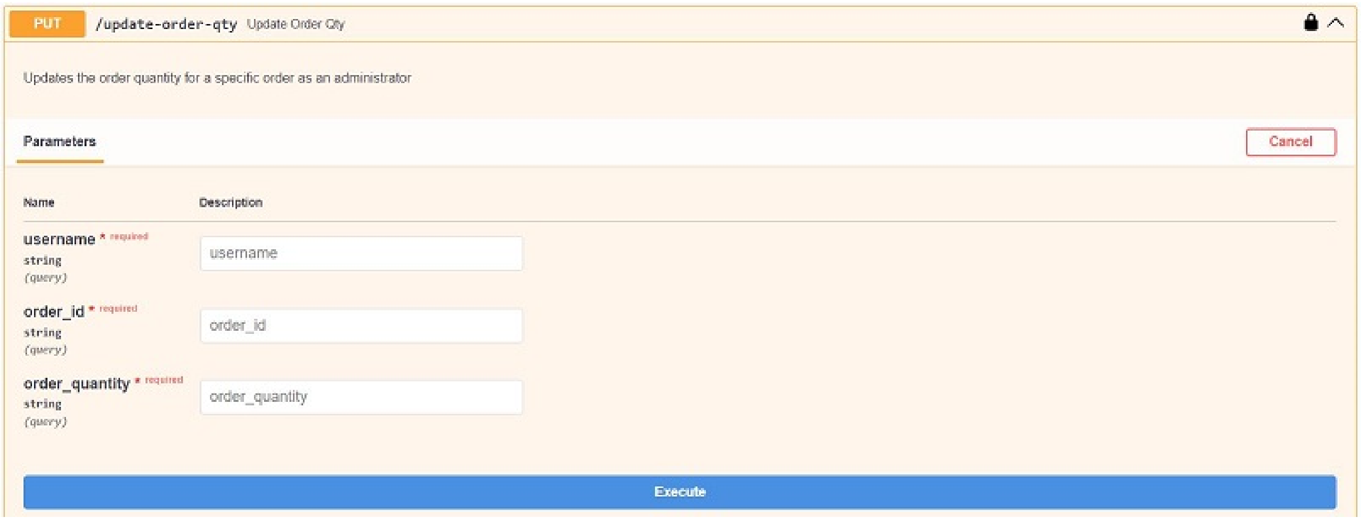
Name	Description
username * required string (query)	username
item_id * required string (query)	item_id
item_name * required string (query)	item_name
item_price * required string (query)	item_price
item_description * required string (query)	item_description
item_stock * required string (query)	item_stock

Execute

Fig 9. Add Items

Update Order Quantity

This will require you to input a username, order id and order quantity as parameters. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function. The function will check to see if there is already an order with that order id. Use orders.json file to test as it should have been populated with data by the onlineretailer.py script.


PUT /update-order-qty Update Order Qty

Updates the order quantity for a specific order as an administrator

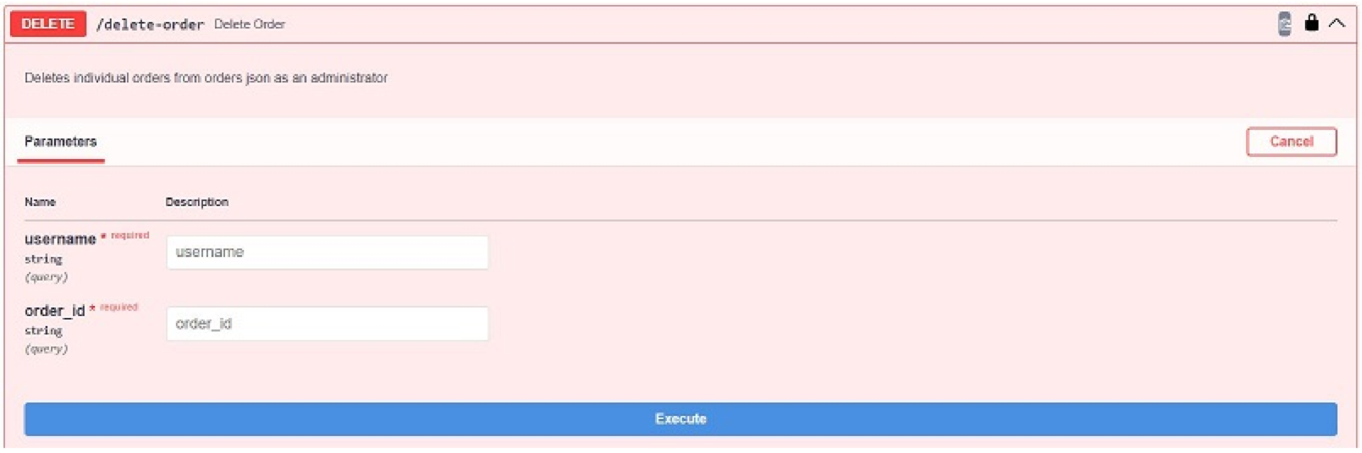
Parameters

Name	Description
username * required string (query)	username
order_id * required string (query)	order_id
order_quantity * required string (query)	order_quantity

Fig 10. Update Order Quantity

Delete Order

This will require you to input a username, order id as parameters. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function. The function will check to see if there is already an order with that order id. Use orders.json file to test as it should have been populated with data by the onlineretailer.py script.


DELETE /delete-order Delete Order

Deletes individual orders from orders json as an administrator

Parameters

Name	Description
username * required string (query)	username
order_id * required string (query)	order_id

Fig 11. Delete Order

Upload File

This will require you to input a username and a file selection (object) as parameters. It is the same username as authorisation. Based on the role or disabled state in the API_USERS_DB in main.py will determine if you can execute the API function. The function will check to see if there is already a file with that name in the uploads folder, check for size and file extension.

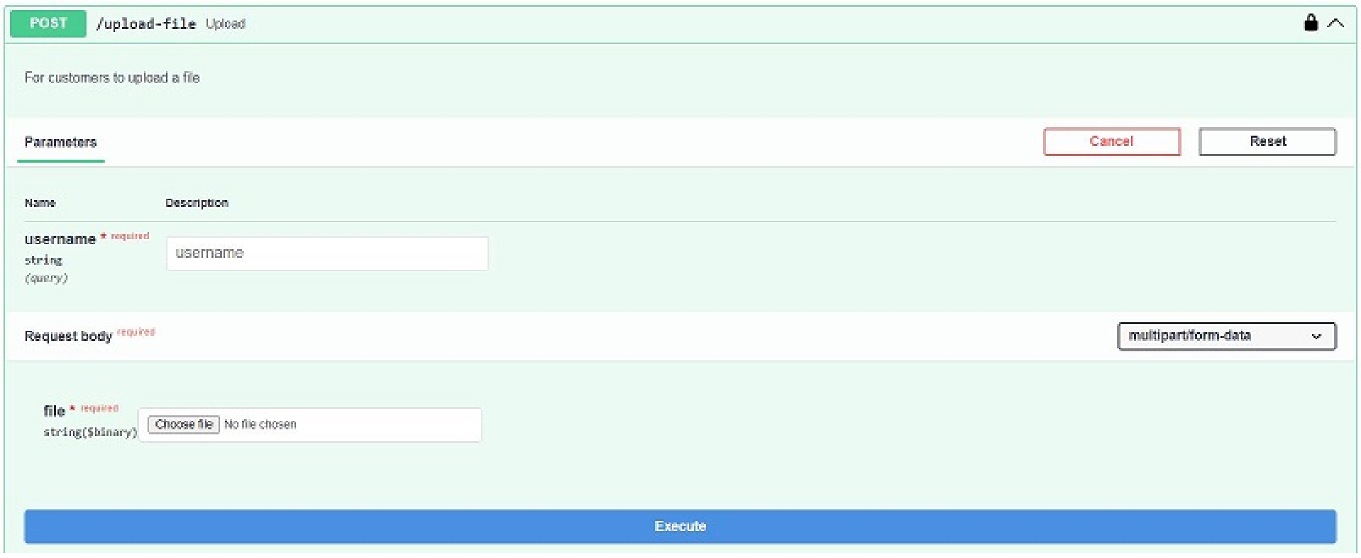


Fig 12. Upload File

Unsecure API

By setting the SECURE variable to FALSE in server.py this will run mainunsecure.py when server.py is run. This API has the same functions but all authorisation, security and control removed. This would be useful for testing vulnerabilities and is a good representation of exposing an API and backend to potential attackers.

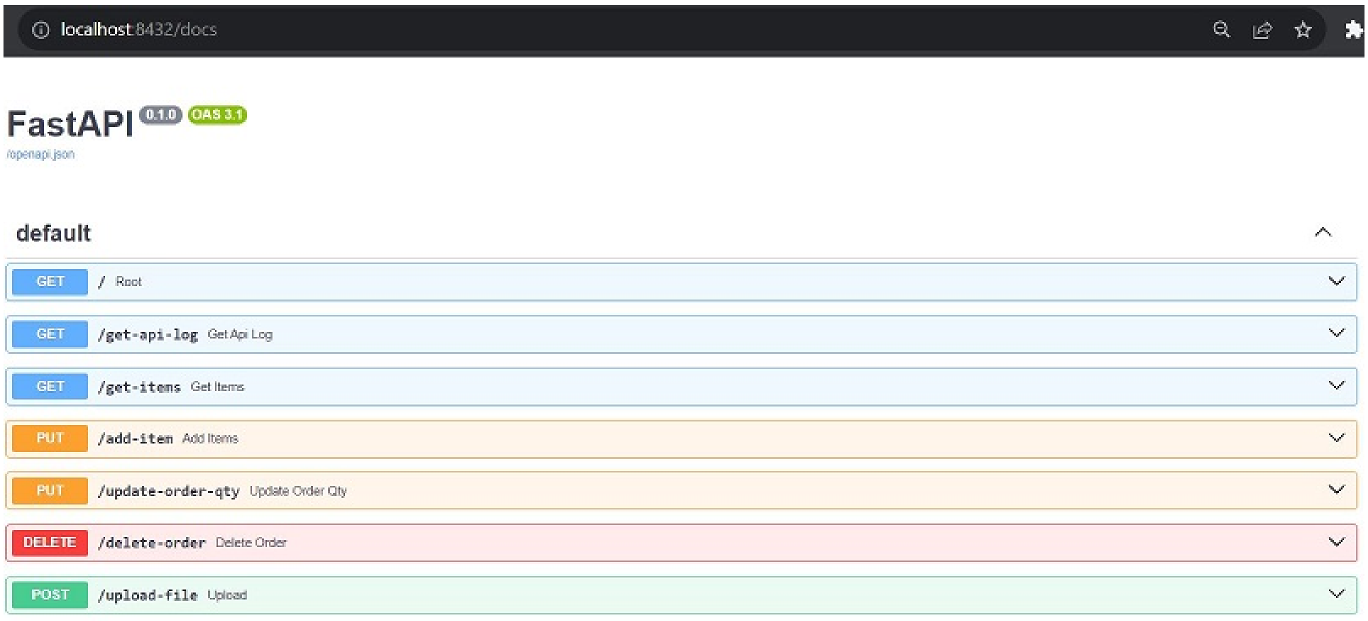


Fig 12. Unsecure API

Now, you can explore the online shop and it's functionality by following the prompts it gives...

Bibliography

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