# Ticket and Cafeteria Ordering System

## Table of Contents

# Group Composition

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The systems is comprised by 4 main components:

# Architecture of the system

| Component | Description |
|---|---|
| **TheaterLink** | Is the backend service. Interacts with the database and provides the API for the frontend. Written in Python using Flask. |
| **TheaterPal** | The main application. Allows users to consult shows, buy tickets, buy food from the cafeteria among other features. Developed with Kotlin |
| **TheaterValid8** | The validation app for the tickets. Reads tickets using NFC from the customers and validates them. Developed with Kotlin |
| **TheaterBite** | The cafeteria terminal app that receives orders from the customers also using NFC. Developed with Kotlin |

# TheaterLink

- To unclutter the main application, app.py, endpoints were separated into different files. Each file is responsible for a different set of endpoints.

All state changing requests are signed by the user's private key. The signature is then verified either by the server or by the other apps. This is done to ensure the integrity of the data and to prevent unauthorized access.

For example, the request `purchase_tickets` (POST), is signed by the user's private key. The server then verifies the signature using the user's public key. If the signature is valid, the request is processed. If not, the request is rejected, and an error is returned.

> This is the only POST request in which the main app directly interacts with the server and not with the other apps. All other POST requests have either the TheaterValid8 or TheaterBite apps as the intermediary.

The requests `submit_order` and `validate_tickets` are handled by the TheaterBite and TheaterValid8 apps, respectively. The signature is verified by these apps, after the user taps their phone on the terminal.

> The data sent over NFC is signed by the user's private key.

## User Endpoints

user.py contains the endpoints for user management. It allows the creation of new users, login, and user information retrieval.

- API endpoints:
  - `POST /register` - Register a new user
  - `GET /get_user` - Get user information given an ID
  - `GET /users` - Get all users (unused//debugging purposes)

## Show Endpoints

shows.py contains the endpoints for show management. It allows the retrieval of all shows that were previously added to the database (during creation).

## Ticket Endpoints

- API endpoints:
  - `GET /shows` - Get all shows

        - The argument `images` can be passed to the query string to include the base64 encoded image of the show in the response. This is useful for displaying the image in the frontend.
        - The frontend only asks for the shows once, and then caches them.

tickets.py contains the endpoints for ticket management. It allows the creation of new tickets, retrieval of all tickets, and ticket validation.

- API endpoints:
    - `POST /purchase_ticket` - Purchase a ticket
        - Request body:

```
{
  "data:" {
    "show_date_id": "int",
    "user_id": "string",
    "num_tickets": "int",
  },
  "signature": "string"
}
```

        - The response will contain the tickets in the following format:

```
{
  "tickets": [
    {
      "ticketid": "string",
      "userid": "string",
      "date": "string",
      "price": "int",
      "seat": "string",
      "showname": "string"
    }
  ]
}
```

        - On top of that, a vouchers array will be returned, as per each ticket that was purchased, a voucher will be generated. The vouchers are in the following format:

```
{
  "vouchers": [
    {
      "voucherid": "string",
      "vouchertype": "string",
      "userid": "string"
    }
  ]
}
```

    - Voucher type are either "free popcorn" or "free coffee", chosen randomly. A 5% voucher discount is also generated if the total price of the tickets is greater than 200.
  - `GET /tickets` - Get all tickets
  - `POST /validate_ticket` - Validate a ticket
    - This endpoint is called by the TheaterValid8 app to validate a ticket.
    - Request body:

```
{
  "ticketids": ["string"],
  "userid": "string"
}
```

    -
  - `POST /set_ticket_as_used` - Set a ticket as used
    - Receives a ticket ID and sets it as used. This is used when a ticket is validated by the TheaterValid8 app.

## Voucher Endpoints

vouchers.py contains the endpoints for voucher management.

- API endpoints:
  - `GET /vouchers` - Get all vouchers for a user

## Transaction Endpoints

transactions.py contains the endpoints for transaction management. It allows the retrieval of all transactions and other transaction-related operations.

As per the specifications, when the user consults all transctions, the server should also return the vouchers and tickets that are still not used by the user. This allows the customer to recover some

voucher transmitted by mistake in a previous order, or not yet transmitted, and get rid of used ones, if they are still there.

- API endpoints:
  - `GET /transactions` - Get all transactions for a given user
    - The response will contain the transactions in the following format:

```
{
  "transactions": [
    {
      "timestamp": "timestamp",
      "transaction_id": "string",
      "transaction_type": "string",
      "total": "double",
      "vouchers_used" : ["Voucher"],
      "vouchers_generated": ["Voucher"],
      "items" : [
          // IF TYPE IS TICKET PURCHASE
          {
              "date": "string",
              "num_tickets": "int",
              "price": "double",
              "shownname": "string",
          },
          // IF TYPE IS FOOD PURCHASE
          {
              "itemname": "string",
              "price": "double",
              "quantity": "int",
          }
      ]
    }
  ],
  "tickets": [
    {
      "ticketid": "string",
      "userid": "string",
      "date": "string",
      "price": "int",
      "seat": "string",
      "showname": "string"
    }
  ],
  "vouchers": [
    {
      "voucherid": "string",
      "vouchertype": "string",
      "userid": "string",
      "isUsed": "bool"
    }
```

```
    ]
}
```

## Cafeteria Endpoints

cafeteria.py contains the endpoints for cafeteria management. It allows the creation of new orders, retrieval of all orders, and other.

- API endpoints:
  - `POST submit_order`
    - Endpoint used by the TheaterBite app to submit an order when the user taps their phone on the terminal (NFC).
    - Request body:

```
{
  "vouchers_used": ["string"],
  "user_id": "string",
  "order": {
    "items": [
      {
        "itemname": "string",
        "price": "double",
        "quantity": "int"
      }
    ]
  }
  "total": "double",
}
```

  - `GET /orders` - Get all orders

## TheaterPal

## TheaterValid8

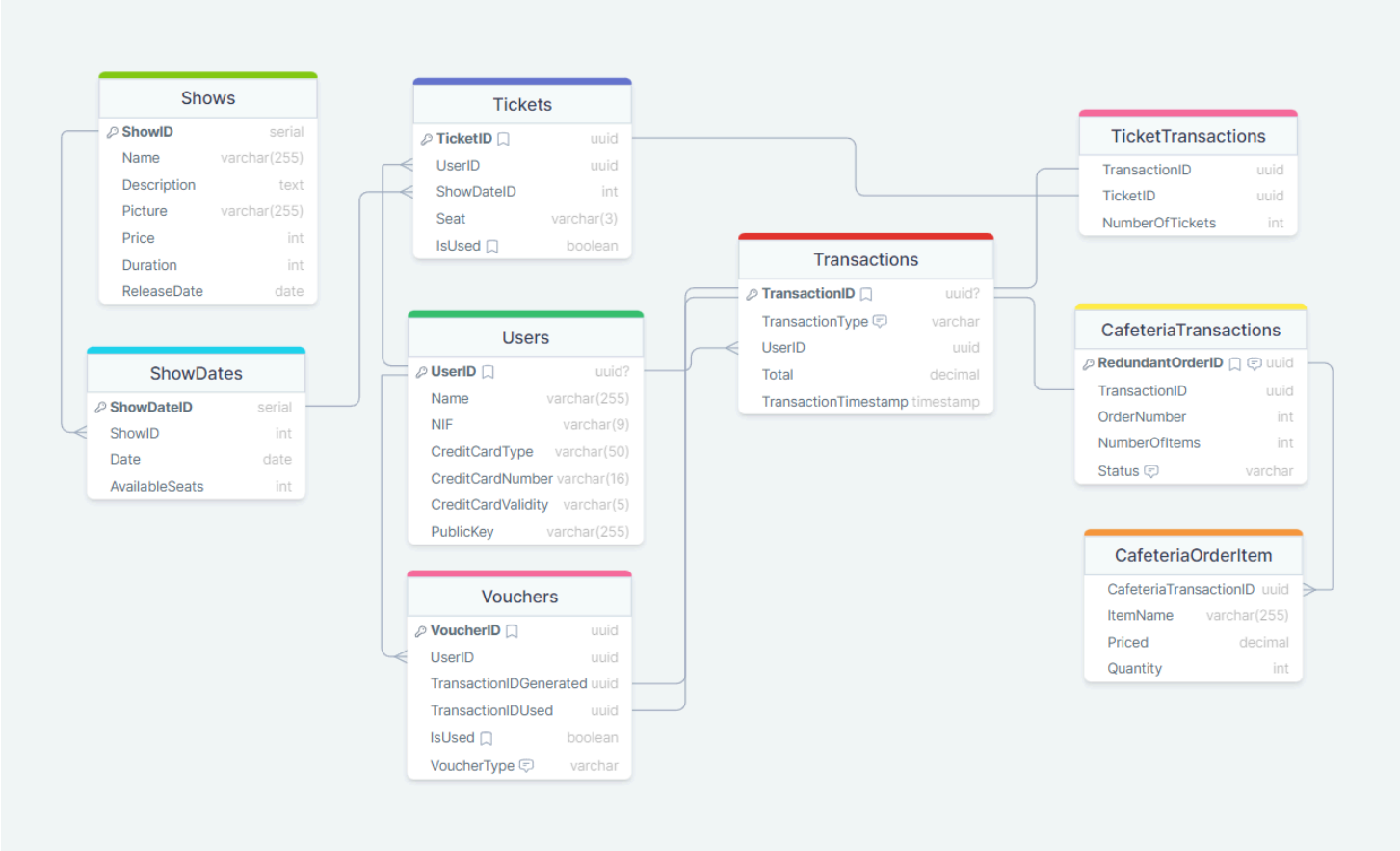
## TheaterBite

# Database and Data Schemes

The database used in this project is PostgreSQL and we used the `psycopg2` library to interact with it, in the backend service.

We used ElephantSQL to host the database.

The database diagram is as follows:




For a more in-depth view of the database schema, visit this link

It is composed by 9 tables:

# Users

Contains the information of the users that are registered in the system.

| Column | Type | Description | Notes |
|---|---|---|---|
| `UserID` | UUID | The user's ID, generated by the system | |
| `Name` | VARCHAR(255) | The user's name | |
| `NIF` | VARCHAR(9) | The user's NIF (Fiscal Identification Number) | |
| `CreditCardType` | VARCHAR(50) | The user's credit card type (VISA, MasterCard, etc.) | |
| `CreditCardNumber` | VARCHAR(16) | The user's credit card number | |
| `CreditCardValidity` | VARCHAR(5) | The user's credit card expiration date (MM/YY) | |
| `PublicKey` | VARCHAR(255) | The user's public key | This is transmitted from the client to the server and then used for verifying signatures |

# Shows

Contains the information of the shows that are available for purchase.

| Column | Type | Description | Notes |
|---|---|---|---|
| `Showid` | SERIAL | The show's ID, incremented by the system | |
| `Name` | VARCHAR(255) | The show's name | |
| `Description` | TEXT | The show's description | |
| `Picture` | VARCHAR(255) | The show's picture internal URL | |

| Column | Type | Description | Notes |
|---|---|---|---|
| `Price` | INT | The price of the tickets for the show | |
| `Duration` | INT | The duration of the show in minutes | |
| `ReleaseDate` | DATE | The date the show was released | |

## ShowDates

Contains the dates that a show is available.

| Column | Type | Description | Notes |
|---|---|---|---|
| `ShowDateID` | SERIAL | The show date's ID, incremented by the system | |
| `ShowID` | INT | The show's ID | Foreign key to the `Shows` table |
| `Date` | DATE | The date the show is available | |
| `AvailableSeats` | INT | The number of available seats for the show | Not used in the current implementation |

## Transactions

Contains the information of the transactions that were made.

The type of the transaction is an ENUM with the following values: `TICKET_PURCHASE`, `CAFETERIA_ORDER`.

| Column | Type | Description | Notes |
|---|---|---|---|
| `TransactionID` | UUID | The transaction's ID, generated by the system | |
| `UserID` | UUID | The user's ID | Foreign key to the `Users` table |
| `TransactionType` | transaction_type | The type of the transaction | |
| `Total` | DOUBLE | The total amount of the transaction | |

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `TransactionTimestamp` | TIMESTAMP | The timestamp of the transaction | |

# Tickets

Contains the information of the tickets that were purchased.

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `TicketID` | UUID | The ticket's ID, generated by the system | |
| `UserID` | UUID | The user's ID | Foreign key to the `Users` table |
| `ShowDateID` | INT | The show date's ID | Foreign key to the `ShowDates` table |
| `Seat` | VARCHAR(5) | The seat allocated to the ticket | |
| `isUsed` | BOOLEAN | Whether the ticket was used or not | Default is `FALSE` |

# Vouchers

Contains the information of the vouchers that were generated.

The type of the voucher is an ENUM with the following values: `FREE_POPCORN`, `FREE_COFFEE`, `FIVE_PERCENT`.

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `VoucherID` | UUID | The voucher's ID, generated by the system | |
| `UserID` | UUID | The user's ID | Foreign key to the `Users` table |
| `VoucherType` | voucher_type | The type of the voucher | |

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `isUsed` | BOOLEAN | Whether the voucher was used or not | Default is `FALSE` |
| `TransactionIDGenerated` | UUID | The transaction that generated the voucher | Foreign key to the `Transactions` table |
| `TransactionIDUsed` | UUID | The transaction in which the voucher was used | Foreign key to the `Transactions` table |

## TicketTransactions

Contains the information of the tickets that were purchased in a transaction.

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `TransactionID` | UUID | The transaction's ID | Foreign key to the `Transactions` table |
| `TicketID` | UUID | The ticket's ID | Foreign key to the `Tickets` table |
| `NumberOfTickets` | INT | The number of tickets purchased | |

Note: If more than one ticket was purchased in a transaction, the ticket ID will be set to the first ticket purchased and the number of tickets will be the total number of tickets purchased.

## CafeteriaTransactions

Contains the information of the order that was made in the cafeteria.

The status of an order is an ENUM with the following values: `COLLECTED`, `PREPARING`, `READY`, `DELIVERED`.

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `TransactionID` | UUID | The transaction's ID | Foreign key to the `Transactions` table |
| `RedundantOrderID` | UUID | A redundant order ID | |

| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `OrderNumber` | INT | The order number | Will be used to identify the order in the cafeteria |
| `NumberOfItems` | INT | The number of items in the order | |
| `Status` | order_status | The status of the order | |

> Note: The `RedundantOrderID` is needed because `CafeteriaOrderItem` needs to reference the `CafeteriaTransactions` table, and the `TransactionID` is not the primary key there.
> This could have been avoided by using the `TransactionID` as the foreign key in the `CafeteriaOrderItem` table, but we decided to keep the consistency of the database, even if it meant adding redundancy.

## CafeteriaOrderItem

Contains the information of the items that were purcased in an order.

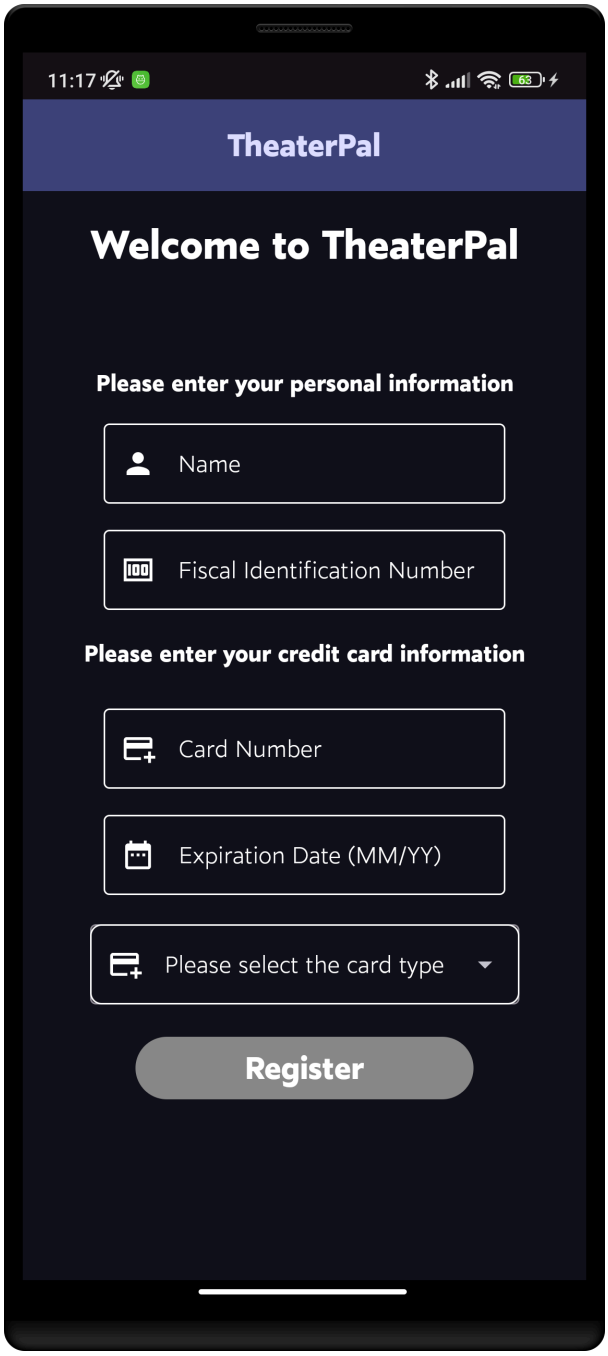
| Column | Type | Description | Notes |
| --- | --- | --- | --- |
| `CafeteriaTransactionID` | UUID | The cafeteria transaction's ID | Foreign key to the `CafeteriaTransactions` table |
| `ItemName` | VARCHAR(255) | The name of the item | |
| `Price` | DOUBLE | The price of the item | |
| `Quantity` | INT | The quantity of the item | |

# Features

## Register

The first time a customer uses the system, they must register. This is done by providing their name, NIF, and credit card information. The credit card information is used to make the payments for the tickets and cafeteria orders.

The image below shows the registration screen:



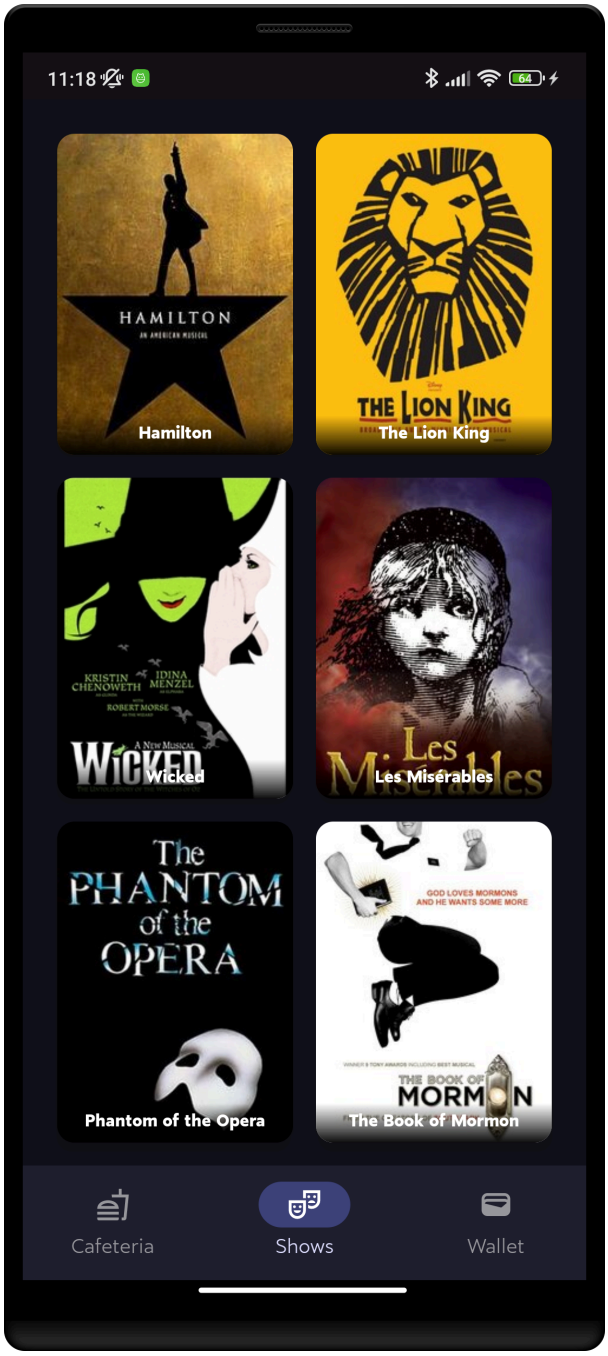

After the user registers, an RSA key pair is generated. The public key is sent to the server and stored in the database. The private key is stored in the user's device.

This step is only done once, and the user can then use the system without having to register again.

## Consult Shows

The customer, after registering, is presented with a list of shows that are available for purchase. The shows are retrieved from the server and displayed in the app.

The image below shows the list of shows:




## Purchase Tickets

By clicking on a show card, the user is presented with more information about the show, such as the description, price, and duration:

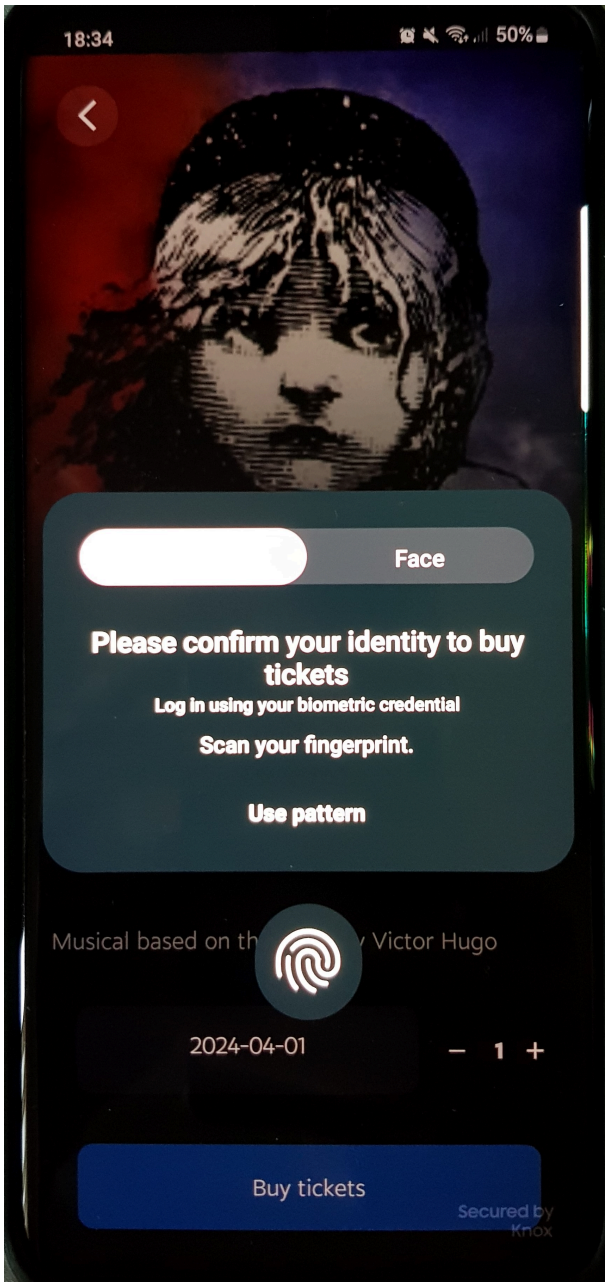

From here, the user can select from a list of available dates and purchase tickets for the show (maximum of 4 tickets per purchase).

## Biometric Authentication

Before submitting the order, the user must authenticate using biometrics. This is done to ensure that the user is the one making the purchase.

> Note: As some phones don't provide either a fingerprint sensor or facial recognition, we also provide the option to authenticate using a PIN or pattern.

The authentication screen is shown below:

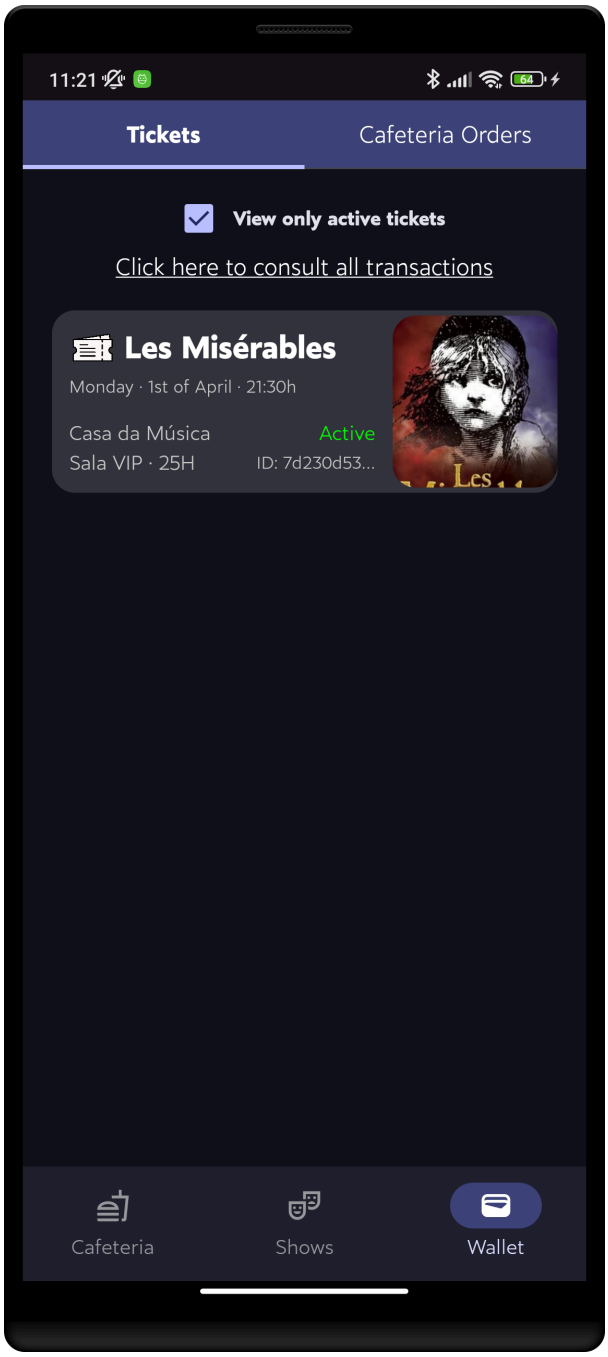



After the user authenticates, the order is submitted to the server, and the tickets are generated.

## Consult Tickets

The user can consult all the tickets they have purchased. This is done by clicking on the "Wallet" icon in the bottom navigation bar.

The image below shows the wallet screen:



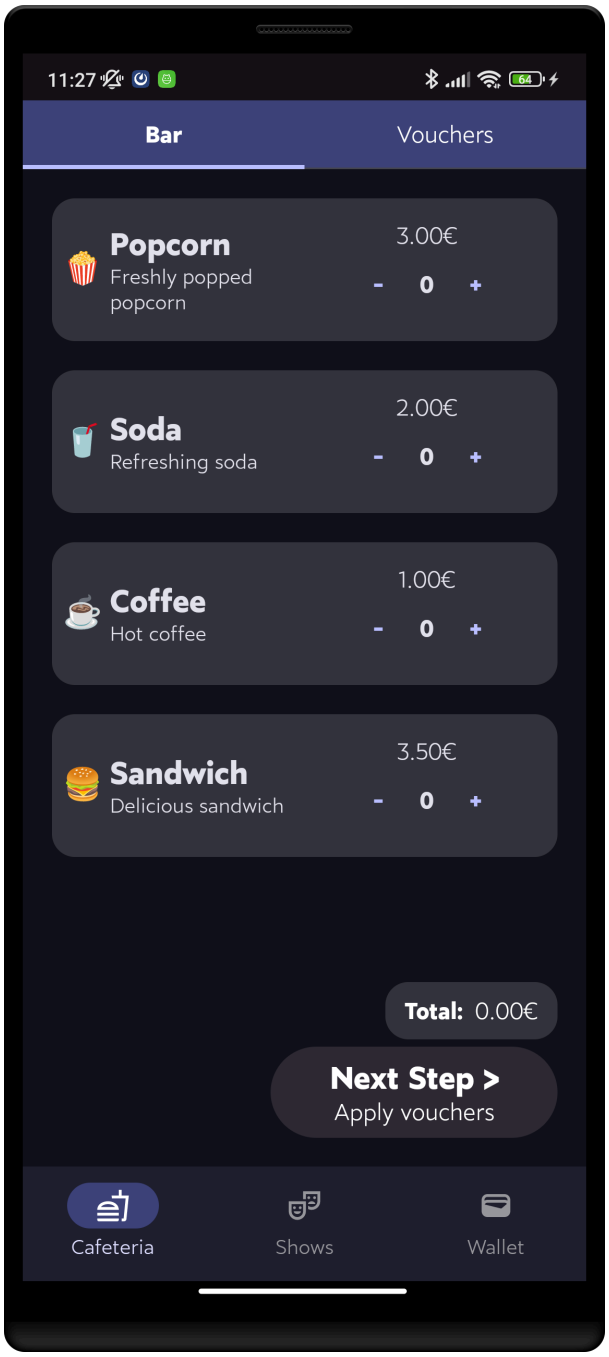

The user can also filter the tickets to show only the ones that are still valid.

The wallet screen has two tabs: one for the tickets and other for orders made in the cafeteria.

## Check items in the Cafeteria

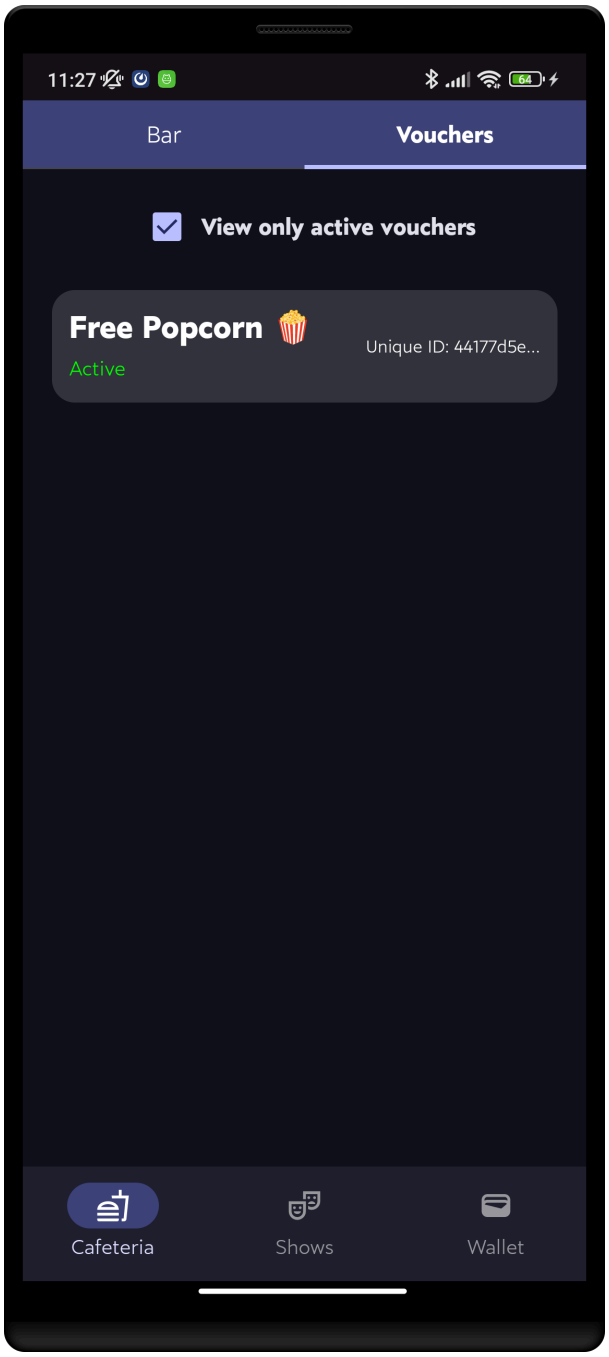
The user can also check the items available in the cafeteria. This is done by clicking on the "Cafeteria" icon in the bottom navigation bar.

The image below shows the cafeteria screen:




## Consult Available Vouchers

By swiping to the "Vouchers" tab in the cafeteria screen, the user can consult all the vouchers they have available:

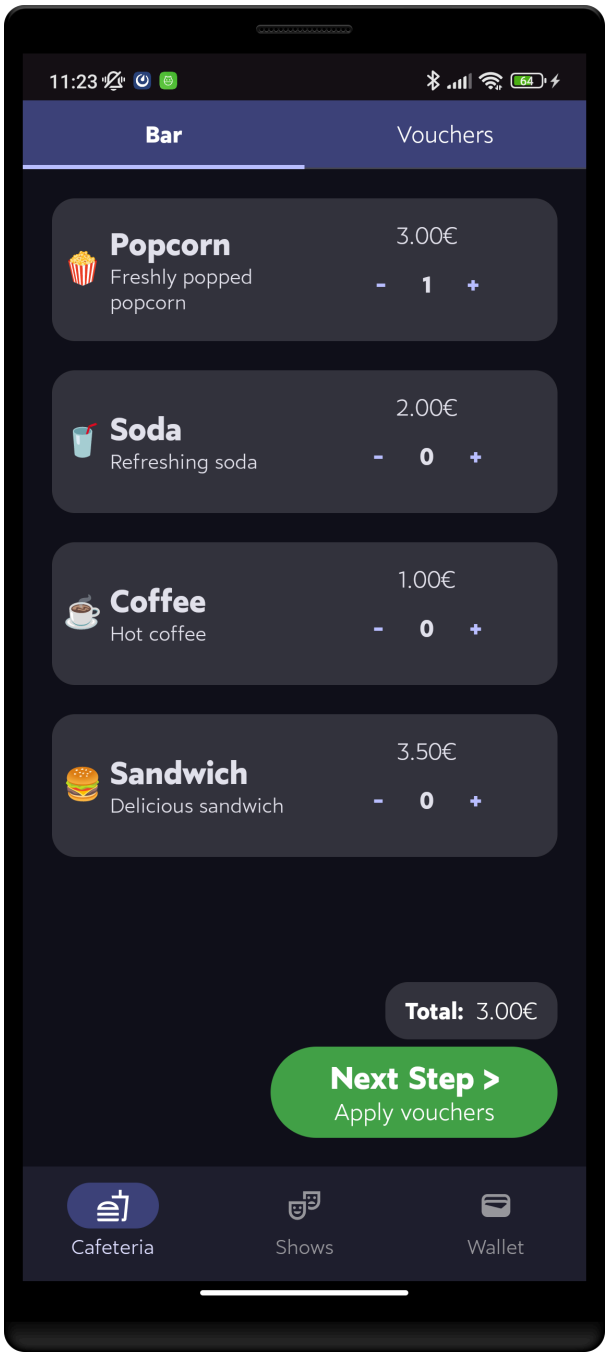



The user can also filter the vouchers to show only the ones that are still valid.

## Order Food

To make an order in the cafeteria, the user first selects from the list of products:

## Choosing Products




Note that the button to submit the order is disabled until the user selects at least one item.
At any moment, the user can see the total price of the order.

## Select Vouchers

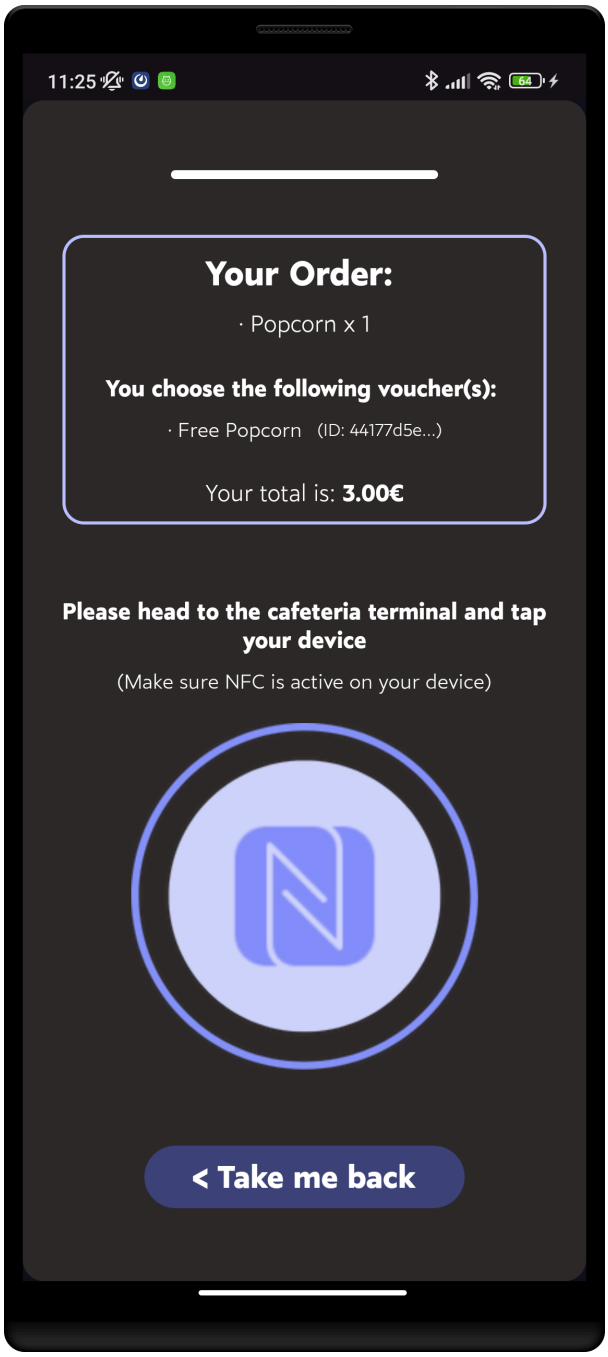
After clicking on the "Next Step" button, the user is presented with a screen to select the vouchers they want to use:


There are some restriction in place:

- The user can only select up to 2 vouchers.
- If available, the user can select only one 5% discount voucher.

## Validate Order

After selecting the vouchers, the user can click on the "Submit Order" button to generate the order and, go to the cafeteria validation screen.



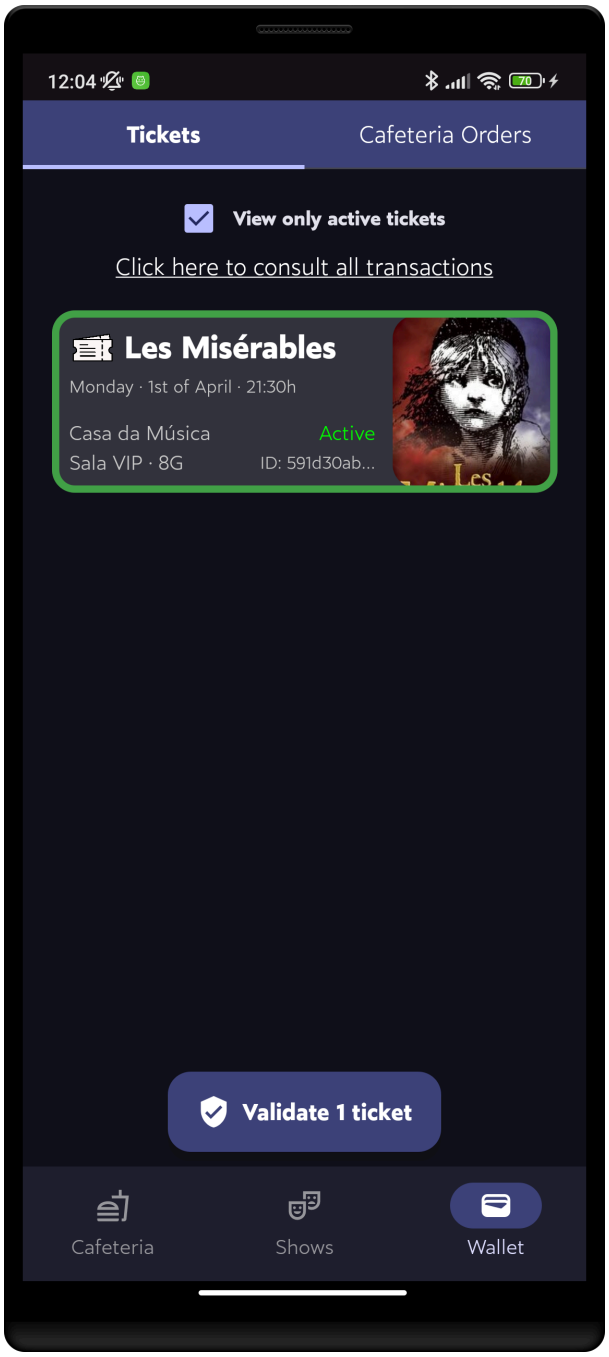

At this point, NFC should be enabled. If it isn't, the user is prompted to enable it before proceeding.

## Consult Orders

After the order is submitted, the user can consult all the orders they have made in the cafeteria. This is done by clicking on the "Wallet" icon in the bottom navigation bar and swiping to the "Orders" tab.

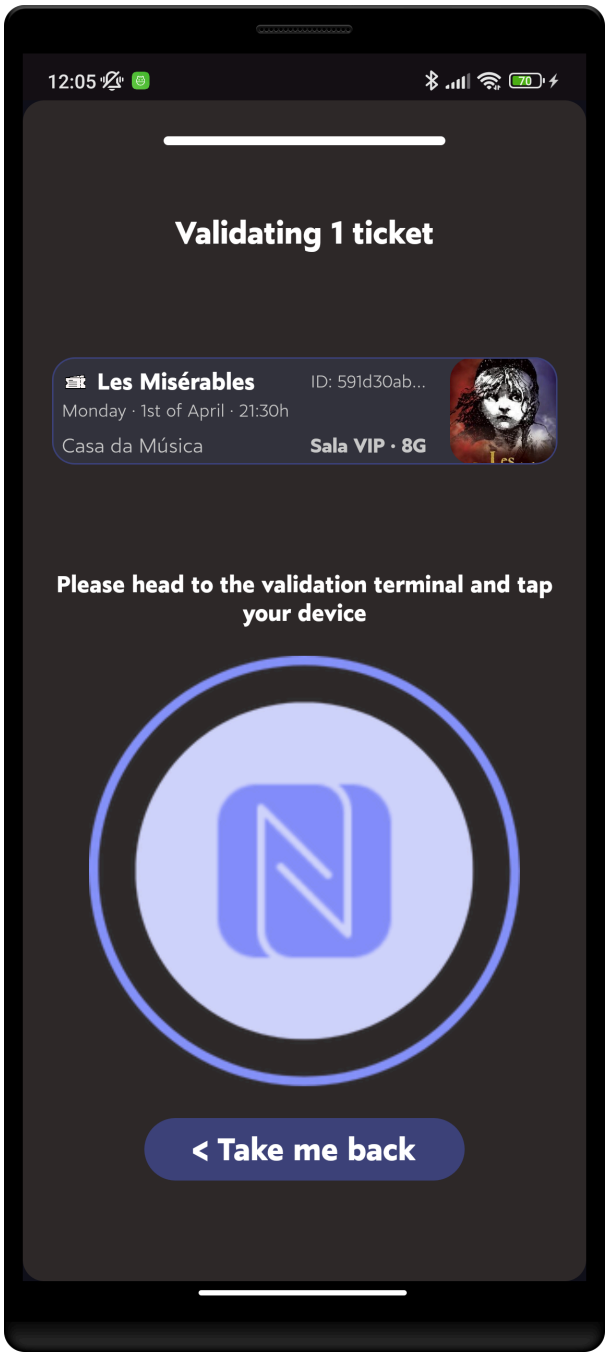
## Validate Tickets

The user can also validate the tickets they have purchased. In the "Wallet" screen, the user can swipe to the "Tickets" tab and, by selecting a ticket, they can validate it.



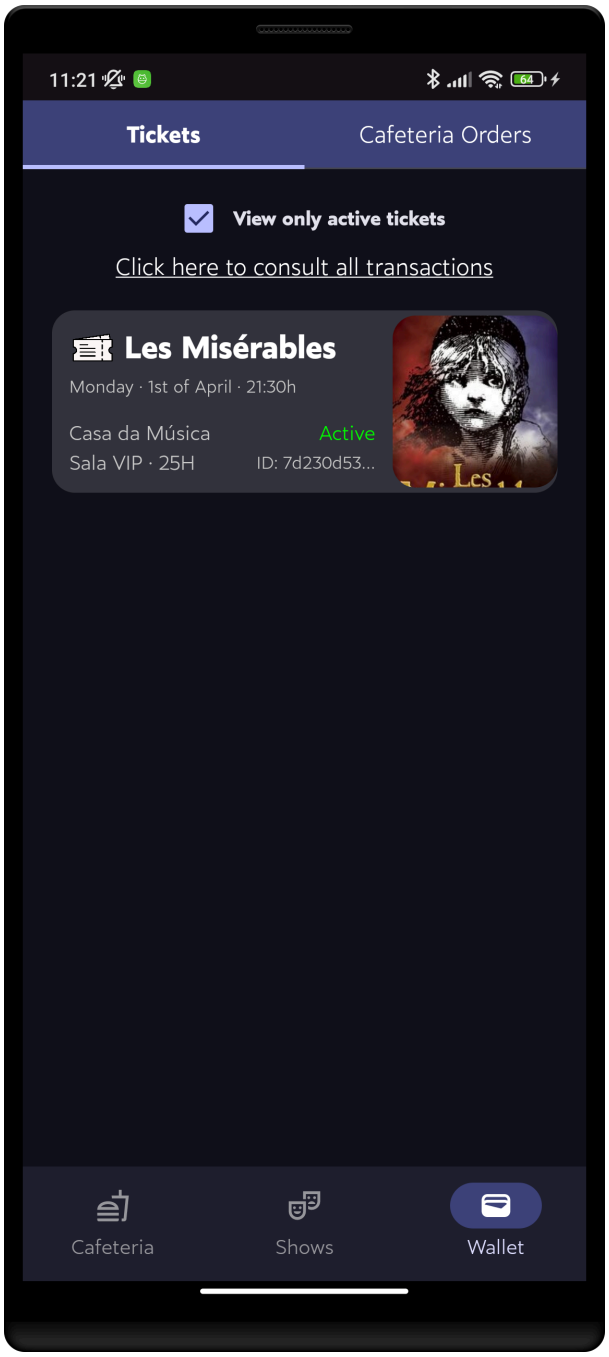

When the user selects a ticket, a button to validate it appears. At this stage, the user can chosoe up to 4 tickets to validate, at each time.

After clicking on the "Validate" button, the user is presented with a screen to tap their phone on the NFC terminal.



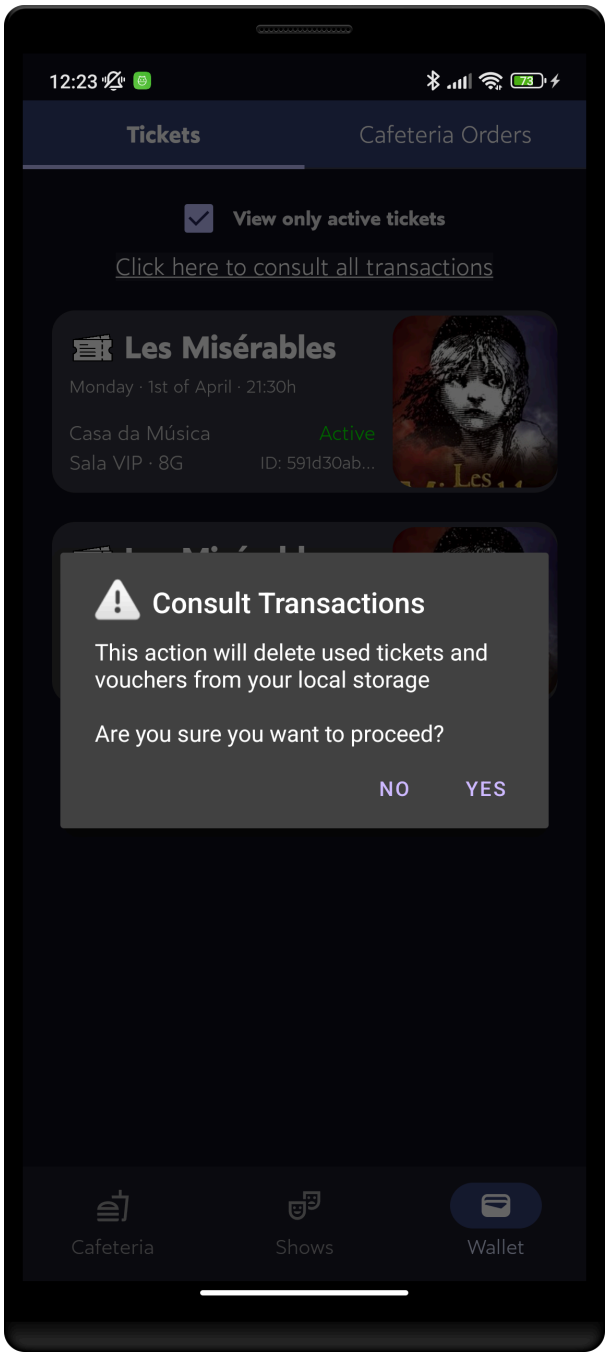

## Consult Transactions

At any given moment, the user can consult all the transactions they have made. To do this, go to the "Wallet" screen and click on the `Click here to see consult transactions` text.

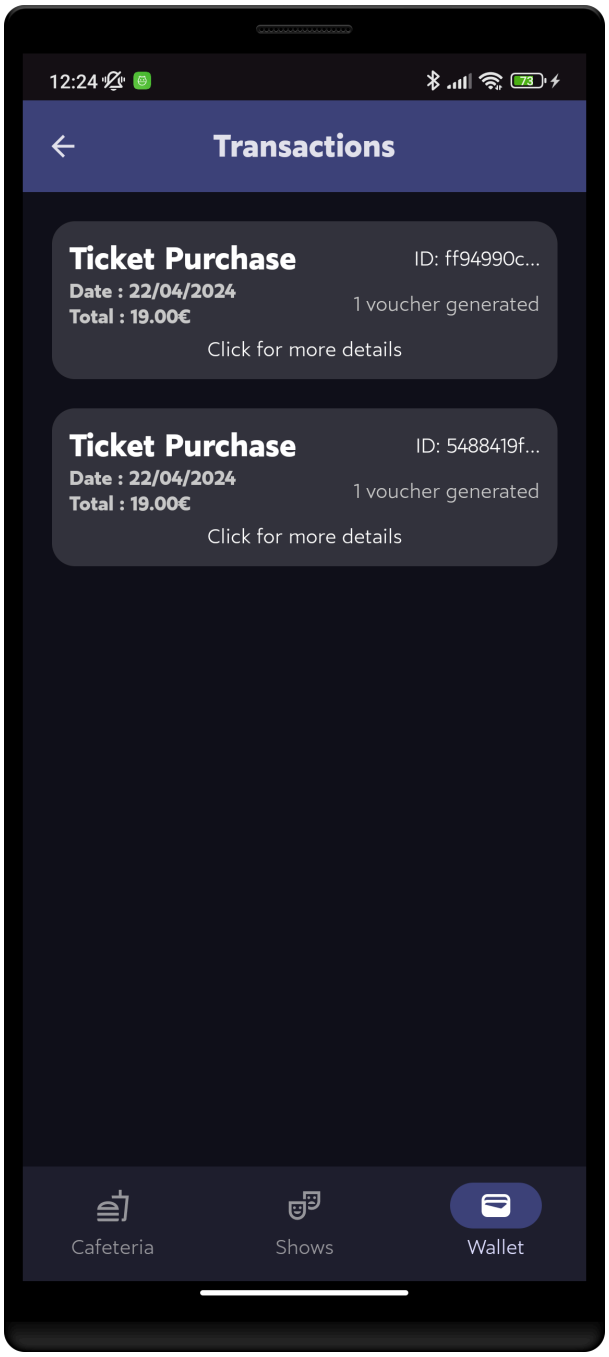



Per the specifications, consulting the transctions will fetch the vouchers and tickets that are still not used by the customer. In this way used tickets and vouchers are deleted from the customer app, allowing the customer to recover some voucher transmitted by mistake in a previous order, or not yet transmitted, and get rid of used ones, if they are still there.

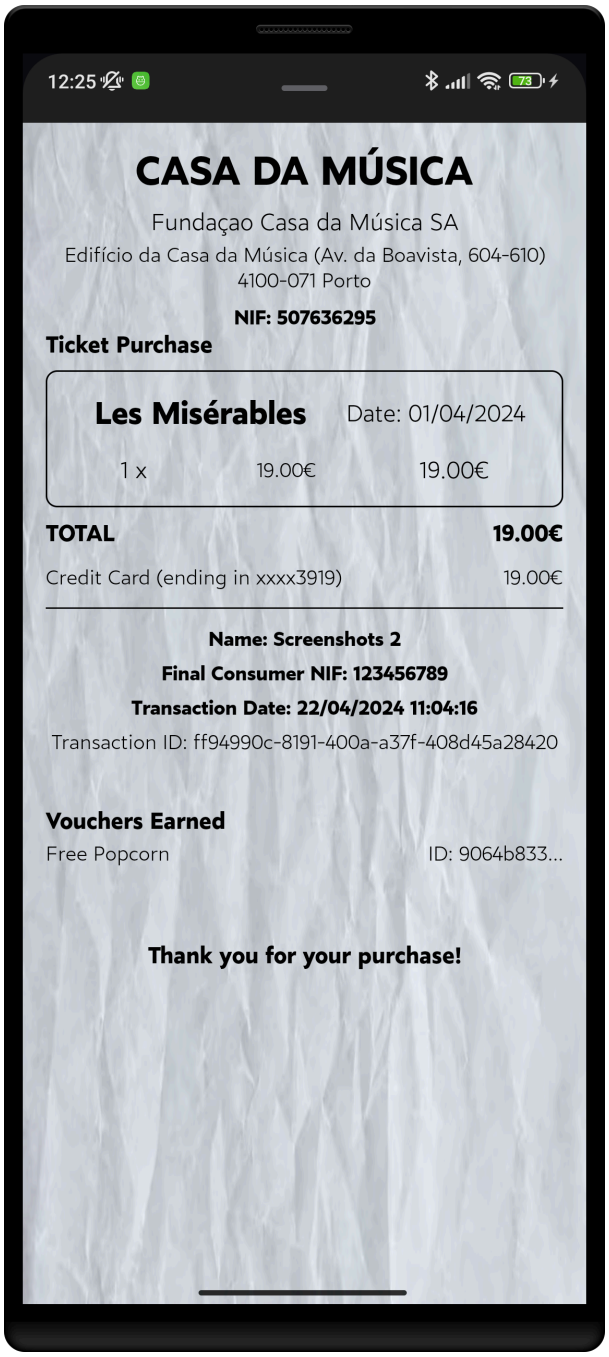
As this is a potentially heavy operation, the user is prompted to confirm if they want to fetch the transactions.




If the users chooses to proceed, the transactions are fetched and displayed in a list:




Clicking on a transaction will show a receipt-like screen with all the details of the transaction:


12:25
CASA DA MÚSICA
Fundaçao Casa da Música SA
Edifício da Casa da Música (Av. da Boavista, 604-610)
4100-071 Porto
NIF: 507636295
Ticket Purchase
Les Misérables
Date: 01/04/2024
1 x
19.00€
19.00€
TOTAL
19.00€
Credit Card (ending in xxxx3919)
19.00€
Name: Screenshots 2
Final Consumer NIF: 123456789
Transaction Date: 22/04/2024 11:04:16
Transaction ID: ff94990c-8191-400a-a37f-408d45a28420
Vouchers Earned
Free Popcorn
ID: 9064b833...
Thank you for your purchase!

# Navigation Map

# Scenario Tests

# How to Use

## TheaterLink

## TheaterPal

## TheaterValid8

## TheaterBite