**Introduction**

Many of our lives now revolve around travel. While some people travel for work, others travel simply to explore the world. Air travel has essentially taken over our life for a variety of reasons.

The flight management system is an application that assists passengers to easily book, modify, and cancel their flights. Travellers can complete mandatory web check-ins and obtain boarding passes from the comfort of their homes. The app sends notifications to passengers to remind them of their upcoming flights and the steps they need to finish before boarding. Along with all these features, this application has a feature called "Baggage Track" that aids traveller in tracking down their bags. With this tool, consumers may check real-time updates on their luggage and confirm that it is in fact traveling to its intended location. This delivery tracking app-like "baggage track" enables users to track their luggage with the help of a distinct bar code number that is assigned to each user's bag during airport check-in. This app primarily consists of data from one specific airline, for example emirates, and offers all the necessary flight information related to that particular airline. The application is free and designed to be mobile-friendly.

The main justification for choosing "Flight Management System" is that it is an essential application that is advantageous to every traveller. Everyone must have encountered a circumstance where they had to make travel arrangements and book flights. For those, this app is helpful because it serves as the platform for making flight reservations and planning a secure trip. I have a personal connection with this application because there was a situation where I lost my luggage during a trip, so through this app I would like to provide people with a convenient option where they can make sure their bags are not being lost.

**Business Analysis**

**#1 User persona: Peter, an entrepreneur**

Peter is a business owner who must travel regularly for work-related reasons. For every business travel, Peter is required to make flight arrangements. He lost his bag, which contained crucial papers connected to a business agreement, while on one of his visits. Since then, Peter began to pack all of his belongings into the cabin bags. Peter's difficulty was resolved when one of his co-workers advised him to sign up for the "Flight Management System" app to track his bags while flying.

**#2 User persona: Linda, a travel enthusiast**

Linda is the type of person that likes to explore and discover new places. She prefers to arrange flights provided by one certain airline for every trip she takes. She frequently uses Google to look for flights before being redirected to any website that Google suggests for booking flights, without knowing whether that website is secure. One of her friends advised her to search for flights offered by the airline using the "Flight Management System" and make reservations directly on the website. Since then, Linda has started utilizing this app, which has made traveling hassle-free.

There are two users for this application. One is the customer and the other is administrator.

**Customer**

* With the help of their name, email, phone number, password, and nationality, users sign up for the app. Once logged in, the user can begin looking for flights by entering the appropriate departure and arrival cities, the date of travel, how many people will be traveling, and whether the trip is one-way or round-trip.
* In accordance with the search parameters, the app redirects to a page with relevant flights.
* After the user chooses the flight, they can make the payment by selecting the appropriate payment option.
* Users can access their reserved bookings in their profile, manage or cancel the flights. They can web check in and obtain their boarding passes up to 48 hours before take-off.
* The user can enable the ‘baggage track’ feature after checking in at the airport by inputting the special bar code number.

**Administrator**

* Admin can access the system with their login credentials.
* Administrators have the ability to add, update, and delete data regarding available flights and individual passenger’s luggage.

**Business Rules**

The application primarily consists of two users: Customer/User and Administrator/Admin.

1. CUSTOMER registers on the application with name, email, mobile number, and nationality. CUSTOMER can login to the app using USERNAME and PASSWORD.
2. The CUSTOMER ACCOUNT will contain all the details regarding PROFILE, BOOKINGS, and PAYMENT METHODS.
3. CUSTOMER can search for flights by entering appropriate FLIGHT DETAILS.
4. The PAYMENT option is available for First class, Business class, and Economy ticket type.
5. The ADMIN will log in to the database system using the USERNAME and PASSWORD. ADMIN can add, update, and delete information regarding flight and customers.
6. ADMIN will have unrestricted access to the payment.
7. Only until the flight has taken off, both CUSTOMER and ADMIN will be able to access the BAGGAGE TRACK option. While the ADMIN can UPDATE the bag's location, the CUSTOMER can MONITOR the movement of their bag.

**Table Design and Analysis**

Graphical user interface, diagram

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I:ER Diagram

There are six entities total in the flight management system, each with its own primary and secondary keys.

1. **User:** This entity consists of one primary key – User\_ID int(50). Other attributes are User\_Name varchar(20), User\_Email varchar(20), First\_Name varchar(20), Last\_Name varchar(20), User\_Mobile varchar(20), User\_Country varchar(20), Username varchar(20), Password varchar(20).
2. **Flight\_Details:** This entity consists of one primary key – Flight\_ID int(50). Other attributes are Departure\_City varchar(30), Arrival\_City varchar(30), Date int(50), Trip\_Type varchar(20), Passengers\_Count int(50).
3. **Ticket\_Type:** This consists of one primary key which is also a foreign key – Flight\_ID int(50). Other attributes are Ticket\_Class varchar(20), Ticket\_Price int(50).
4. **Payment:** This consists of one primary key – Transaction\_ID int(50) and two foreign keys – Flight\_ID int(50), Booking\_ID int(50). Other attributes are Trasaction\_Date int(50), Trasaction\_Time int(50).
5. **Bookings:** This entity consists of one primary key – Booking\_ID int(50) and two foreign keys – Flight\_ID int(50), User\_ID int(50). Other attributes are Booking\_Date int(50), Booking\_Time int(50).
6. **Baggage\_Track:** This entity consists of one primary key – Baggage\_ID int(50). Three foreign keys – Flight\_ID int(50), User\_ID int(50), and Booking\_ID int(50). And one other attribute Baggage\_location varchar(20).

**Database Implementation**

1. The admin wants to retrieve data about the passengers travelling to New York in Business Class.

SELECT User\_Name, Departure\_City, Arrival\_City, Date, Ticket\_Class, Ticket\_Price, Booking\_Date, Booking\_Time FROM Flight\_Details f

JOIN Bookings b ON f.Flight\_ID = b.FK\_Flight\_ID

JOIN User u ON u.User\_ID = b.FK\_User\_ID

JOIN Ticket\_Type t ON t.FK\_Flight\_ID = f.Flight\_ID

WHERE Arrival\_City = "New York" AND Ticket\_Class = "Business-Class";

Graphical user interface, text, application

Description automatically generated

1. The admin wants to extract data of all the passengers travelling in Economy class.

SELECT User\_Name, Ticket\_Class, Ticket\_Price, Passengers\_Count, Booking\_Date

FROM Flight\_Details f

JOIN Bookings b ON f.Flight\_ID = b.FK\_Flight\_ID

JOIN User u ON u.User\_ID = b.FK\_User\_ID

JOIN Ticket\_Type t ON t.FK\_Flight\_ID = f.Flight\_ID

WHERE Ticket\_Class = "Economy";

Table

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1. A person named "Cece" wants to check the live location of her baggage.

SELECT User\_Name, Departure\_City, Arrival\_City, Trip\_Type, Baggage\_location

FROM Baggage\_Track bt

JOIN User u ON bt.FK\_User\_ID = u.User\_ID

JOIN Flight\_Details f ON f.Flight\_ID = bt.FK\_Flight\_ID

WHERE Departure\_City = "Hyderabad" AND User\_Name = "Cece";

Text

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1. A person named "Chandler" wants to retrieve his upcoming trip booking details.

SELECT User\_Name, Departure\_City, Arrival\_City, Transaction\_ID, Transaction\_Date, Transaction\_Time, Ticket\_Price

FROM User u

JOIN Bookings b ON b.FK\_User\_ID = u.User\_ID

JOIN Flight\_Details f ON f.Flight\_ID = b.FK\_Flight\_ID

JOIN Payment p ON p.FK\_Flight\_ID = f.Flight\_ID

JOIN Ticket\_Type t ON t.FK\_Flight\_ID = p.FK\_Flight\_ID

WHERE User\_Name = "Chandler";

Text

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1. The admin wants information of passengers travelling to Delhi on April 30th, 2022.

SELECT User\_Name, Departure\_City, Arrival\_City, Trip\_Type, Ticket\_Class

FROM User u

JOIN Bookings b ON b.FK\_User\_ID = u.User\_ID

JOIN Flight\_Details f ON f.Flight\_ID = b.FK\_Flight\_ID

JOIN Ticket\_Type t ON t.FK\_Flight\_ID = f.Flight\_ID

WHERE Arrival\_City = "Delhi" AND Date = "30/07/2022";

Text

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**User story**

A person named “Jess” is searching for flights from ‘Goa’ to ‘Delhi’ on 30th July 2022.

Graphical user interface, text, application

Description automatically generated

Generally, when anyone is trying to book a flight, the app will ask general details of the passengers like name, email, phone number to print them on the boarding pass.

Graphical user interface, text, application, email

Description automatically generated

After giving these details, the user will proceed to payment.

A picture containing graphical user interface

Description automatically generated

After completion of payment, the booking details are visible.

Graphical user interface, text, application

Description automatically generated

Now, the user can track their baggage.

Text

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**Analytics, Reports and Metrics**

* **Number of flights** available for this airline.

Graphical user interface, text, application

Description automatically generated

* **Number of users** registered on the application.

Graphical user interface, text

Description automatically generated

* **Number of bookings**

Graphical user interface, text, application

Description automatically generated

**Security Concerns**

**Data Encryption:** Data encryption services have adapted to use an asymmetric algorithm to exchange the secret key after using a symmetric algorithm to encrypt data. This data encryption is crucial for any website to function properly.

**Implement internal security measures:** If a threat attacker can escape with devices containing critical resources, outer-level security defences are ineffective. Make sure to lock up all this tangible inventory as well.

**Authorised personnel access:** Every quarter, the employees' access needs to be checked and confirmed. Any employee's access must be terminated if he departs the company. To access the database, 2FA authentication also needs to be activated.

**Architecture**

Diagram

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II: Database Architecture

The client/server architecture allows multiple clients to connect to a single server which manages and stores data in a database. This server accepts the requests made by the users and returns the required data from the database. For example, let us consider a customer wants to book a flight. Customer enters the required data on the website, the server takes the requests and retrieves flight information from the database and provides to the customer.

The flight management system requires a cloud-based hosting platform due to the huge size of data and the potential need to upgrade the storage in future.

The storage requirements for the flight management system highly depends on the volume of data generated and the difficulty to manage the data. For the initial stage of the application, 100GB storage will be sufficient and this can be later upgraded as per the requirements.

**Project wrap-up considerations**

* Acquired knowledge of database architecture, business analysis, ER diagram, and how to implement and retrieve data from a database.
* Acquired knowledge of how to use SQLite to create tables and generate connections between each table in order to access necessary data in accordance with the application's use-cases.
* In order to establish a fully functioning database, the relationships between primary and foreign keys are crucial. These relationships were introduced to me during this course.

**Future considerations**

* The database is now ready for usage; thus, the project's next stage is to develop the application's user interface (UI).
* To operate correctly and error-free, the baggage track table's data implementation must be substantially enhanced.
* As the number of users increase, more data will be produced, and this data needs to be stored securely. Therefore, it is necessary to re-evaluate the amount of storage needed for future needs.

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