COMP3278 Individual Project – Airline Reservation System

Introduction

It is a system for an airline company to store customers' basic personal information and details of reservations made, as well as flight schedules.

Business Rules

- Both members and non-members can make a reservation. Each customer is identified by a unique customer id and has a prefix (e.g. Mr./Ms.), name and email address. Each customer can have one or more phone number.

- Registered member is identified by the customer id (which is renamed as member id), membership level and miles earned currently.

- All non-registered customers are non-members. They will be also identified by the customer id. Customer id of non-members will be different whenever a same person make a new reservation.

- Each reservation made by customer is identified by unique reservation number, specifying the fare class and booking time of that reservation.

- Each reservation may have one or more passengers which the customer making that reservation need not to be one of them. Passengers are identified by unique passenger number, nationality, passport number, date of birth, prefix, name and one single contact number.

- Passenger information of the same person will be stored only once when he/she takes multiple flights (i.e. included in different reservations).

- Each reservation may include more than one passenger, they share the same reservation number. So, each passenger will be issued a distinct ticket with unique ticket number, with row and seat number and boarding time. Boarding time is derived by 30 minutes before the actual departing time at that instance. Number of baggage is also derived and will not be shown on the ticket.

- Each luggage the passenger post will be identified by its unique baggage number and flight ticket number. Each passenger will send his/her own luggage.

- The flight schedule has a list of flights identified by unique flight number. The list also consists of origin and destination, expected departure and arrival time.

- Each flight identified by flight number have a list of dates having that flight on that day, with actual departure and arrival time, status (e.g. boarded), check in counter, boarding gate and luggage belt.

- Expected departure and arrival time means the schedules time (fixed) while actual departure and arrival time refers to the expected/estimated time (before departing/landing) that will keep on changing until it is finalized as the actual departed/landed time.

Assumptions

- All passengers having a transfer will have separate bookings (different reservation no).

- Round-trip and multi-stops travel are treated as separate bookings (different reservation no).

- Luggage may not follow the same flight (separate aircraft for passengers and luggage) but will still be identified by the flight number of the corresponding passenger.

- Flights will not be delayed for more than 12 hours.

System functionalities/user activities

- Find the customer id and name of all non-member customers order by customer id.
- List the membership id, name, email and contact numbers of members who have at least 20000 miles or is a platinum member.
- List all the reservations made by customer ME0001, including the reservation no, booking time, number of passengers, flight no, flight date, order by booking time.
- List all the reservations with not less than 10 passengers, including the reservation no, customer name and email.
- List the passenger name with prefix, flight number, date of flight, origin, destination, row number, seat number, boarding gate and boarding time as 30 minutes before the actual departure time at that instance, which can be used for printing the flight ticket with ticket number MC7548332.
- List the prefix, name, nationality and passport no of all passengers taking CX410 on 2020-11-25. Order the results by last name, then first name.
- Find the name and contact no of all passengers seating in row 2 to 4 in CX410 on 2020-11-25, order by row number and seat number.
- List the flight no, origin and actual (or expected) arrival time of all flights using luggage belt 11 in Hong Kong Airport on 2020-11-25. Order the results by Actual arrival time. (We can assume actual_arr_time will not be NULL as the flight should be landing soon if a luggage belt is assigned)
- List the flight no and flight date of all the cancelled flights in November, order by date then flight number
- List the flight no, flight date, origin, destination and time of delay of all flights that departed late for at least 1 hour, order by delay in descending order. (Here, since we only recorded the time for departure and arrival time, we assume the delay won't exceed 12 hours for simplicity)
- List no of baggage and total weight of flight CX410 on 2020-11-25

Data requirement analysis

Customer data

Attribute Name	Description		
cust_id	Unique customer id	Mandatory/Optional	Mandatory
		Type	Char
		Length	7
		Format	
		Validation	
		Default	
		Example	ME0001
email	email of a customer	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	50
		Format	
		Validation	
		Default	
		Example	abc@gmail.com
prefix	title of a customer before name (i.e. Mr/Ms/Miss/Mrs)	Mandatory/Optional	Optional
		Type	Enum
		Length	
		Format	
		Validation	Fixed value
		Default	
		Example	Mr
first_name	First name of customer	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	50
		Format	
		Validation	
		Default	
		Example	Tai Man
last_name	Last name of customer	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	Chan

Customer_contact data

Attribute Name	Description		
contact_no	Contact number of customers	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	20
		Format	
		Validation	
		Default	

		Example	91239123

Member-Customer data

Attribute Name	Description		
mem_level	Membership level of members	Mandatory/Optional	Mandatory
		Type	varchar
		Length	10
		Format	
		Validation	
		Default	Bronze
		Example	Gold
miles	Number of miles a member currently has	Mandatory/Optional	Mandatory
		Type	int
		Length	
		Format	
		Validation	>=0
		Default	0
		Example	1234

Passenger data

Attribute Name	Description		
passenger_no	Unique passenger number	Mandatory/Optional	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	P42335
prefix	title of a passenger before name (i.e. Mr/Ms/Miss/Mrs)	Mandatory/Optional	Mandatory
		Type	Enum
		Length	
		Format	
		Validation	Fixed value
		Default	
		Example	Mr
First_name	First name of passenger	Mandatory/Optional	Mandatory
		Type	varchar
		Length	50
		Format	
		Validation	
		Default	
		Example	Tai Man
Last_name	Last name of passenger	Mandatory/Optional	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	

		Default	
		Example	Chan
nationality	Nationality of passenger	Mandatory/Optional	Mandatory
		Type	varchar
		Length	30
		Format	
		Validation	
		Default	
		Example	Hong Kong
passport_no	Valid passport number of passengers	Mandatory/Optional	Mandatory
		Type	varchar
		Length	15
		Format	
		Validation	
		Default	
		Example	K01230123
date_of_birth	Date of birth of passenger	Mandatory/Optional	Mandatory
		Type	Date
		Length	10
		Format	yyyy-mm-dd
		Validation	
		Default	
		Example	2000-10-17
contact_no	Contact number of passenger	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	91234567

Reservation data

Attribute Name	Description		
reserve_no	Unique reservation number	Mandatory/Optional	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	HJ3897535
booking_time	Time when customer make the reservation	Mandatory/Optional	Mandatory
		Type	Date and time
		Length	
		Format	yyyy-mm-dd hh:mm
		Validation	
		Default	
		Example	2020-10-17 22:00
fare_class	The fare class customer	Mandatory/Optional	Mandatory

	booked	Type	char
		Length	2
		Format	
		Validation	
		Default	
		Example	Z

Include data

(no extra data)

Ticket data

Attribute Name	Description		
ticket_no	Unique flight ticket number	Mandatory/Optional	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	MC7548332
row_no	Row number of the reserved seat	Mandatory/Optional	Optional
		Type	Int
		Length	
		Format	
		Validation	>0
		Default	
		Example	22
seat_no	Seat number of the reserved seat	Mandatory/Optional	Optional
		Type	char
		Length	2
		Format	
		Validation	
		Default	
		Example	A

Baggage data

Attribute Name	Description		
baggage_no	Unique number of baggage sent by passenger	Mandatory/Optional	Mandatory
		Type	Varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	AZ75839674
size	Approximate size of luggage (usually won't measure exact volume)	Mandatory/Optional	Optional
		Type	Varchar
		Length	20

			Format	
			Validation	
			Default	Standard
			Example	Oversize
weight	Weight of luggage in kg		Mandatory/Optional	Optional
			Type	Decimal
			Length	(3,1)
			Format	
			Validation	>0
			Default	
			Example	23.1

Flight data

Attribute Name	Description			
flight_no	Flight number of the flight		Mandatory/Optional	Mandatory
			Type	char
			Length	8
			Format	
			Validation	
			Default	
			Example	CX322
origin	Origin of the flight in terms of the airport's short form		Mandatory/Optional	Mandatory
			Type	Varchar
			Length	10
			Format	
			Validation	
			Default	
			Example	HKG
destination	Destination of the flight in terms of the airport's short form		Mandatory/Optional	Mandatory
			Type	varchar
			Length	10
			Format	
			Validation	
			Default	
			Example	ICN
expect_dep_time	Scheduled departure time of the flight		Mandatory/Optional	Optional
			Type	Time
			Length	
			Format	24-hour
			Validation	
			Default	
			Example	22:00
expect_arr_time	Scheduled arrival time of the flight		Mandatory/Optional	Optional
			Type	time
			Length	
			Format	24-hour
			Validation	
			Default	

		Example	23:00

Flight_wif_date data

Attribute name	Description		
flight_date	Unique date of a particular flight	Mandatory/Optional	Mandatory
		Type	Date
		Length	
		Format	yyyy-mm-dd
		Validation	
		Default	
		Example	2020-10-17
actual_dep_time	Estimated departure time (keeps changing) until departed	Mandatory/Optional	Optional
		Type	time
		Length	
		Format	24-hour
		Validation	
		Default	
		Example	22:00
actual_arr_time	Estimated arrival time (keep changing) until landed	Mandatory/Optional	Optional
		Type	time
		Length	
		Format	24-hour
		Validation	
		Default	
		Example	23:00
status	status of the flight	Mandatory/Optional	Optional
		Type	varchar
		Length	30
		Format	
		Validation	
		Default	
		Example	boarding
check-in_counter	Check in counter of the flight	Mandatory/Optional	Optional
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	A10-A20
boarding_gate	Boarding gate of the flight	Mandatory/Optional	Optional
		Type	Int
		Length	
		Format	
		Validation	>0
		Default	
		Example	240
luggage_belt	Luggage belt of the flight	Mandatory/Optional	Optional
		Type	int

		Length	
		Format	
		Validation	>0
		Default	
		Example	15

ER model diagram
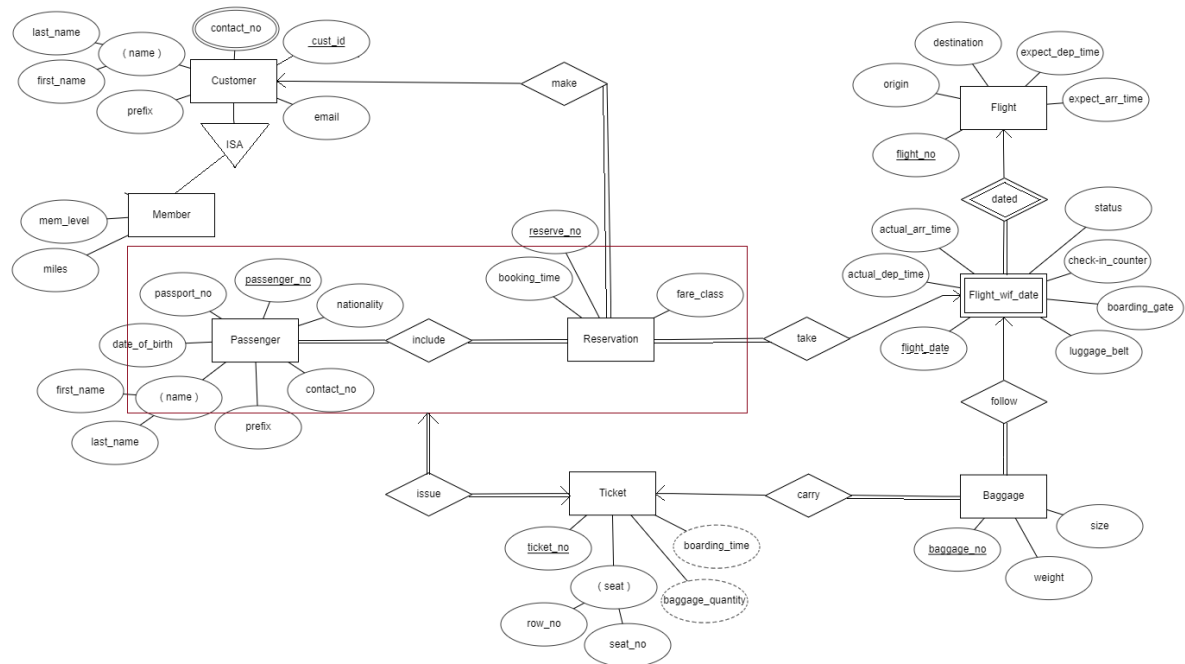
ER diagram description:

- Each customer makes zero (partial participation) to many reservations.
- Each customer can be a member (partial specialization), all other customers are non-members.
- Each reservation is made by only one (total participation) customer.
- Each reservation includes at least one (total participation) passenger.
- Each passenger is included in at least one (total participation) reservation. Passenger information is saved when he/she is included in a reservation for the first time.
- One ticket is issued to one (total participation) passenger included in a reservation.
- A passenger included in a reservation will be issued (total participation) with one ticket.
- Each ticket can post zero to several luggage (partial participation) depending on the fare class.
- Each luggage should be posted by one (total participation) passenger that means one flight ticket only.
- Each reservation refers to one (total participation) flight with specific date.
- Each flight with specific date may have zero to many (partial participation) reservations.
- Each flight with specific date must refer to one and only one (total participation) flight number.
- Each flight number may refer to zero (partial participation, if no schedule of that flight) to many flights with specific date.

Relational Database Schema:

Customer_contact
- **cust_id** (FK)
- **contact_no**

Member_Customer
- **mem_id** (FK)
- mem_level
- miles

Customer
- **cust_id**
- email
- prefix
- first_name
- last_name

Reservation
- **reserve_no**
- booking_time
- fare_class
- cust_id (FK)
- flight_no
- flight_date] (FK)

Passenger
- **passenger_no**
- prefix
- first_name
- last_name
- nationality
- passport_no
- date_of_birth
- contact_no

Include
- **reserve_no** (FK)
- **passenger_no** (FK)

Ticket
- **ticket_no**
- row_no
- seat_no
- reserve_no
- passenger_no] (FK)

Flight
- **flight_no**
- origin
- destination
- expect_dep_time
- expect_arr_time

Flight_wif_date
- **flight_no** (FK)
- **flight_date**
- actual_dep_time
- actual_arr_time
- status
- check-in_counter
- boarding_gate
- luggage_belt

Baggage
- **baggage_no**
- flight_no
- flight_date] (FK)
- size
- weight
- ticket_no (FK)