Assignment 1: ERD Design & DDL Conversion
University of Toronto Mississauga
Due: Friday, February 17th, 2023 at 5:00PM ET

Released: Febraury 5th, 2023 || Version: 1.1

ER Diagram Requirements

Since COVID-19, air travel has gone awry and you have been commissioned to develop a new airline booking system for UTM Travel. As the database architect, you are required to follow the design notation provided by your CSC343 Course Instructor, and must ensure to follow the design without any adaptations (i.e., you must develop the ERD using the requirements herein, even if you believe there are alternative ways to build such a system). In the event there is uncertainty, you may provide written notes to clarify your ERD and show your work.

Details

An airline management system must have both customers and airlines. Every airline has a unique airline code, a name, and at least one airport that they belong to. Every airport has an unique airport code (i.e., an IATA code), some number of runways, and a description describing that airport. Every airport has many airlines that belong to them, but cannot be an airport without any airlines. For airlines to operate their business, they must own airplanes otherwise they cannot be an airline. Airplanes have a unique airplane identifier, an airplane registration number, an airplane type, the number of passengers, the cargo capacity, and the number of years this aircraft has been in service. Airplanes have exactly one owner. Since the types of airplanes keep changing, `UTM Travel` has decided to not restrict this data type. Additionally, to compute the cargo capacity, the airplane must check all tickets issued for that airplane on that specific flight, so `UTM Travel` would like a separate table to easily compute this.

More on tickets in a bit, but first, flights. Flights are a bit of a tricky process to keep a record of, as every flight has a numeric flight number which is not unique. However, when a flight is scheduled, the flight number in combination with an airline's code and the airplane's identifier will uniquely identify that flight. Flights also keep record of the airport the flight is departing from and the airport that the flight is arriving at, these are their respective IATA codes. Flights cannot exist if they are not scheduled, but there could be many flights with the same flight number (e.g., flight number 001 may be re-used to identify the flight from YYZ to HND on different days). *More on scheduling later.*

For airlines to make money, they sell tickets. Tickets have their own unique ticket identifier, as well as the base price of the fare, the flight number, an assigned seat, a customer identifier indicating who the ticket belongs to, and if baggage is included (or not) for that ticket. Tickets are purchased by a customer, who is identified by their customer identifier. Additionally, each customer is assigned a status. Customers have exactly one status assigned to them (of the four statuses which exist; Non-Member, Bronze, Silver, or Gold). Receipts are only issued when a ticket is purchased by a customer. Receipts have a unique receipt number, amount paid, date and time stamp of the transaction, a method of payment (cash, debit, credit, gift card), and an airline code. Both tickets and receipts cannot be produced without being purchased, and no two tickets or receipts are the same. However, a receipt can be issued identifying the purchase of more than one ticket (E.g., if a customer has a layover then they would have two tickets but only one receipt, or if a customer purchases multiple tickets in the same transaction then they would have several tickets but only one receipt).

In addition to customers, airlines have staff. Both share a variety of properties: a unique person identifier, first name, last name, and a text field that stores contact/personal information. All staff have exactly one role (Pilot, Flight Attendant, Baggage Handler, Kiosk Staff, Manager), and either have airport security clearance or do not. Pilots and Managers hold at least one license. Licenses are uniquely identifiable by their license identifier, but also store information such: the staff member's name, the type of license they have (let this be a variable character), the issue date of the license, and the expiry date. Licenses are issued to an individual directly. Note that staff members cannot share licenses.

Back to scheduling... additionally, airlines need a way to schedule flights as well as allocate airplanes appropriately to the schedule. Note that not all airplanes are assigned or operating all the time (e.g., those that are being repaired). The schedule contains the airport's and airplane's unique identifiers, the scheduled departure and arrival datetime of that flight, and a list of all staff working the flight (we call them the "crew"). All airlines must have a schedule to stay in business.

Tasks

1. Construct the Entity-Relationship Diagram (ERD)

Draw an Entity-Relationship Diagram (ERD) to capture the described requirements. The ERD must be electronically drawn (using Draw.io). You cannot add additional attributes, relationships, or entity-sets not defined in the specification above. You cannot assume anything as the set of requirements are very particular. If you wish to justify a choice made due to ambiguity, you may do so in text format in the submission PDF (on a different page from the ERD). You must use Chen's Notation, as per the notational reference sheet provided in lecture/quercus. Do not make up your own notation, do not use the textbook notation, do not google notation. Please ensure that your ERD is clearly readable and that line crossing is kept to a minimal (or does not happen at all). Neither handwritten submission nor hand-drawn illustrations will be accepted for credit.

2. Create the Data Definition Language (DDL)

Provide the corresponding PostgreSQL CREATE TABLE statements describing the relational schema. You must enforce both inter- and intra-relational constraints (<u>note</u>: you **cannot disable** foreign key checks!), all relevant CHECK constraints, and custom data types must be included as well. Please include all your statements in an executable script (a1.ddl) that can be run on the MCS PostgreSQL server (i.e., we will invoke the \i command). Scripts that do not execute on the server, when the file is run, will not be marked and a grade of 0 assigned.

3. A Few Extra Things...

Provide a written response (or SQL statement) answering the following questions:

1. Provide the INSERT statement(s) needed to schedule an Air Canada flight leaving from YYZ to FCO on April 1st, 2023 at 11:00AM ET.

2. If you were given a receipt number, explain how would you retrieve what the departure and arrival airports are? How would you identify where that customer is sitting?

3. Provide the appropriate DELETE statement(s) needed to fire a staff member with the identifier '007'.

Requirements and Submission

This assignment is to be completed individually. You may not communicate with anyone about your assignment, except with the CSC343H5S, 202301 teaching staff. You must understand all parts of your submission and are strictly prohibited from using any artificial intelligence to assist with your assignment. Please refer to the syllabus for additional details on assessments and the "Minimum Standards for Submitted Work".

All submission are required to be written in LaTeX. I would strongly suggest using Overleaf as a means of editing LaTeX documents. You are not permitted to use another word processor.

All files are to be submitted using the MarkUs platform (https://markus108.utm.utoronto.ca/markus23s/). You may submit as many times as you like, in fact you are encouraged to submit many times! Please ensure your <u>answers are typed</u> and submissions is clearly legible/understandable.

Entity-Relationship Diagrams (ERDs) must be completed on Draw.io allowing you to extract the raw XML file (which is to be submitted too). The XML file should be "compressed" and include "all pages".

You must include your full name, student number, and utorid in <u>all files</u>; the LaTeX file, DDL file, and in the PDF. Submit your answers to the ERD (Task 1) and all extra things (Task 3) in one file called **a1.pdf**, as well as your answers to your DDL file called **a1.ddl**. Additionally, you must submit the source LaTeX file (**a1.tex**) and XML file (**a1.xml**).