Assignment on CSE411

Summer 2019

Airline Reservation System

**Overview**

Airline reservation systems incorporate airline schedules (Attachment 1), passenger reservations (Attachment 2) and ticket records (Attachment 3). An airline's direct distribution works within their own reservation system, as well as pushing out information to the Global Distribution System (GDS). The second type of direct distribution channel are consumers who use the internet or mobile applications to make their own reservations. Prior to deregulation, airlines owned their own reservation systems with travel agents subscribing to them. Today, the GDS are run by independent companies with airlines and travel agencies being major subscribers.

Reservation systems may host "ticket-less" airlines and "hybrid" airlines that use [e-ticketing](https://en.wikipedia.org/wiki/E-ticket) in addition to ticket-less to accommodate code-shares and [interlines](https://en.wikipedia.org/wiki/Interline_travel).

**Inventory management**

In the airline industry, available seats are commonly referred to as inventory. The inventory of an airline is generally classified into service classes (e.g. first, business or economy class) and up to 26, for which different prices and booking conditions apply.

There are many air lines and each airline has many aeroplanes. An airline has an id, name, type. A country has many airlines. A country has id, name and population. An airline has many flights and each flight has one source (airport) and one or more destinations (airports). For each source destination pairs, you have to record the distance. A source has airport id, name, type and number of runways. A country has many airports and an airport belongs to only one country.

Passengers buys tickets from agents or directly online. A passenger has passport number, country, date of expiry. A passenger can buy many tickets and a ticket must be bought by only one passenger. A ticket has id, price and type. A ticket can have many sources and many destinations. For each source, there are departure time and date. For each destination, there are arrival time and date. An agent has license number, membership number. A country has many agents but an agent must be registered in only one country.

All passengers are issued boarding pass for each source. A boarding pass is identified by ticket number and attributes are flight number, date, time, seat no, gate number. Boarding pass is issued to passenger based on the type (class) of the ticket.

Each flight Inventory data is imported and maintained through a schedule distribution system over standardized interfaces. One of the core functions of inventory management is inventory control. Inventory control steers how many seats are available in the different booking classes, by opening and closing individual booking classes for sale. In combination with the fares and booking conditions stored in the Fare Quote System, the price for each sold seat is determined. In most cases, inventory control has a real time interface to an airline’s [Yield management](https://en.wikipedia.org/wiki/Yield_management) system to support a permanent optimization of the offered booking classes in response to changes in demand or pricing strategies of a competitor.

**Availability display and reservation (PNR)**

Users access an airline’s inventory through an availability display. It contains all offered flights for a particular city-pair with their available seats in the different booking classes. This display contains flights which are operated by the airline itself as well as code share flights which are operated in co-operation with another airline. If the city pair is not one on which the airline offers service, it may display a connection using its own flights or display the flights of other airlines. The availability of seats of other airlines is updated through standard industry interfaces. Depending on the type of co-operation, it supports access to the last seat (last seat availability) in real-time.

Reservations for individual passengers or groups are stored in a so-called [passenger name record](https://en.wikipedia.org/wiki/Passenger_name_record) (PNR). Among other data, the PNR contains personal information such as name, contact information or special services requests (SSRs) e.g. for a vegetarian meal, as well as the flights (segments) and issued tickets. Some reservation systems also allow to store customer data in profiles to avoid data re-entry each time a new reservation is made for a known passenger. In addition, most systems have interfaces to CRM systems or customer loyalty applications (aka frequent traveler systems). Before a flight departs, the so-called passenger name list (PNL) is handed over to the departure control system that is used to check-in passengers and baggage. Reservation data such as the number of booked passengers and special service requests is also transferred to flight operations systems, crew management and catering systems. Once a flight has departed, the reservation system is updated with a list of the checked-in passengers (e.g. passengers who had a reservation but did not check in (no shows) and passengers who checked in, but did not have a reservation (go shows)). Finally, data needed for revenue accounting and reporting is handed over to administrative systems.

**Task 1 Implement the following using relational DBMS**

Assignments:

Design ERD for the above system.

Create DDL to transform the ERD into database with all primary key, foreign key and other constraints.

1. Buying ticket online
2. Selling ticket by agents
3. Issue boarding pass to passengers
4. Showing the available seats of a flight
5. Display the flight list and departure time
6. Display the flight list and arrival time
7. List of on-board passengers of a flight of an airline in a date

**Task 2 Implement the above requirements using object- relational DBMS**

**Task 3 Implement the above requirements using NOSQL DBMS**

**Task 4 Analyze the effort requirement for relational, object-relational and NOSQL model.**

1. **Use any software engineering cost estimation model for effort estimation for the implimentation of a – g of task 1.**
2. **Database size estimation by inserting sample data (e.g., 10 sample, 20 sample, 30 sample …)**

**Task 5. Include new applications (3..5) such that it will be exponentially complex by using relational model and implementable without complexity in NOSQL model.**

**About the new applications:**

**The following figure shows the performance of relation model with data complexity. New applications must have data complexity such that it goes beyond the green line of relational database. The linear increase of number of attributes does not increase the data complexity. The schema-less design requirement, the exponential increase of normalized relations, unstructured data etc. can increase the data complexity.**

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**Research questions to answer:**

1. **The impact of relational or object relational schema on system development using relational or object relational databases. (Can be explained with examples) Problem of scalability.**
2. **The impact of data redundancy (unnormalized data) of NOSQL model in maintaining the consistency in database applications.**
3. **Transactional ACID property support in NOSQL database: problems and existing solutions**
4. **Any other research question from the project**

**Project submissions:**

1. **Database implementations of the tasks 1-3 have to be shown in own laptop after presentation on 23rd September 2019.**
2. **Power point presentation for each group as follows:**

**Duration of presentation = 6 minutes**

**Q/A = 2 minutes**

**Total = 8 minutes**

**Presentation shall include task I (ERD, screenshots of DDL), Task 2 & 3 screenshots, task 4 graphs, data etc., task 5 findings and answer to research questions.**

1. **Report (submission into moodle): Report and presentation must be consistent and presentation shall be as per report order. (submission before 11pm on 25 september 2019)**