SQL – Case Study Solutions

Instructions:

This case study is designed with a set of use case scenarios extracted from real life business needs. There has been some simplifications done to enable all learners to learn different SQL concepts while diluting very deep business rules. The names of any company/application or person are indicative and do not relate to any real brands or people.

You are required to

1. Read the case study requirements carefully and raise your queries to the facilitator/Mentor

Background:

JagChalo runs public transport buses across the city of Mumbai. They are now keen to develop an app to display all their bus schedules, bus routes, current status of bus with respect to each stop, bus fares for routes based on different bus types. Currently they run AC, Luxury as well as Economic buses. AC have AC facility with TV as well as only sitting. Luxury is only sitting without AC. Economic buses allow standing as well and run without AC.

They have around 10000 buses plying across the city to around 300 routes. Around 100 routes are round-robin covering main market places to residences or train suburban stations to people residences. 3000000 (30 lakhs) commuters leverage their services through out the city.

JagChalo has christened their app as "KabChalo". You are required to design the database for "KabChalo".

Solutions:

This document provides solution hints to the case study. We are required to apply our learning from our exercises and try to arrive at solutions for all the case study requirement.

Activity:

Episode 1:

In this episode, you are required to understand the KabChalo app broad objectives and accordingly arrive at the database design. You are required to

1. Design the Entity-Relation Model for KabChalo app.
2. Let's normalize the database to
    a. 1 NF
    b. 2 NF
    c. 3 NF
3. Create the database.

Solutions:

1. Based on the background given,

Bus: This is the description of the Bus with its unique number. It contains Bus-number, bus-regn-number, bus-brand, bus-capacity, bus-type, bus-purchase-date, bus-status

Bus-Maintenace-Details : This contains details of the bus maintenance
Bus-number, maintenance-date, repair-date, repair-description, Maintenance-total-cost

Route: This entity will contain the definition of route i.e. route-number, route-zone, source-stop, destination-stop, total_number of stops in between

Route-Stops: This is the route stops with route-number, from-stop-name, Next-stop-name

Route-Ticket-Cost: This is the ticket costs in the route as defined in route-stops
Route-number, from-stop-name, To-Stop-name,distance-in-km, cost_per_ticket in INR.

BR-Schedule: This is bus route schedule which consists of the route-number, bus-number, source-start-time, desitination-end-time

BR-Schedule-Daily: This gives the daily schedules of the buses to ply on the route with source-start-time and destination-end-time.
Route-number, bus-number, ScheduleDate, start-time, end-time, passenger-capacity, bus-drive-name, bus-conductor-name

current-BR-Schedule – This is the running bus schedule captured live based on GPS and stored here. This is further then flushed into a BR-Actual
Bus-number, route-number, current-time, current_stop-name, Next-stop-name,

BR-actual-schedule: This is the actual schedule of the bus routes.
Bus-number, route-number, schedule-date, schedule-time, stop-name, next-stop-name

BR-actual-TicketsSummary: This will contain the tickets sold for the Bus Route and payment for a trip.
Bus-number, route-number, schedule-date, total-tickets, totat-amount-received.

BR-actual-Tickets: This will contain the tickets sold for the bus route, from stop, To-stop, ticketCount, Amount_Received

2. To identify the attributes, read all episodes to see what kind of information is required additionally for reports, dashboards etc.
3. Additionally suggest, study all the episodes once to check if we need to add some more tables at the start.

Episode 2:

"KabChalo" database is designed with key entities and their relationships. We need to create the physical table structure as well as define different attributes. How do we define the attributes for the tables/entity?

1. Let's create the tables the entities and relations. Refer to Episode1 for details of the tables and attributes.
2. Let's insert few data in all the tables.
3. Now few operations for our immediate help.
    a. Location of "Khargar" was misspelt everywhere as "Kharaghar". Now update the same in Route? Do we have to update in other places? Why?
    b. By mistake, an AC bus-route was created for bus number 143. Kindly remove the same from the table.
    c. Help the bus drivers with the bus timetable allotted to them for the day.

Episode 3:

"KabChalo" database is designed appropriately with required tables, keys. Now we are in process to help the users and management with different kind of reports. These reports will be used by them for their daily monitoring as well as analyse trends to maximise commuter comfort and increase reach to comman man. You need to generate the SQL queries to get the data out of database.

1. KabChalo app administrator needs to have a dashboard report every hour stating Route-wise number of buses planned, number of busses allotted, total INR value collected for the day.
   Solutions Hint:

2. We need to write a query to extract the status of a Bus number in terms of which route the bus is, the current stop where bus is, next stop where it would reach.

   Solutions Hint: Can we get this from the current-BR-Schedule

3. We need to write a query to extract all routes alongwith bus number allotted in whichever route.

4. We need to have a zone-wise, count of busses as well as count of routes with the INR amount generated.

Episode 4:

"KabChalo" database is designed appropriately with required tables, keys. You all have helped in generating reports using Select and joins. Now management would like to leverage their data for future planning in terms of new buses, new routes etc. Read the requirements to get clarity on the same. You are required to again write the queries to extract the data from database.

1. Since the data volume of the day-to-day route schedules are higher, "Kabchalo" DBA had decided to move the bus routes and income generated for previous year to another set of tables with prefix as 2021 and 2020 for two years before. Management wanted to only store 3 years of data in the current database. Hence DBA handled the implementation in this way. Now, when management was looking at the data for income generated, they could not see any information on year 2021 or 2020. Help them generate their report including 2021 as well.
   `Solutions Hint - Use create table as well as select to move the data year wise.`
   `Use of Union will help accumulate the data in a single report.`

2. Now, every year, due to some challenges, few of the buses are discarded. Now the reports are providing bus details of the discarded buses. Generate the report only for the active buses in current and year 2021.
   `Solutions Hint : We could use simple join and get the details.`
3. There are few buses which are active but not at all used due to frequent maintenance. Management has been holding on to them for any emergency kind of requirements. Management wants you to generate the query removing all such buses as well. All such buses are marked as "Hold" in their status.
   `Solutions Hint : This is a simple select from the bus table`

4. It is required to find out details of all those buses who have been procured 5 years before 2021 and still have gone for minimum maintenance in 2021 and 2022. We need to provide the bus related details as well as INR generated by those buses.