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DEPARTMENT OF SYSTEMS ENGINEERING AND ENGINEERING MANAGEMENT

SEEM3040 Engineering Database and Systems

Project Title:

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1. Introduction

In this project, Lalamove is selected to be our target for designing a business database. A back-end database is applied to aid the system of the Lalamove mobile application. Our main focus would be on how the knowledge of business back-end databases benefits our chosen company, customer and drivers. Different approaches in the database will be overseen and valued for various stakeholders.

1.1 Company Background:

Lalamove is a logistic service company deeply rooted in Hong Kong. Being an app-founded logistics platform in Asia, Lalamove has kept on performing breakthroughs in the logistic field by using innovative ways to revolute the whole delivering industry. The company aims to serve the individuals and corporations by its large variety of logistic fleet of vehicles.

For individual customers, Lalamove provides the service of goods transport, bulky items, house moving, warehouse storage etc. Additional help can also be received, for instance, movers assisting, forklift renting. For companies, customised means and door-to-door transportation are offered in various markets. Lalamove supplies a dependable service with economical transportation fee in a rapid manner.

Over 8 years time, the company has expanded its business coverage to over 300 cities in Asia and beyond, along with over 700,000 licensed drivers and over 7 million users within the network. Growing potentials are foreseeable in the coming years.

1.2 Business System

Lalamove is an on-demand services platform where users could be either customers or independent services agents to maximise the utilisation and efficiency of the logistic industry. The company encourages its customers to download their mobile app to place online in order to enhance the effectiveness of the platform. By using a GPS system, it identifies the closest drivers and provides the fastest service for their customers. Drivers are allowed to choose to work full-time or part-time, they can just choose an order on the online platform according to their preference and contact the customer to arrange the pick-up time and location.

1.3 Database Application

The business system can be benefitted by our database in five ways.

To commence with, customer information is kept in our system. Every user has to use an email or affiliate partner account like apple ID and gmail to register an account before conducting an order. The account data is needed when making orders and generating delivery records.

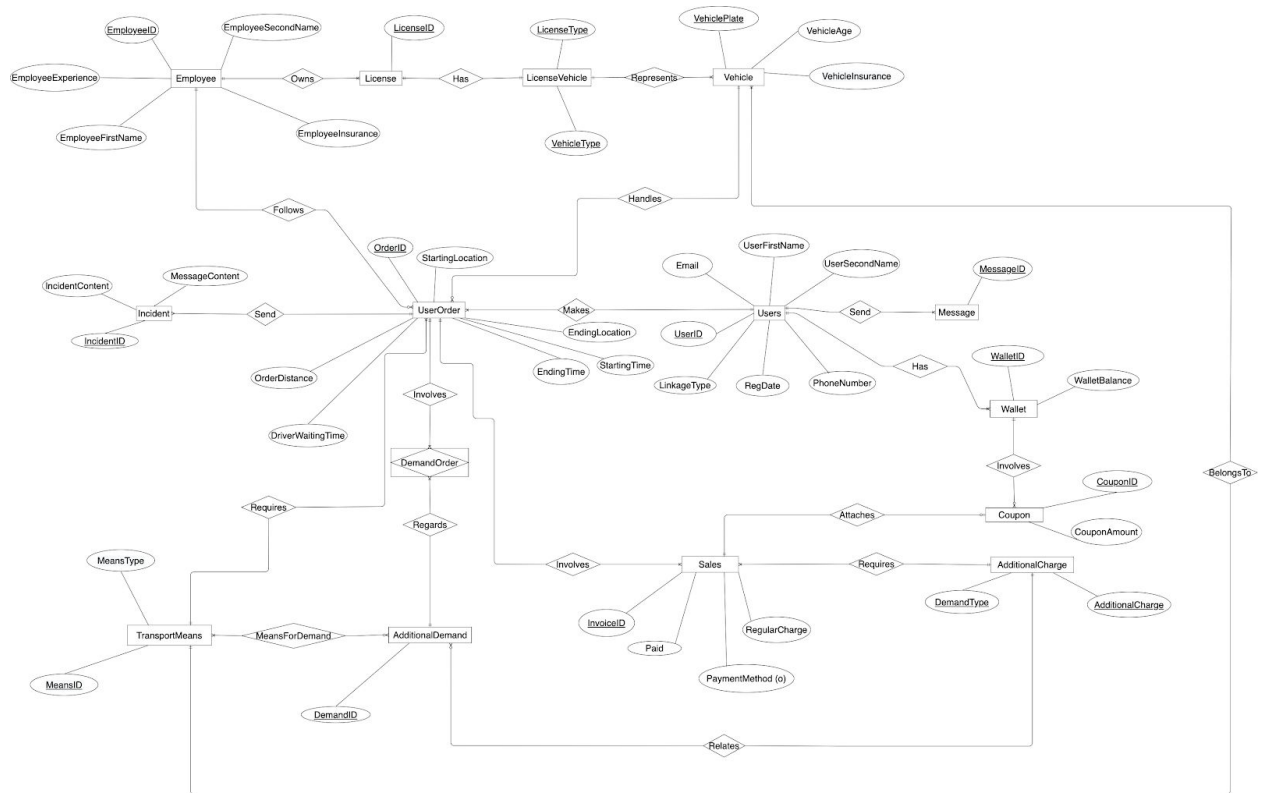
In addition to the customer information, drivers details such as driving license number, contact information and employee number are stored in the database. These data are managed in an organised way. When there is an increasing enrollment of drivers, the system can stand the expansion. Also, at the time of placing delivery services from customers, relevant drivers data will be retrieved from the database and shown to the customer partially.

On top of that, the database stores the location details of the particular order including starting and delivery destinations. This could help us to provide a better match with the nearby drivers and give the drivers a suitable route of the delivering process, since some of the place will be cramped or jammed up by cars in some rush hours.

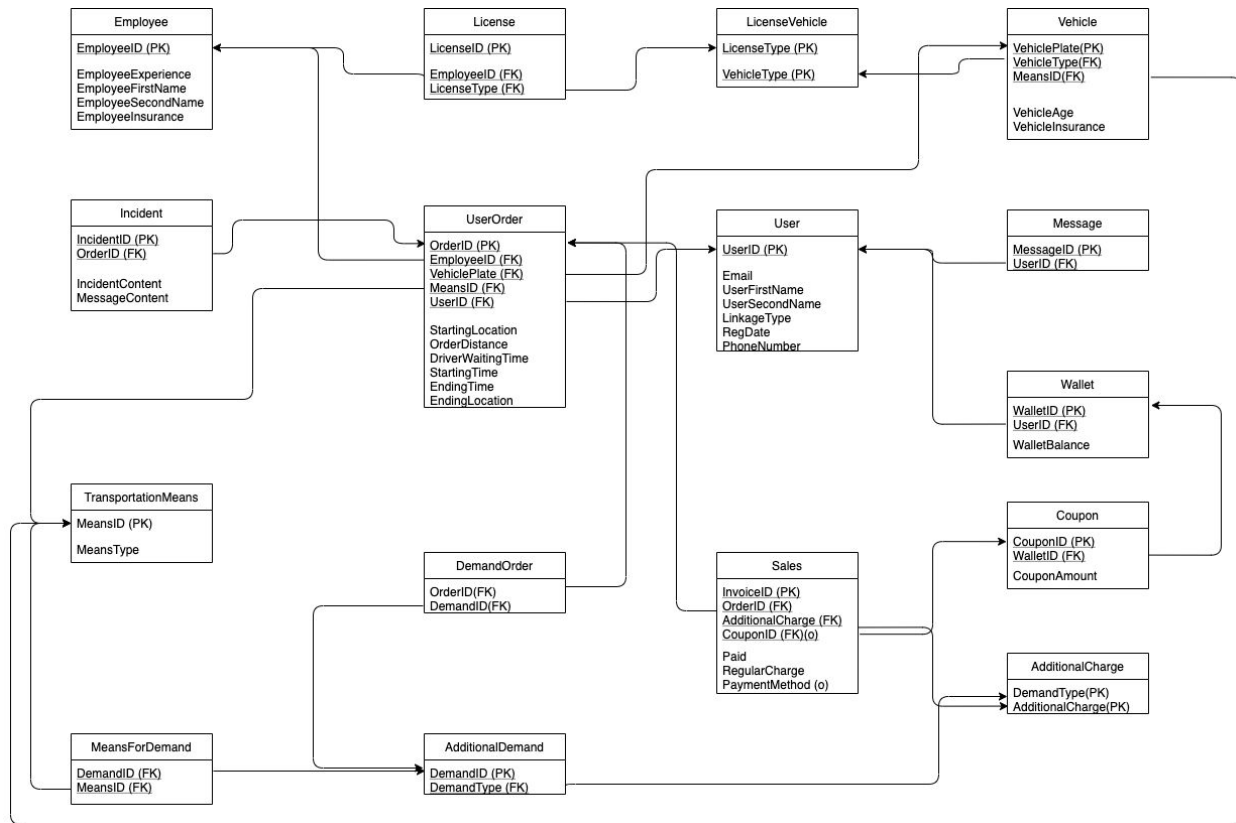
As for the payment and waybill records, they are also set out in our system. Previous payment methods are kept and displayed for next ordering to foster the users' experience. Users could choose to pay with cash at the end of the delivery or pay with prepaid credits at the beginning, which could be recharged using credit cards or by bank payment. Users preferences can also be stored for future analysis.

Lastly, our database provides the storage of rate and reviews. The comment, rates and suggestions are stored, for the improvements in the delivery service and guidance in the service quality of the couriers.

2. Blueprint (ER Diagram)



3. Interpretation of Entities



User - the information of users

Attribute	Explanation
user_id	unique id assign to each user
user_first_name	first name of the user
user_sec_name	last name of the user
user_linkage_type	the type of external account the user have linked to
user_phone_no	phone number of the user
user_email	email of the user
user_regdate	registration date of the user account

Message - *the messages received by user*

Attribute	Explanation
msg_id	<i>unique id assign to each message</i>
msg_content	<i>content of each message</i>
user_id	<i>foreign key, link to User table</i>

Employee - *the employee of company involved in the orders/operation process*

Attribute	Explanation
emp_id	<i>unique id assign to each employee</i>
emp_first_name	<i>first name of the employee</i>
emp_sec_name	<i>last name of the employee</i>
emp_exp	<i>experience of the employee in terms of year</i>
emp_ins_id	<i>id of employee insurance</i>

Incident - *incidents happened during orders/operation process*

Attribute	Explanation
inc_id	<i>unique id assign to each incident</i>
inc_content	<i>detail of each incident</i>
order_id	<i>foreign key, link to Order table</i>

License - driving license

Attribute	Explanation
lic_id	<i>unique id assign to each license</i>
lic_type	<i>foreign key, link to License_Vehicle, indicating the type of the driving license</i>
emp_id	<i>foreign key, link to Employee table</i>

License_Vehicle - Relationship between license type and vehicle type

Attribute	Explanation
lic_type	<i>the type of the driving license</i>
veh_type	<i>the type of the vehicle</i>

Vehicle - table containing detail of each vehicle

Attribute	Explanation
veh_plate	<i>plate number of each vehicle, unique key</i>
veh_type	<i>foreign key, link to License_Vehicle, indicating the type of the vehicle in terms of driving license</i>
veh_ins	<i>binary data indicating whether the vehicle is insured</i>
veh_age	<i>age of the vehicle</i>
means_id	<i>foreign key, link to Transport_Means, indicating the means the vehicle belongs to</i>

Transport_Means - *different means of transport used in the orders/operation*

Attribute	Explanation
means_id	<i>unique id assign to each mean</i>
means_type	<i>detailed description of the mean, e.g. on foot, 9 tons truck</i>

Additional_demand - *additional demands can be made by users*

Attribute	Explanation
demand_id	<i>unique id assign to each demand type</i>
demand_type	<i>foreign key, link to Additional_Charge, detailed description of the demand, e.g. English, fork trolley</i>

Additional_Charge - *charges caused by additional demands*

Attribute	Explanation
demand_type	<i>detailed description of the demand, e.g. English, fork trolley</i>
additional_charge	<i>exact charge caused by each type of demand</i>

Means_for_demand - *what kind of additional demand choice does each means has*

Attribute	Explanation
means_id	<i>foreign key, link to Transport_Means</i>
demand_id	<i>foreign key, link to Additional_demand</i>

User_Order - orders make by user

Attribute	Explanation
order_id	<i>unique id assign to each order</i>
starting_location	<i>Starting place where the user wants to deliver to</i>
starting_time	<i>time when the order is placed</i>
order_distance	<i>delivery distance</i>
driver_waiting_time	<i>waiting time of the employee which generate additional charge</i>
ending_location	<i>Ending place where the user wants to deliver to</i>
ending_time	<i>time when is order is finished</i>
emp_id	<i>foreign key, link to Employee, indicating employee involved in this order</i>
veh_plate	<i>foreign key, link to Vehicle, indicating vehicle involved in this order</i>
user_id	<i>foreign key, link to User, indicating the user who made this order</i>
means_id	<i>foreign key, link to Transport_Means</i>

Sales - detail of invoice of each order

Attribute	Explanation
invoice_id	<i>unique id assign to each invoice</i>
order_id	<i>foreign key, link to the invoices ' corresponding order</i>
regular_charge	<i>regular charge excluding cost generated by additional demand</i>

additional_charge	<i>cost generated by additional demand</i>
coupon_id	<i>the coupon used in this payment, can be null</i>
paid	<i>binary data representing whether the bill is paid</i>
payment_method	<i>the payment method of the invoice</i>

demand_order - *record of additional demand made in each order*

Attribute	Explanation
order_id	<i>foreign key, link to User_Order</i>
demand_id	<i>foreign key, link to Additional_demand</i>

Wallet - *the wallet of each user's account*

Attribute	Explanation
wallet_id	<i>unique id assign to each wallet</i>
wallet_balance	<i>The balance of the wallet</i>
user_id	<i>foreign key, link to User, indicating the user which the wallet belongs to</i>

Coupon - *coupons which will give discount to orders*

Attribute	Explanation
coupon_id	<i>unique id assign to each coupon</i>
coupon_amount	<i>amount of discount of the coupon</i>
wallet_id	<i>foreign key, link to Wallet, indicating the wallet the coupon belongs to</i>

4. Example of Queries

The following are the examples of knowledge that can be extracted from this database.

```
/*count users with more than 10 orders*/
SELECT COUNT(*) AS total_number
FROM User_Order
WHERE user_id IN (SELECT user_id FROM User_Order GROUP BY user_id HAVING COUNT(*)>10);

/*vehicle & drivers involved in incident*/
SELECT DISTINCT emp_id AS driver_id, veh_plate
FROM User_Order
WHERE order_id IN (SELECT order_id FROM Incident);

/*total coupon amount being used*/
SELECT SUM(coupon_amount)
FROM Coupon
WHERE coupon_id IN (SELECT coupon_id FROM Sales);

/*what type of vehicle can an employee drive*/
SELECT DISTINCT l.emp_id AS employee_id, v.veh_type AS vehicle_type
FROM License l, License_Vehicle v
WHERE l.lic_type = v.lic_type
ORDER BY l.emp_id ;

/*all employees' jobs done*/
SELECT emp_id, COUNT(*) AS total_number_of_jobs
FROM User_Order
GROUP BY emp_id

/*total revenue made by each employee*/
SELECT o.emp_id, SUM(regular_charge+additional_charge) AS total_number_of_jobs
FROM User_Order o, Sales s
WHERE o.orderid = s.orderid
GROUP BY o.emp_id
```

- 1) The first query simulates the situation in which a user needs to get the number of frequent users, with the definition of frequent user defined as those who have more than 10 orders.

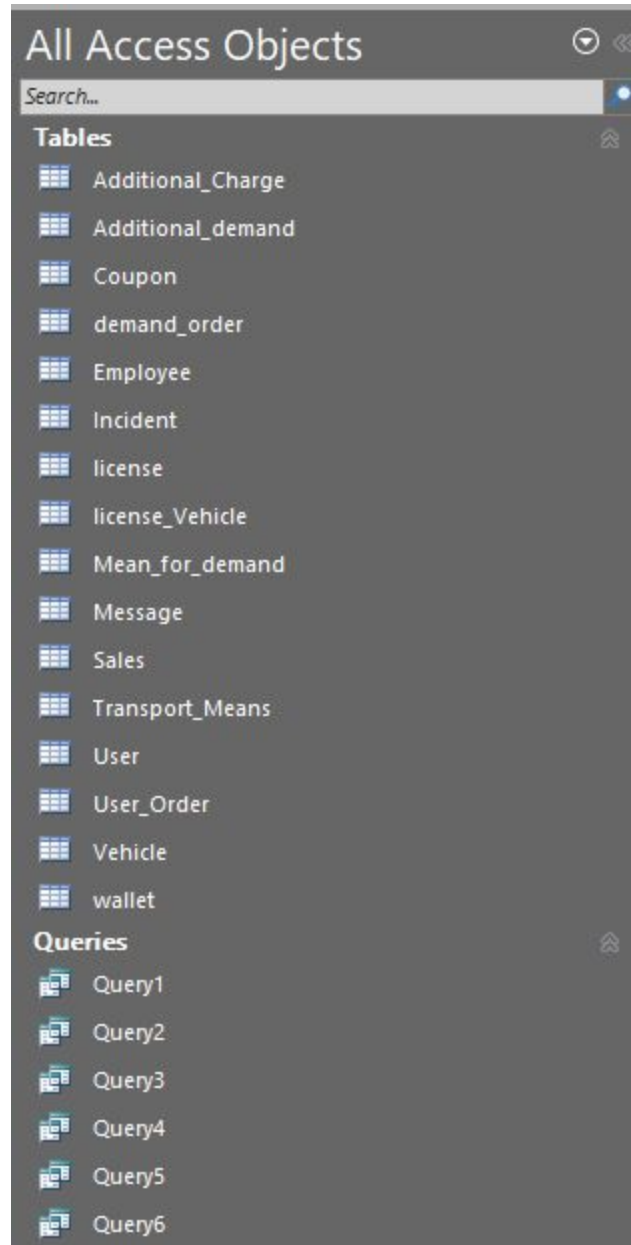
In this query, an integer amount is returned.

- 2) The next query simulates the situation in which the user is trying to find out those vehicles and their corresponding drivers involved in incidents before. In this query, vehicle-driver pairs are returned, representing the vehicles and their corresponding drivers at the time.
- 3) The next query simulates the situation in which the user is trying to find out the total amount of discount given out through coupons. In this query, an amount is returned, indicating the amount of discount caused by coupons.
- 4) The next query simulates the situation in which the user is trying to find out what kind of vehicle can each employee with a license drive. In this query, multiple driver-vehicle type pairs will be obtained, representing the type of vehicle an employee can drive with his license.
- 5) The next query simulates the situation in which the user is trying to find out the total number of jobs done by each employee. In this query, integers and IDs will be obtained which represents the number of jobs done by each employee.
- 6) The next query simulates the situation in which the user is trying to find out the total amount of revenue generated by each employee. In this query, IDs and numbers will result, which represent the revenue generated by each employee.

Listed are just some queries that are believed to be frequently used. Besides the listed queries, there are still many other information that can be extracted from these database with addition queries

5. Implements of the database

We have transferred the entities and queries into real life applications using Microsoft Access. Here is the table and queries that we have created.



There are a total of 16 tables in this database. Additional_charge will hold the type of demand and the respective charges involved. Additional_demand will hold the demand_id and demand_name of the additional demand. Coupon will hold coupon_id, coupon_amount and respective wallet_id that the coupon belongs to. Demand_order will hold the order_id who needs the additional demand with recording demand_id at the same time. Employee will hold the employee info, and incident will hold the time , incident and incident info when an incident happened. License will hold which employee holds which driver licenses. License_Vehicle will hold which driver license refers to which type of vehicles, like no.18 driver license could drive 5.5 ton and 9 ton trucks. Mean_for_demand will hold which type of additional demand could the specific transportation means provide. Message will record the sender and receiver info and the message info, and Sales will hold all the pricing info for each user order. Transport_Means will hold the mean_id for each type of transportation means. User will hold all the user information and User_order will link the data between order info and the user. Vehicle will record the vehicle info of the fleet, and the wallet will record all the info of each customer.

Queries are referred to part 4 with the same ordering.

Summary

In this project, we have developed a back-end database to store the information generated by the mobile application of lalamove. Despite future room for further development, we believe that this database can very well fit the current need of the application, and the need of the company in terms of data extraction. We believe that this database development experience can benefit us in the future.

Reference

1. Lalamove. (n.d.). About Us: Express Delivery & Courier Service: Lalamove Hong Kong. Retrieved December 16, 2020, from <https://www.lalamove.com/hongkong/en/about-us>