INFO 6210 - Data Management and Database Design - Spring 2021

Project Topic: Electric Bike Rental Management System

Team Name: Anonymous (Team-5)

Team Members:

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Project Overview:

Database management system for Electric bike rental platform, wherein the purpose of this Database is to create, manage and monitor the records of the electric bike and the users of the electric bike present across the city of Boston. This database will give us information on the usage, maintenance, and performance of the electric bike in the city, furthermore, it also gives us insights on the revenue generated, it also gives us the perception on re-envisioning how people experience and move around the city. With this we can study how our business resolves the last mile problem and connects the gap from home to the nearest public transport station.

Problem Statement:

In a city like Boston where there is an abundance of public transport facilities, there persists an issue of last mile connectivity. An e-bike rental system would solve the issue of the last mile connectivity and makes the commute faster, convenient while also being ecofriendly and reducing the carbon footprint. The rental system, though simple, requires a vast amount of data to provide a seamless experience to the user. By creating this DBMS for the rental system, we intend to solve issues pertaining to

1. Data redundancy/duplication caused when a user upgrades the account to a premium/VIP status.
2. Difficulties associated in retrieving data distributed across multiple entities and providing personalized information to the user.
3. Security, which can be achieved by providing limited data access to users.
4. manual tracking/calculation of certain attributes by creating calculated fields, thereby eliminating the process of manual tracking/calculation.
5. Difficulties in Inventory Management of the e-bikes and tracking maintenance requirements.
6. Manual deletion of all the records associated with the user when a user deletes their account.
7. Increasing the customer relationship by assigning an employee to track a customer ticket as well as maintenance ticket.

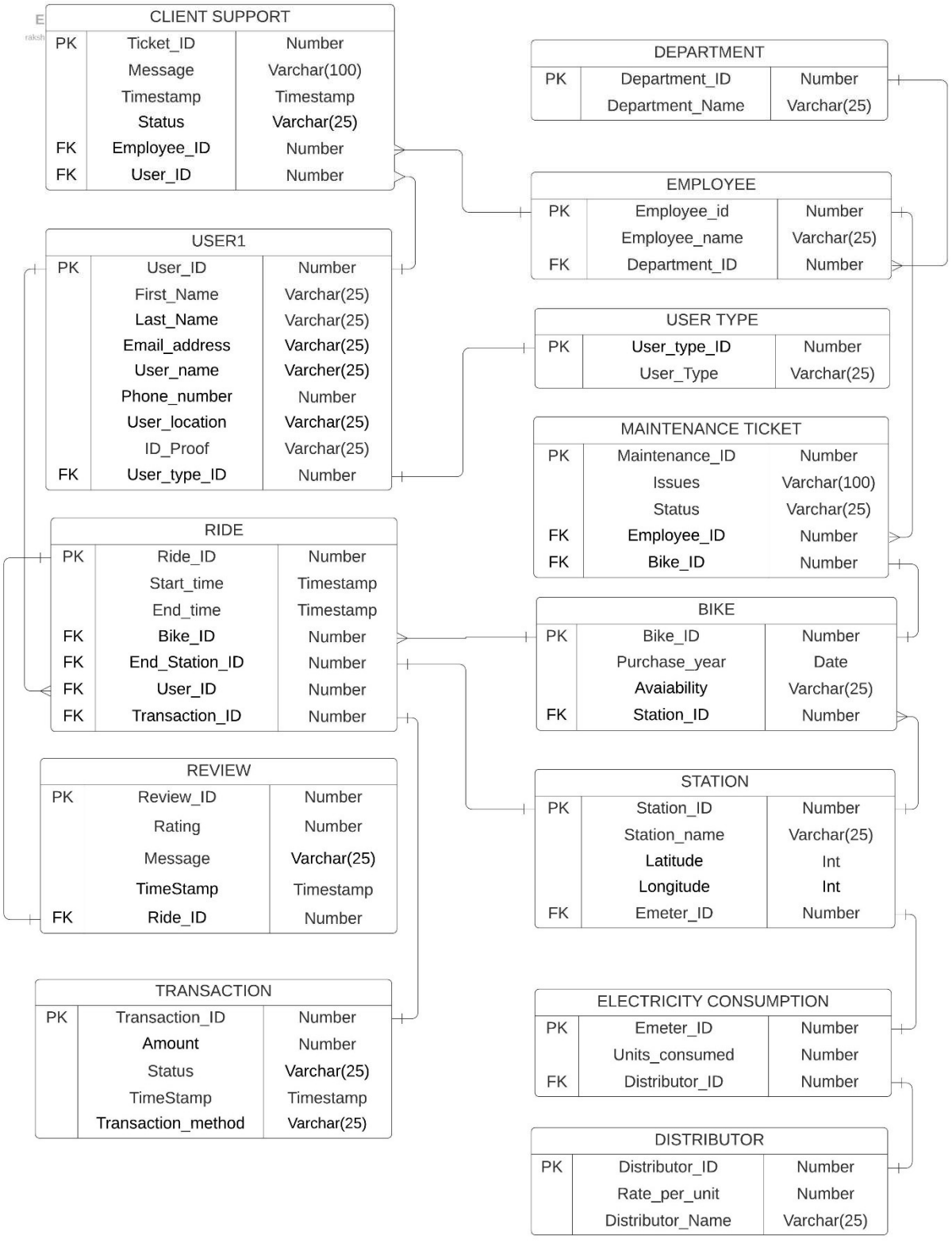
Project Objective:

1. To achieve our goal of reducing the duplication of record created when a user upgrades their account to premium/VIP status we plan to use the concept of normalization.
2. The concepts of triggers are used to automate the process of calculation.
3. Since we store the data pertaining to various categories across multiple entities retrieving, updating, and monitoring the data pertaining to that particular entity is easy and fast.
4. To provide personalized information pertaining to our user we generally make use of the concepts of joins to retrieve data that are distributed across multiple entities.
5. Generating real time visualization dashboard to improve business performance.

Proposed Solution:

1. To resolve our first issue data redundancy, we plan on using **UPDATE** script to update the **User_Type** attribute whenever a user changes from normal user to our VIP user.
2. Using our database system, with the use of **Foreign Key** reference with **ON DELETE CASCADE** can be used to automatically delete all the data associated with the user when the user chooses to delete their account.
3. To solve the issues of getting data across multiple entities to fetch a particular detail of a user or the bike we make use of **JOINS** to retrieve the information required. Ex: We need to find the maintenance status of a bike we join the **BIKE** and **MAINTENANCE TICKET** table on **Bike_ID** to retrieve all the maintenance records along with the **Employee_ID** which can further give us the information of the employee handling the ticket whom it is assigned to. This resolves major issues in the fleet and user management.
4. We can use the **UNIQUE KEY** constraint in the databases so that the user does not sign up with an existing username.
5. We make use of the basic arithmetic operators like **+ (ADD), * (MULTIPLY), - (SUB)** to calculate revenue generated and the spending's on electricity with the help of units consumed and cost per unit.

Entity-Relationship Diagram



Entity – Attributes - Datatype

USER1

Attribute	Data Type and Size	Comments	Description
User_ID	NUMBER	Primary key	Unique ID for each user.
First_Name	VARCHAR(25)	Not null	First Name of the user.
Last_Name	VARCHAR(25)	Not null	Second Name of the user.
Email_address	VARCHAR(25)	Not null	Email ID of the user.
Phone_number	NUMBER	Not null	Phone Number of the User.
User_location	VARCHAR(25)	Not null	User Location.
ID_Proof	VARCHAR(25)	Not null	Any Govt. Issued ID Card.
Username	VARCHAR(25)	Not null	Username of the user.
User_type_ID	NUMBER	Foreign key	The type of the user (Membership).

BIKE

Attribute	Data Type and Size	Comments	Description
Bike_ID	NUMBER	Primary key	Unique ID assigned to each bike in the fleet.
Purchase_year	DATE	Not null	Year of purchase of the bike.
Availability	VARCHAR(25)	Not null	Current Availability of the bike.
Station_ID	NUMBER	Foreign key	Station_ID where the bike is currently present.

CLIENT SUPPORT

Attribute	Data Type and Size	Comments	Description
Ticket_ID	NUMBER	Primary key	Ticket_ID of the open client support ticket.
Status	VARCHAR(25)	Not null	Status of the ticket
TimeStamp	TIMESTAMP	Not null	Time when the ticket was created.
Message	VARCHAR(100)	Not null	Message written in the ticket for the issue.
Employee_ID	NUMBER	Foreign Key	Employee_ID to whom the ticket is assigned
User_ID	NUMBER	Foreign key	User_ID of the user who reported an issue.

STATION

Attribute	Data Type and Size	Comments	Description
Station_ID	NUMBER	Primary key	Unique ID assigned to the bike Stations
Station_Name	VARCHAR(25)	Not null	Name of the Station
Latitude	INT	Not null	Latitude of the location of the station
Longitude	INT	Not null	Longitude of the location of the station
Emeter_ID	NUMBER	Foreign key	ID of the Electricity meter in the station

RIDE

Attribute	Data Type and Size	Comments	Description
Ride_ID	NUMBER	Primary key	Unique ID for the ride
Start_time	TIMESTAMP	Not null	The time the ride started from the station
End_time	TIMESTAMP	Not null	The time the ride ended at the destination
Bike_ID	NUMBER	Foreign key	The ID of the bike which was used for the ride
User_ID	NUMBER	Foreign key	The ID of the user who rode the bike
End_Station_ID	NUMBER	Foreign key	The ID of the Review given by user after ride
Transaction_ID	NUMBER	Foreign key	The ID of the transaction by user for the ride

TRANSACTION

Attribute	Data Type and Size	Comments	Description
Transaction_ID	NUMBER	Primary key	ID of the transaction made by the user
TimeStamp	TIMESTAMP	Not null	Time at which the transaction was made
Status	VARCHAR(25)	Not null	Status of the ride transaction
Amount	NUMBER	Not null	Cost of the ride
Payment_ID	NUMBER	Foreign key	ID of payment linked with the transaction

REVIEW

Attribute	Data Type and Size	Comments	Description
Review_ID	NUMBER	Primary key	ID of the review given by the user at end of ride
Rating	NUMBER	Not null	Rating given by the user
Message	VARCHAR(25)	Not null	Review message given by the user
Ride_ID	NUMBER	Foreign key	Unique ID for the ride
TimeStamp	TIMESTAMP	Not null	Time when the review was given

USER TYPE

Attribute	Data Type and Size	Comments	Description
User_type_ID	NUMBER	Primary key	Id of user type in the app ex: Premium, Normal
User_Type	VARCHAR(25)	Not null	user type in the app ex: Premium, Normal

MAINTENANCE

Attribute	Data Type and Size	Comments	Description
Maintenance_ID	NUMBER	Primary key	Unique ID for the maintenance ticket raised
Issue	VARCHAR(100)	Not null	Issue reported with the bike
Status	VARCHAR(25)	Not null	Status of repair
Employee_ID	NUMBER	Foreign Key	ID of employee handling the ticket
Bike_ID	NUMBER	Foreign key	ID of the bike with issue

DISTRIBUTOR

Attribute	Data Type and Size	Comments	Description
Distributer_ID	NUMBER	Primary key	Unique ID of the electricity distributor
Rates_per_unit	NUMBER	Not null	Cost of electricity per unit
Distributor_name	VARCHAR(25)	Not null	Name of the electricity distributor

ELECTRICITY CONSUMPTION

Attribute	Data Type and Size	Comments	Description
Emeter_ID	NUMBER	Primary key	ID of the electricity meter at the station
Units_Consumed	NUMBER	Not null	ID of the station of the Electricity meter
Distributor_ID	VARCHAR(25)	Foreign Key	Unique ID of the electricity distributor

EMPLOYEE

Attribute	Data Type and Size	Comments	Description
Employee_ID	NUMBER	Primary key	Unique ID of the employee
Employee_name	VARCHAR(25)	Not null	Name of the employee
Department_ID	NUMBER	Foreign key	Department ID of the employee

DEPARTMENT

Attribute	Data Type and Size	Comments	Description
Department_ID	NUMBER	Primary key	Unique ID of the department
Department_name	VARCHAR(25)	Not null	Name of the department

SECURITY RULES: (User level Access/Permissions)

USER:

1. Has **NO ACCESS** to **EMPLOYEE**, **DEPARTMENT**, **MAINTENANCE_TICKET**, **ELECTRICITY_CONSUMPTION**, and **DISTRIBUTOR**.

2. Has only **READ ACCESS** to **BIKE**, **STATION, USER_TYPE and TRANSACTION** tables.

3. Has **READ/WRITE/UPDATE ACCESS** to **CLIENT_SUPPORT**, **USER1, REVIEW** and **RIDE** tables.

EMPLOYEE:

1. Has only **READ ACCESS** to **EMPLOYEE**, **USER** , **BIKE**, **STATION** and **DEPARTMENT** table.

2. Has **READ and UPDATE ACCESS** to **MAINTENANCE_TICKET** and **CLIENT_SUPPORT** table.

3. Has **NO ACCESS** to **TRANSACTION**, **ELECTRICITY_CONSUMPTION** and **DISTRIBUTOR** table.

ADMIN:

1. Has **ALL level of ACCESS** to **all the entities** in the database.

BUSINESS RULES

1. **USER** can raise one or more **CLIENT_SUPPORT** tickets.

2. **USER** can be associated with one **USER_TYPE.**

3. **USER** can book more than one **RIDE** over a period but only one **RIDE** at a time and cannot book another until the ongoing **RIDE** is completed.

4. **USER** can only book the bike from the station nearest to the **USER_LOCATION**.

5. Every **USER** has **USER_LOCATION** associated with it and that cannot be NULL as it is used to point them to the nearest station.

6. Our **USER_LOCATION** should be within BOSTON, MA as our system is available only in BOSTON.

7. **USER** can select the type of membership or **USER_TYPE** they want to be under. **Ex: Premium, Regular**

8. **USER** can change the type of membership whenever they desire to, but they will only have the offers that come under that **USER_TYPE.**

9. One **EMPLOYEE** can belong to only one **DEPARTMENT**.

10. **EMPLOYEE** can be assigned one or more **CLIENT_SUPPORT** tickets to work on the issues faced by the client.

11. **EMPLOYEE** can be assigned one or more **MAINTENANCE_TICKET** to work on the issues related to **BIKE**.

12. **EMPLOYEE** can update the **STATUS** of **MAINTENANCE_TICKET** and **CLIENT_SUPPORT** tickets when it is **ex: Open, Resolved, Assigned etc.**

13. **BIKE** can have many **RIDES** associated with it, past or current **RIDES**.

14. Only one unique **RIDE** can be associated with only one unique **REVIEW_ID**.

15. **STATION** can have many **BIKES** associated with it.

16. **MAINTENANCE_TICKET** is raised by the employee and tracked when a **BIKE** has issues and is not functional.

17. When a **BIKE** is in **MAINTENANCE** the bike will not be accessible for any **USERS**.

18. **DEPARTMENT** can only be added or changed by the **ADMIN.**

19. There are different **DEPARTMENTS** the **EMPLOYEE** belongs to ex: **CLIENT_SUPPORT, MAINTENANCE etc.**

20. One **BIKE** can be present at only one **STATION** at one time.

21. **STATION_NAME** can only be the stations present in the city of BOSTON.

22. There can be only one **TRANSACTION** that can be associated with one **RIDE**.

23. **TRANSACTION** can have only 2 possible status either **Complete** or **Incomplete**.

24. One **STATION** can consume electricity from one unique **DISTRIBUTOR** through one unique meter.

25. One **DISTRIBUTOR** supplies electricity to one **STATION** at a rate fixed by the distributor per unit of electricity.

26. The **STATIONS** are also linked to the **RIDE** when the **USER** ends a **RIDE** at a particular **STATION**, to maintain records and improve the business.