

Car Rental System

Introduction to Database Systems Project

Submitted to Ms. Roohi Jan

Presented by:

Tala Alhazmi

Ruba AlHudaithi

Ghada AlQara

Gamar Almutairi



Table of Contents:

1 Phase 1:

- Introduction
- Purpose and Scope
- UI and Prototype
- Functional and Nonfunctional Requirements
- Entities, Attributes, and Relationships

2 Phase 2:

- EER Diagram

3 Phase 3:

- Relational Diagram

4 Phase 4:

- mySQL Table Creation

5 Phase 5:

- mySQL Queries



🌸 Phase 1: Introduction

Overview:

- Development of a Car Rental database management system.
- Aims to automate the car rental process for efficiency and transparency.



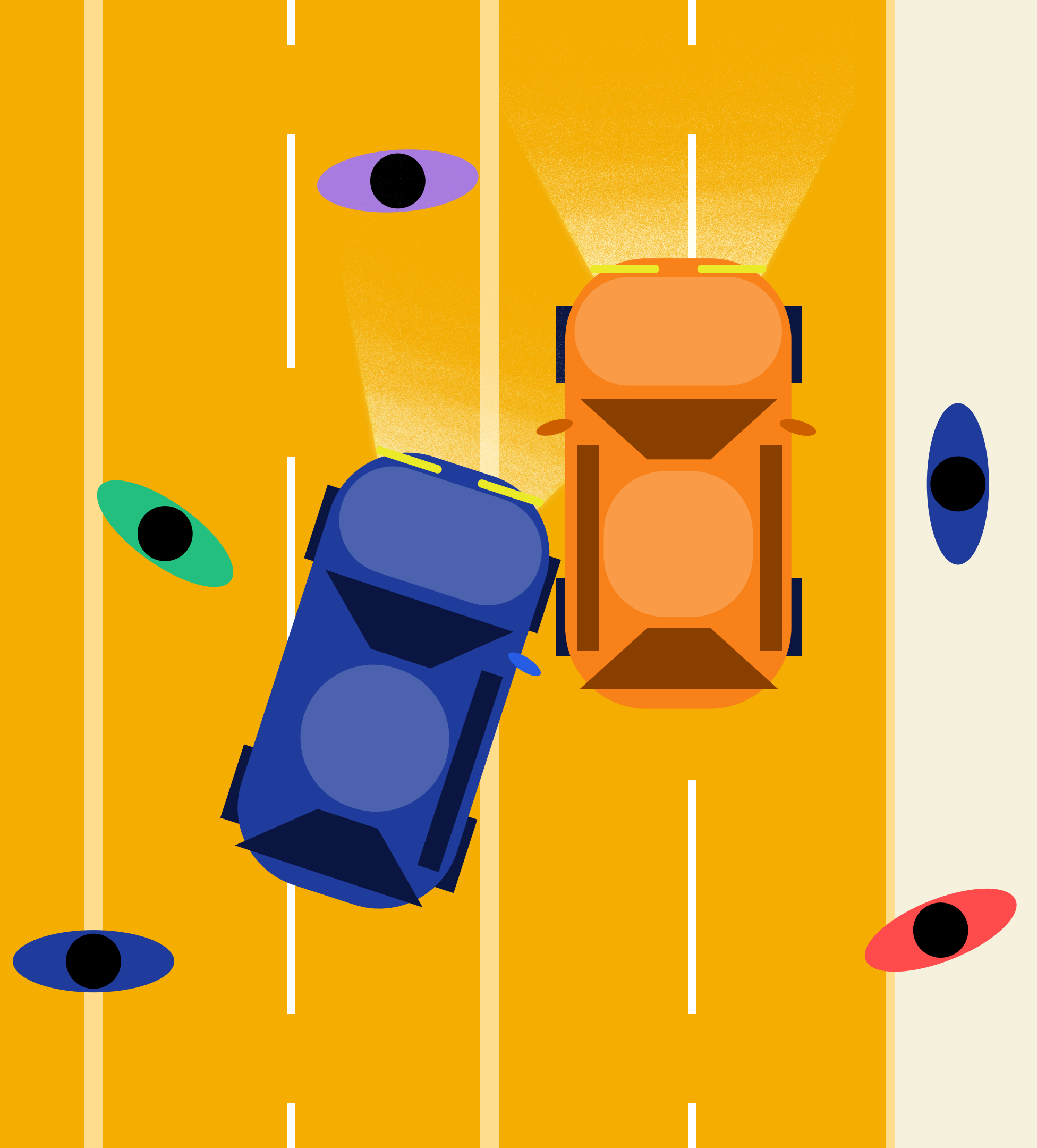
🌸 Purpose and Scope

Purpose

- Streamline rental process.
- Improve accuracy and customer service.

Scope

- Management of car inventory, payments, and rental contracts.



User Interface

Customer View (End-User):

- Login Page
- Access to personal information
- View and download rental and billing history
- View vehicle information
- Manage vehicle rentals

Administrator View:

- Login Page
- Access to all customer information
- Access to all vehicle information and management
- Manage billing settings and calculations
- Generate reports and analytics
- Monitor system logs and security settings



Prototype

Choose your access

Select

Employee

Costumer

Choose your access

Select

Administrators

Employee

Select

sign In

sign Up

Create new Account

Already Registered? Sign in here.

FIRST NAME LAST NAME

name name

EMAIL

hello@reallygreatsite.com

PASSWORD

PHONE NUMBER

+966 258963147

sign up

Sign in

Email:

hello@reallygreatsite.com

Password:

Forget Password?

Verify phone

A code was sent to verify your account with the phone number associated in your account (+966)5*****589

DIDN'T GET IT? SEND A NEW CODE

Next

Costumer

Select

Personal information

view and rent cars

Payment information

adminstrator

Select

Manage employees

Manage costumers

Manage inventory

Start your Journey..

Specify your duration

Daily

Weekly

Mounthly

Yearly

Date will be automatically Specified*

From 14/12/2024 - To 19/12/2024

Specify your Class

Luxury

Premium

Semi Premium

Specify your Prefered Size

SUV

Sedan

Mini

Check Out

Duration: 5 Days (250x5)

Car Class/Size: Luxury/Sedan (500x5)

Total: 3750 SR

Have any Discount Code? enter here

A123

Secure Payment

Choose Your Payment Method

Apple Pay

PayPal

Master Card

Tabby/Tamara

SubTotal: 3000 SR

Functional Requirements:

User:

- Account creation and password management.
- Authentication with secure login and two-factor authentication.
- Permission to store personal, contact, and payment data.
- Ability to view and update personal details.
- Access vehicle information, create, update, view, and cancel rental bookings.
- Process rental check-ins/outs, calculate payment details, and submit payments.
- View payment history and rate vehicles/administrators.

Administrator:

- Account creation and password management.
- Authentication with secure login and two-factor authentication.
- Permission to store personal, contact, and job-related data.
- Update personal information and manage vehicle data.
- Access customer information and rate customer profiles.

System:

- Generate and store payment records.
- Maintain security measures, access controls, and system logs.



Non-Functional Requirements:

Performance:

- Support simultaneous user access without performance degradation.
- Response times under 3 seconds during peak hours.

Scalability:

- Accommodate a 20% increase in user load within a year.

Reliability:

- Minimum uptime of 99.9%.
- Backup and recovery mechanisms for minimal downtime and data loss.

Security:

- Adhere to industry security standards, with role-based access control.
- Encrypt data both at rest and in transit, with regular security updates.

Usability:

- Intuitive and user-friendly interface.
- Multi-language support for Saudi Arabian users.

Some Relationships in the data:

- User Roles:** Users are either **Employee** or **Customer**, identified by **UserID**, **Name**, and **Contact**.
- Customer Details:** Customers are defined by **Gender**, **Age**, **Driving License**, and **Address**.
- Employee Details:** Employees have a **Job Position** (e.g., Administrator) and manage **Rental Offices**.
- Car Details:** Cars are uniquely identified by **Serial Number** and include **Brand**, **Model**, **Plate Number**, and **Year**.
- Rental Price:** Cars have varying **Rental Prices** based on **Duration**, **Class**, and **Size**.
- Maintenance:** Maintenance history (linked to car) includes **ID**, **Date**, and **Description**.
- Category & Rental Office:** Cars belong to a **Category** (e.g., Luxury) and are available at a **Rental Office**, which is managed by one **Employee**.
- Rental Order:** Includes **Order ID**, **Date**, **Amount**, **Duration**, **Purpose**, and **Discount**.
- Payment:** Each rental order has one or more **Payments**, detailing **Amount**, **Method**, and **Split** options.
- Insurance & Location:** Every car requires **Insurance**, and cars can be picked up/returned at various **Locations**.

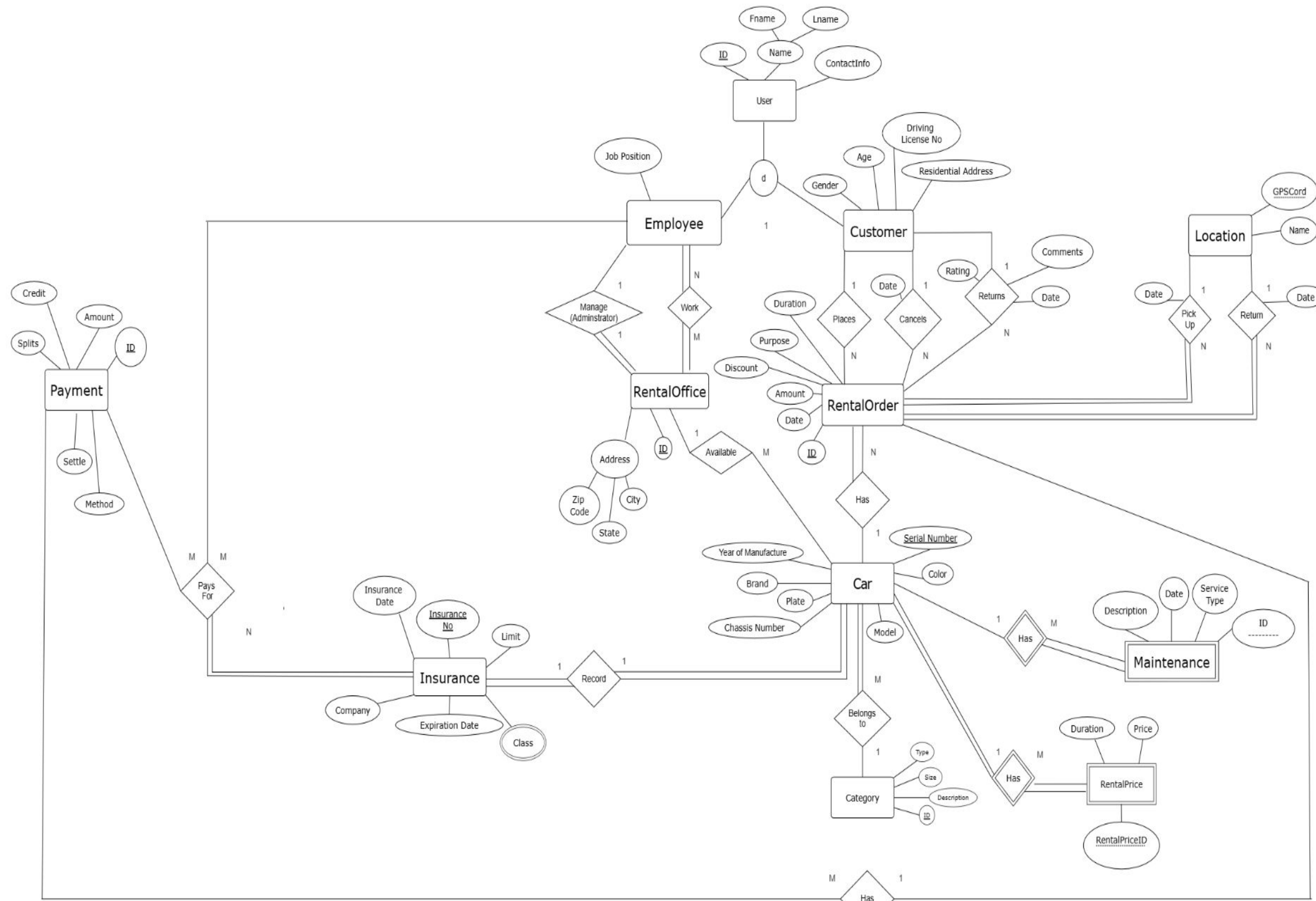


**The upcoming slide will show a brief for
the entities, attributes and their
descriptions:**



Entity	Attributes	Description
User	UserID, FName, LName, ContactInformation, Role	Represents customers and employees with unique identifiers and contact details.
Customer	UserID, Gender, Age, DrivingLicenseNo, ResidentialAddress	Extends User, capturing customer-specific details like age, gender, and license.
Employee	UserID, JobPosition, OfficeID	Extends User, identifying employee job position and office affiliation.
Car	SerialNumber, Brand, Model, Color, Chassis Number, Plate Number, Year of Manufacture, CategoryID	Represents cars with detailed specifications and links to Category.
RentalPrice	RentalPriceID, CarSerialNumber, Duration, Price	Stores rental pricing for each car based on duration.
Maintenance	MaintenanceID, MaintenanceDate, MaintenanceServiceType, MaintenanceDescription	Tracks maintenance activities for cars.
Category	CategoryID, CategoryType, Size, Description	Defines categories of cars (e.g., luxury, SUV).
RentalOffice	OfficeID, Address	Represents rental office locations with physical addresses.
RentalOrder	OrderID, OrderDate, OrderAmount, CarSerialNumber, Duration, Purpose, Discount, CustomerID	Tracks rental orders, car details, duration, and customer.
Payment	PaymentID, PaymentAmount, PaymentMethod, OrderID, SplitPayment	Stores payment information for rental orders.
Insurance	InsuranceNumber, CarSerialNumber, DateOfInsurance, ExpirationDate, InsuranceLimit, Class, Company	Covers car insurance details like coverage limits and provider.
Location	LocationName, GPSCoord	Represents rental locations with geographical coordinates.
Feedback	FeedbackID, CarSerialNumber, OrderID, FeedbackDescription	Stores customer feedback related to rentals.

Phase 2: EER Diagram



Business Constraints:

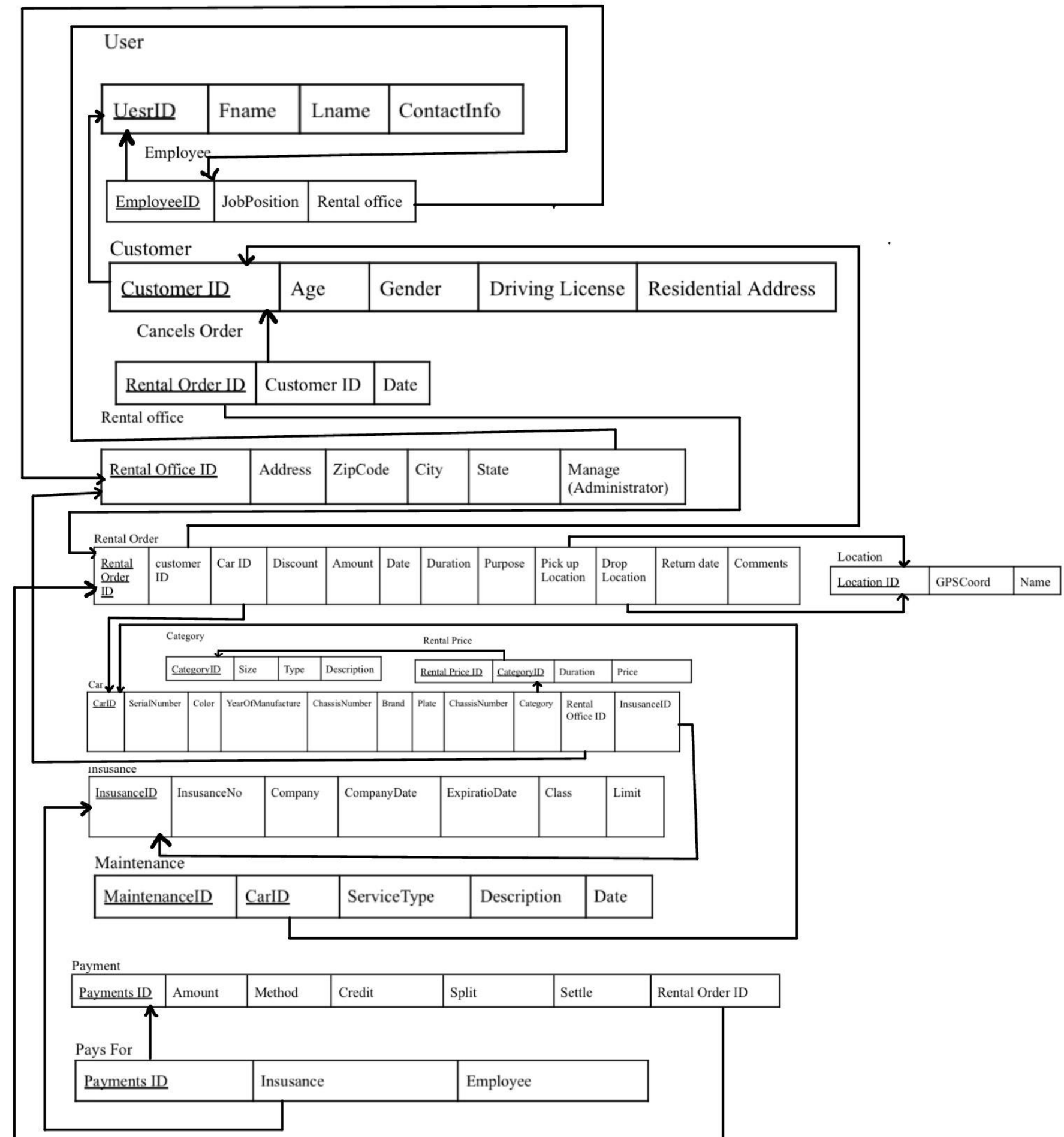
All cars must have valid insurance before they can be rented out. Rentals will not proceed if the insurance has expired.

Only one discount can be applied per rental order, regardless of multiple offers.

Payment must be completed before pickup, and split payments are allowed only if within specific limits.

Phase 3: Relational Diagram

12 data dictionary tables were created
to help create the relational diagram.





Phase 4: mySQL Table Creation and Record Insertion

Table Creation: 12 tables were created in the Car Rental schema in mySQL based on the Data Dictionary.

• **User Table:**

User - Table										
Table Name: User		Schema: mydb								
Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
UserID	VARCHAR(9)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fname	VARCHAR(15)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lname	VARCHAR(15)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
ContactInfo	VARCHAR(100)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

• **Category Table:**

Category - Table										
Table Name: Category		Schema: mydb								
Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
CategoryID	VARCHAR(9)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Size	VARCHAR(10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Type	VARCHAR(10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Description	VARCHAR(100)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	





MySQL Table Creation and Record Insertion

Data Insertion:

10 records were inserted into each of the 12 tables in the Car Rental schema in MySQL.

- User Records:

UserID	Fname	Lname	ContactInfo
U001	Alice	Smith	alice.smith@gmail.com
U002	Bob	Johnson	bob.johnson@gmail.com
U003	John	Doe	john.doe@example.com
U004	Jane	Smith	jane.smith@example.com
U005	Charlie	Davis	charlie.davis@example.com
U006	Diana	Wilson	diana.wilson@example.com
U007	Ethan	Taylor	ethan.taylor@example.com
U008	Fiona	Moore	fiona.moore@example.com
U009	George	Anderson	george.anderson@example.com
U010	Hannah	Thomas	hannah.thomas@example.com

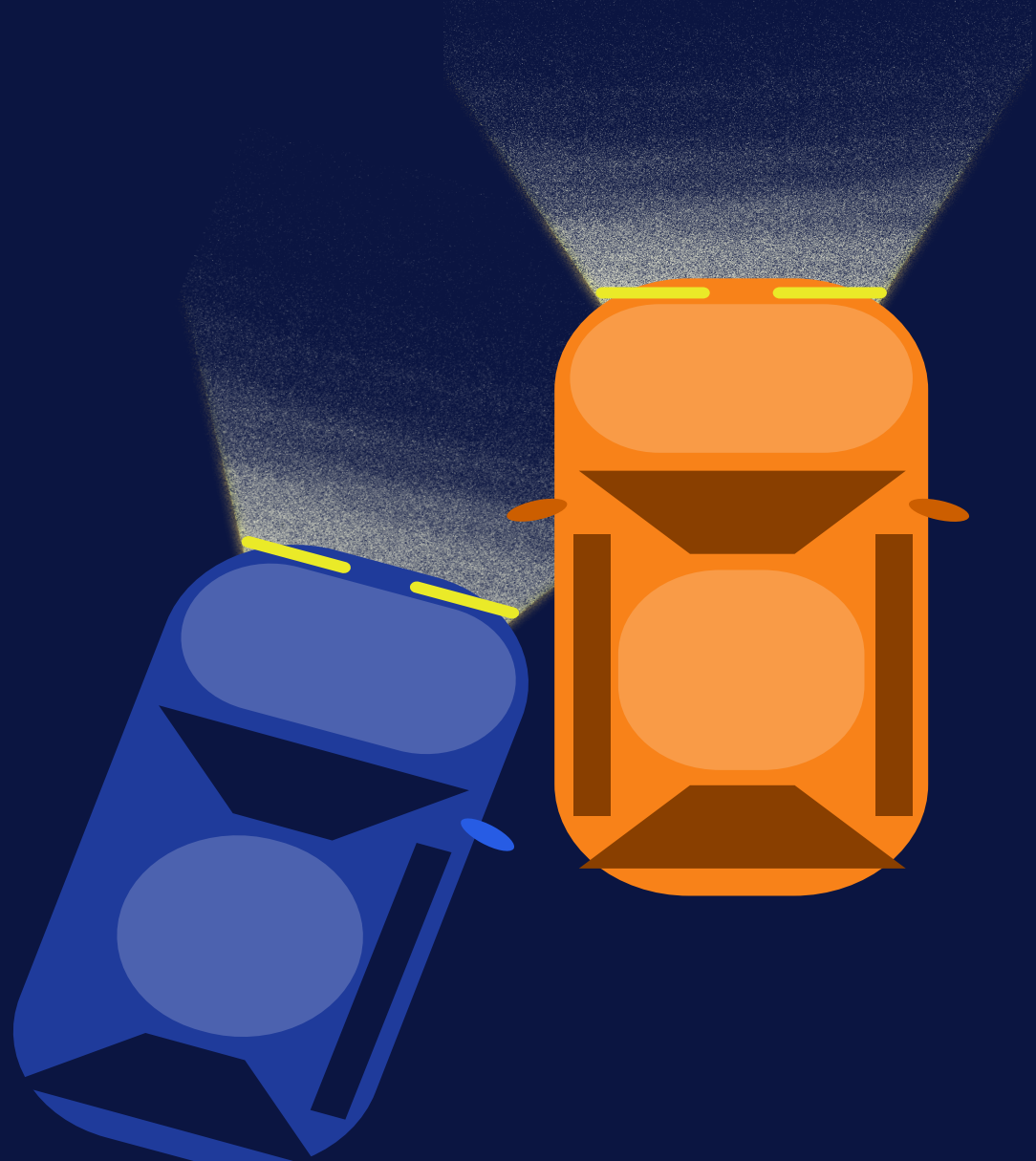
- Category Table:

CategoryID	Size	TYPE	Description
CT001	Small	Sedan	Compact sedan for city driving
CT002	Medium	SUV	Sport Utility Vehicle for families
CT003	Large	Pickup	Pickup truck for heavy loads
CT004	Small	Coupe	Stylish two-door car
CT005	Medium	Hatchback	Versatile hatchback for all needs
CT006	Large	Van	Spacious van for large groups
CT007	Medium	Convertible	Open-top car for fun driving
CT008	Small	Electric	Eco-friendly electric vehicle
CT009	Large	Luxury	High-end luxury vehicle
CT010	Medium	Crossover	Crossover vehicle for comfort

Phase 5: MySQL Queries

• MySQL Queries

40 queries in total were inserted and executed in the Car Rental Schema (20 basic queries + 20 advanced queries).



• Basic Queries:

1. Find total number of employees:

```
SELECT COUNT(employeeID)
"Total Number of Employees"
FROM Employee;
```

```
246
247 • SELECT COUNT(employeeID) "Total Number of Employees " FROM Employee;
248
249 • SELECT * FROM Employee;
250
251 • UPDATE Employee SET jobposition = 'Admin' WHERE employeeID = 'E002';
252
253 • SELECT * FROM User WHERE fname LIKE 'J____';
254
255 • SELECT * FROM Customer WHERE gender = 'M';
256
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

	Total Number of Employees
▶	10

2. Find the longest rental duration by customer:

```
SELECT CustomerID, MAX(Duration)
AS LongestDuration
FROM Customer c
JOIN User u
ON c.UserID = u.UserID
JOIN RentalOrder r
ON c.CustomerID = r.CustomerID
GROUP BY CustomerID
ORDER BY LongestDuration DESC;
```

```
279 • SELECT c.CustomerID, MAX(Duration) AS LongestDuration
280 FROM Customer c
281 JOIN User u ON c.UserID = u.UserID JOIN RentalOrder r ON c.CustomerID = r.CustomerID
282 GROUP BY CustomerID
283 ORDER BY LongestDuration DESC;
```

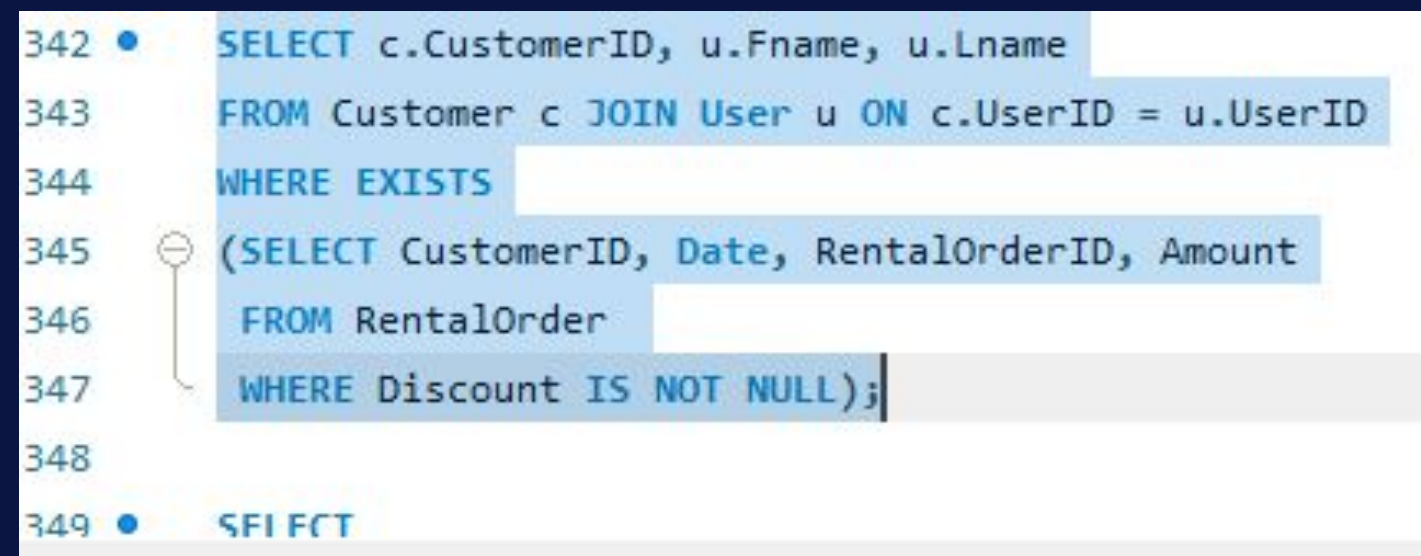
Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

	CustomerID	LongestDuration
▶	C001	3 Days
	C002	1 Day

• Advanced Queries:

1. Find customers who have used discounts:

```
SELECT c.CustomerID, u.Fname, u.Lname
FROM Customer c JOIN User u ON c.UserID = u.UserID
WHERE EXISTS
    (SELECT CustomerID, RentalOrderID, Amount
     FROM RentalOrder
     WHERE Discount IS NOT NULL);
```



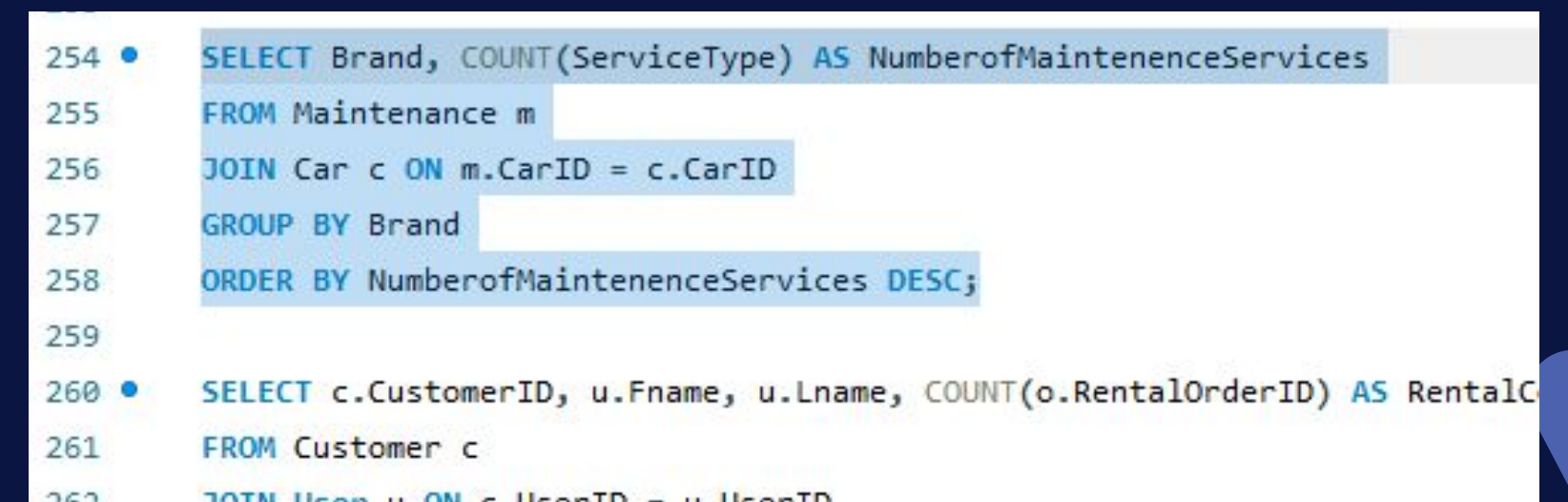
342 • SELECT c.CustomerID, u.Fname, u.Lname
343 FROM Customer c JOIN User u ON c.UserID = u.UserID
344 WHERE EXISTS
345 (SELECT CustomerID, Date, RentalOrderID, Amount
346 FROM RentalOrder
347 WHERE Discount IS NOT NULL);
348
349 • SELECT

Result Grid | Filter Rows: | Export: | Wrap Cell Content

	CustomerID	Fname	Lname
•	C001	Alice	Smith
	C002	Bob	Johnson
	C003	John	Doe
	C004

2. Display customers who have rented a car that's purpose isn't vacation:

```
SELECT c.customerID, u.fname, u.lname
FROM FROM Customer c JOIN User u ON c.UserID = u.UserID
WHERE customerID NOT IN
    (SELECT customerID
     FROM RentalOrder
     WHERE purpose = 'Vacation' );
```



254 • SELECT Brand, COUNT(ServiceType) AS NumberofMaintenanceServices
255 FROM Maintenance m
256 JOIN Car c ON m.CarID = c.CarID
257 GROUP BY Brand
258 ORDER BY NumberofMaintenanceServices DESC;
259
260 • SELECT c.CustomerID, u.Fname, u.Lname, COUNT(o.RentalOrderID) AS RentalC
261 FROM Customer c
262 JOIN User u ON c.UserID = u.UserID

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

	Brand	NumberofMaintenanceServices
►	Toyota	1
	Honda	1
	Ford	1

IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members, and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

I. To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities.

1. to hold paramount, the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, to protect the privacy of others, and to disclose promptly factors that might endanger the public or the environment;
2. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;
3. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
4. to avoid unlawful conduct in professional activities, and to reject bribery in all its forms;
5. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, to be honest, and realistic in stating claims or estimates based on available data, and to credit properly the contributions of others;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;

II. To treat all persons fairly and with respect, to avoid harassment or discrimination, and to avoid injuring others.

7. to treat all persons fairly and with respect, and to not engage in discrimination based on characteristics such as race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
8. to not engage in harassment of any kind, including sexual harassment or bullying behavior;
9. to avoid injuring others, their property, reputation, or employment by false or malicious actions, rumors, or any other verbal or physical abuses;

III. To strive to ensure this code is upheld by colleagues and co-workers.

10. to support colleagues and co-workers in following this code of ethics, to strive to ensure the code is upheld, and to not retaliate against individuals reporting a violation.

***Adopted by the
IEEE Board of Directors
June 2020***

CCIS

كلية علوم الحاسب والمعلومات
COLLEGE OF COMPUTER &
INFORMATION SCIENCES

جامعة الأمير سلطان
PRINCE SULTAN
UNIVERSITY



Thank You!

