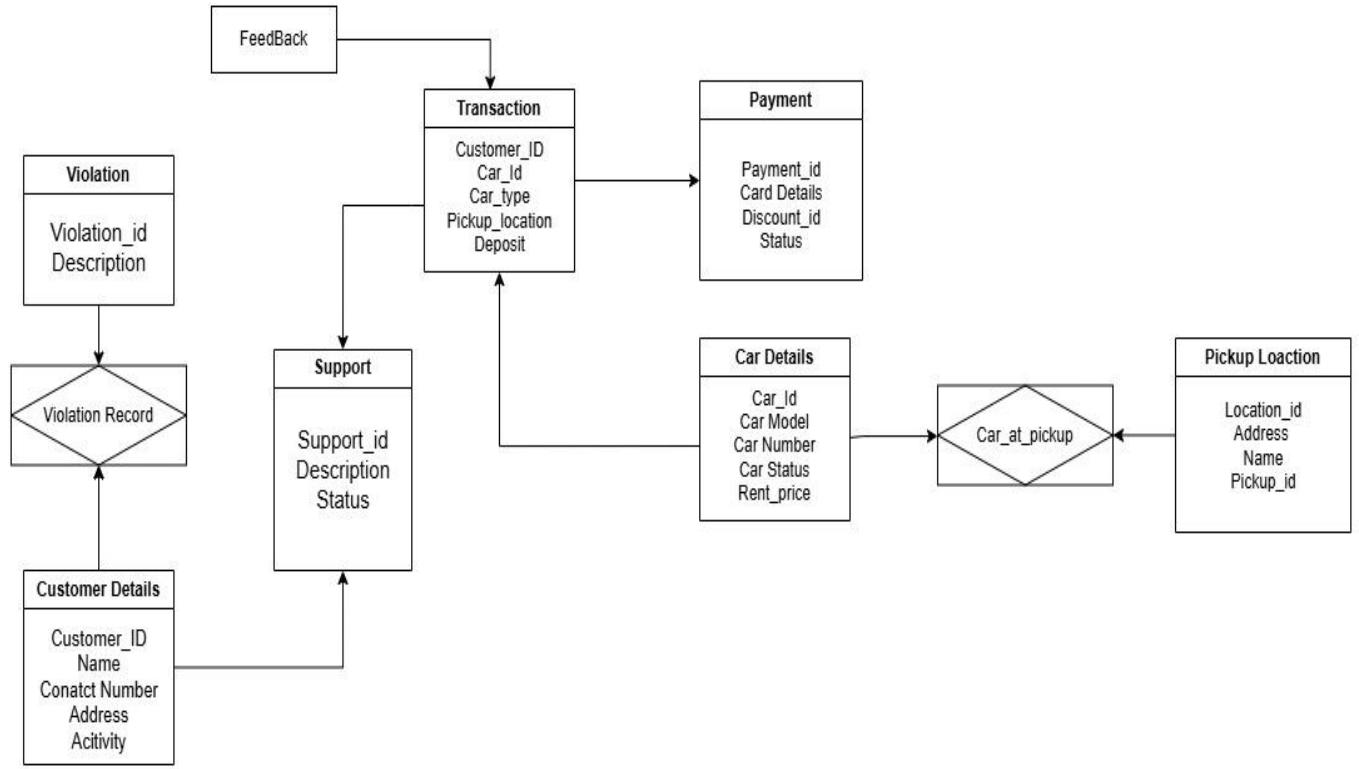


DAMG6210 Database Design Document – Project Part 2

1. Team Introduction

Name	Responsibility
Komal	Normalization
Hammad	Normalization
Yaksha	Normalization

Conceptual Diagram



Normalization:

STAGE 1: FIRST NORMAL FORM (1NF)

Objective: Eliminate repeating groups and ensure atomic values

Transformation Process:

STEP 1: Remove repeating groups by creating separate tables for entities with multi-valued attributes.

STEP 2: Ensure all attributes contain only atomic (indivisible) values.

1. Customer (Split Name, Remove Address & Activity)

Customer_ID (PK)	First_Name	Last_Name	Date_of_Birth	Email_ID (U)	Contact_Number (U)	License_Number (U)
C001	John	Smith	1990-05-15	john@email.com	1234567890	DL123456

Changes: Name → First_Name + Last_Name; Added DOB, Email, License; Removed Address & Activity (moved to separate tables)

2. Customer_Address (New - Extracted from Customer)

Address_ID (PK)	Customer_ID (FK)	Address_Type	Address_Line_1	Address_Line_2	City	State	Zip_Code
A001	C001	Home	123 Main St	Apt 4B	Boston	MA	02101

Changes: Address split into atomic components; Allows multiple addresses per customer

3. Customer_Activity (New - Extracted from Customer)

Activity_ID (PK)	Customer_ID (FK)	Login_Time	Logout_Time
ACT001	C001	2024-01-15 09:00	2024-01-15 17:00
ACT002	C001	2024-01-16 10:00	2024-01-16 18:00

Changes: Repeating activity groups → Separate table with individual records

4. Ride_Transaction (Added PK and atomic values)

Transaction_ID (PK)	Customer_ID (FK)	Car_Id (FK)	Car_Type	Pickup_Location (FK)	Deposit	Transaction_Date	Start_Time	End_Time	Distance	Status
T001	C001	CA R01	SUV	L001	500	2024-01-15	09:00	17:00	150	Completed

Changes: Added Transaction_ID as PK; Added date/time fields; Pickup_location now references Location_ID

5. Payment (Split Card_Details)

Payment_ID (PK)	Card_Number (U)	CVV	Transaction_ID (FK)	Discount_ID (FK)	Payment_Status	Charge_Type	Amount	Discount
P001	4111111111111111	123	T001	D001	Completed	Hourly	400	50

Changes: Card_Details → Card_Number + CVV; Added Amount, Charge_Type, Discount

6. Car (Added missing attributes)

Car_ID (PK)	Car_Type	Car_Make	Car_Model	Car_Number (U)	Capacity	Rate_Hr
CAR01	SUV	Honda	CR-V	ABC-1234	5	50

Changes: Added Car_Type, Car_Make, Capacity, Rate_Hr; Renamed Rent_price → Rate_Hr

7. Pickup_Location (Atomic address, removed redundant ID)

Location_ID (PK)	Name	City	State	Zip_Code
L001	Downtown Hub	Boston	MA	02101

Changes: Address → City + State + Zip_Code; Removed redundant Pickup_id

8. Violation (No change needed)

Violation_ID (PK)	Description
V001	Speeding

9. Violation_Record (New - Junction table)

Record_ID (PK)	Violation_ID (FK)	Customer_ID (FK)	Record_Time
VR001	V001	C001	2024-01-15 14:30

Changes: Created proper junction table with timestamp

10. Support (Added Transaction link and date)

Support_ID (PK)	Transaction_ID (FK)	Description	Status	Support_Date
S001	T001	Car breakdown	Open	2024-01-15

Changes: Added Transaction_ID FK; Added Support_Date

11. Feedback (New - Defined attributes)

Feedback_ID (PK)	Transaction_ID (FK)	Ratings	Comments	Feedback_Type	Feedback_Date
F001	T001	5	Great service	Service	2024-01-16

Changes: Created complete table with all attributes

12. Car_at_Pickup (New - Junction table)

Car_at_Pickup_ID (PK)	Car_ID (FK)	Location_ID (FK)	Status
CP001	CAR01	L001	Available

Changes: Created proper junction table for Car-Location relationship

SECOND NORMAL FORM (2NF)

Objective: Eliminate partial dependencies (non-key attributes depending on only part of a composite primary key)

1. Ride_Transaction (Remove Car_type, use Car_at_Pickup_ID)

Transaction_ID (PK)	Customer_ID (FK)	Car_at_Pickup_ID (FK)	Transaction_Date	Start_Time	End_Time	Distance	Status
T001	C001	CP001	2024-01-15	09:00	17:00	150	Completed

Changes:

- Removed Car_type (already in Car table)
- Removed Car_Id and Pickup_location → Now uses Car_at_Pickup_ID (FK)
- This links transaction to specific car at specific location

THIRD NORMAL FORM (3NF)

Objective: Eliminate transitive dependencies (non-key attributes depending on other non-key attributes)

No changes needed from 2NF to 3NF!

1. CUSTOMER

Column	Data Type	Constraint
Customer_ID	Number(25)	PRIMARY KEY
First_Name	Varchar2(50)	
Last_Name	Varchar2(50)	
Date_of_Birth	Date	
Email_ID	Varchar2(50)	UNIQUE
Contact_Number	Number(10)	UNIQUE
License_Number	Varchar2(25)	UNIQUE

2. CUSTOMER_ADDRESS

Column	Data Type	Constraint
Address_ID	Number(25)	PRIMARY KEY
Customer_ID	Number(25)	FOREIGN KEY → CUSTOMER
Address_Type	VARCHAR2(50)	
Address_Line_1	VARCHAR2(50)	
Address_Line_2	VARCHAR2(50)	
City	VARCHAR2(50)	
State	VARCHAR2(50)	
Zip_Code	VARCHAR2(10)	

3. CUSTOMER_ACTIVITY

Column	Data Type	Constraint
Activity_ID	Number(20)	PRIMARY KEY
Login_Time	Timestamp	
Logout_Time	Timestamp	
Customer_ID	Number(25)	FOREIGN KEY → CUSTOMER

4. CAR

Column	Data Type	Constraint
Car_ID	Number(25)	PRIMARY KEY
Car_Type	VARCHAR2(10)	
Car_Make	VARCHAR2(20)	
Car_Model	VARCHAR2(20)	
Car_Number	VARCHAR2(20)	UNIQUE
Capacity	Number(20)	
Rate_Hr	Number(10)	

5. PICKUP_LOCATION

Column	Data Type	Constraint
Location_ID	Number(20)	PRIMARY KEY
Name	VARCHAR2(20)	
City	VARCHAR2(20)	
State	VARCHAR2(10)	
Zip_Code	VARCHAR2(25)	

6. CAR_AT_PICKUP

Column	Data Type	Constraint
Car_at_Pickup_ID	Number(25)	PRIMARY KEY
Car_ID	Number(25)	FOREIGN KEY → CAR
Location_ID	Number(20)	FOREIGN KEY → PICKUP_LOCATION
Status	Varchar2(10)	

7. RIDE_TRANSACTION

Column	Data Type	Constraint
Transaction_ID	Number(25)	PRIMARY KEY
Customer_ID	Number(25)	FOREIGN KEY → CUSTOMER
Car_at_Pickup_ID	Number(25)	FOREIGN KEY → CAR_AT_PICKUP
Transaction_Date	Date	
Start_Time	Timestamp	
End_Time	Timestamp	
Distance	Number(25)	
Status	Varchar2(10)	

8. PAYMENT

Column	Data Type	Constraint
Payment_ID	Number(20)	PRIMARY KEY
Card_Number	Number(20)	UNIQUE
CVV	Number(10)	
Transaction_ID	Number(25)	FOREIGN KEY → RIDE_TRANSACTION
Discount_ID	Number(20)	FOREIGN KEY
Payment_Status	Varchar2(10)	
Charge_Type	Varchar2(10)	
Amount	Number(20)	
Discount	Varchar2(20)	

9. FEEDBACK

Column	Data Type	Constraint
Feedback_ID	Number(20)	PRIMARY KEY
Transaction_ID	Number(25)	FOREIGN KEY → RIDE_TRANSACTION
Ratings	Number(10)	
Comments	Varchar2(100)	
Feedback_Type	Varchar2(10)	
Feedback_Date	Date	

10. SUPPORT

Column	Data Type	Constraint
Support_ID	Number(20)	PRIMARY KEY
Transaction_ID	Number(25)	FOREIGN KEY → RIDE_TRANSACTION
Description	Varchar2(50)	
Status	Varchar2(20)	
Support_Date	Date	

11. VIOLATION

Column	Data Type	Constraint
Violation_ID	Number(20)	PRIMARY KEY
Description	Varchar2(50)	

12. VIOLATION_RECORD

Column	Data Type	Constraint
Record_ID	Number(20)	PRIMARY KEY
Violation_ID	Number(20)	FOREIGN KEY → VIOLATION
Customer_ID	Number(25)	FOREIGN KEY → CUSTOMER
Record_Time	Timestamp	

Final ER

