Online Price Comparison Platform

Final Project Report – Group 10

BUAN 6320.006

Database Foundations for Business Analytics

Submitted by:

Tanmay Itkelwar - txi220001@utdallas.edu

Utkarsh Mishra - uxm230003@utdallas.edu

Karan Paresh Desai - kpd230001@utdallas.edu

Shivraj Daware - sxd220207@utdallas.edu

Submitted to:

Dr. Lidong Wu

Table of Content

1. Introduction

Our platform simplifies online shopping by allowing users to compare real-time prices of the same product offered on multiple e-commerce websites. We consider additional expenses such as distance and travel time and provide a marketplace that compares all available options for a particular product. This helps users find the most economical option for their needs quickly and easily.

This report outlines the implementation phase of the database project, focusing on the creation of the database, table setup, data population, and SQL queries. Our project utilizes the MySQL database management system. Part is the database creation, including tables, all other structures as well as constraints, data type and format, Part 2 is the query scenario design and implementation.

2. System Requirements Identification

2.1. Information needs:

    I.   Data of latest prices of the stores

    II.   GPS location

    III.   Hyper link of other websites
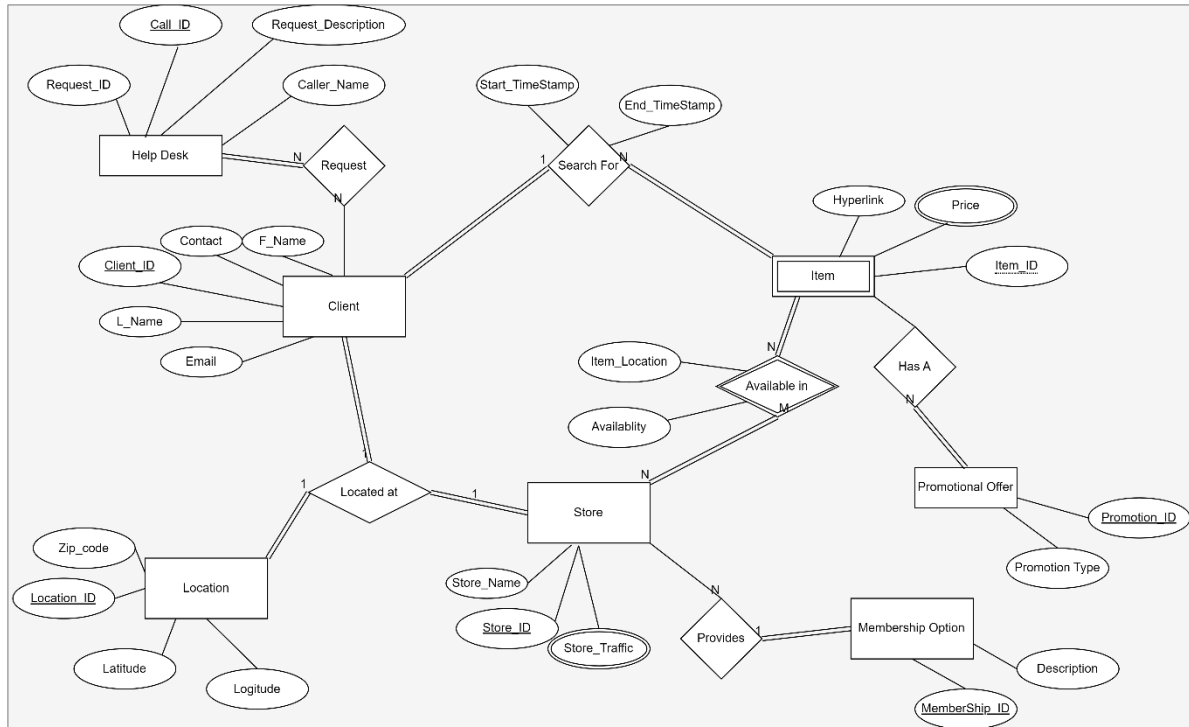
2.2. List of entities as identified

    I.   Client

    II.   Store

    III.   Departments

    IV.   Item

    V.   Location

    VI.   Hyperlink

    VII. Price options

    VIII. Membership option

    IX.   Distance

    X.   Store traffic monitor

    XI.   Promotional offers
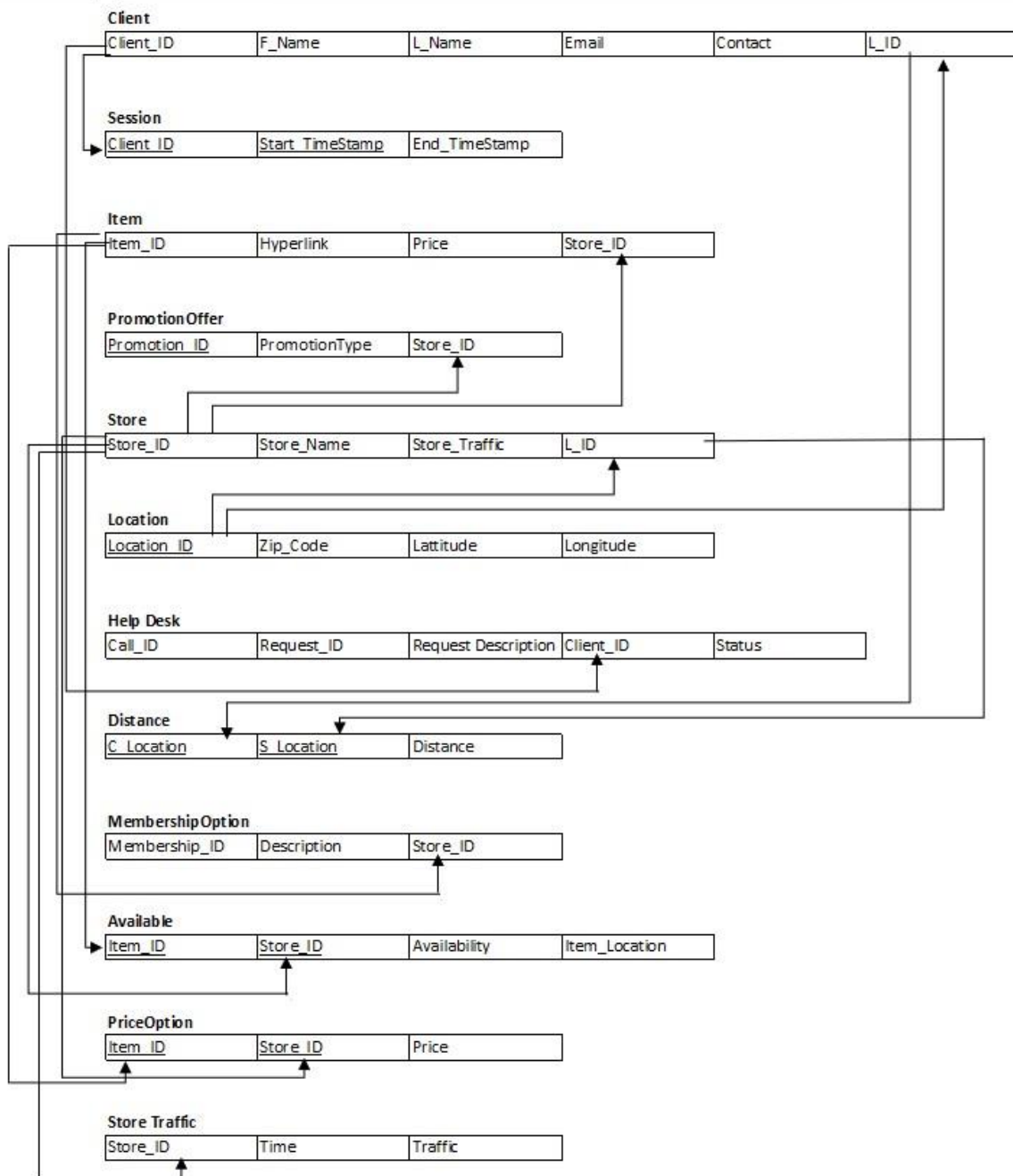
    XII. Help Desk

3. Conceptual Design

Here is the EER diagram generated based on both our project description and real-life experiences.

3.1. EER diagram with all assumptions

4. Relational Schema

4.1. Relational Schema

Client

Client_ID	F_Name	L_Name	Email	Contact	L_ID

Session

Client_ID	Start_TimeStamp	End_TimeStamp

Item

Item_ID	Hyperlink	Price	Store_ID

Promotion Offer

Promotion_ID	PromotionType	Store_ID

Store

Store_ID	Store_Name	Store_Traffic	L_ID

Location

Location_ID	Zip_Code	Lattitude	Longitude

Help Desk

Call_ID	Request_ID	Request Description	Client_ID	Status

Distance

C_Location	S_Location	Distance

Membership Option

Membership_ID	Description	Store_ID

Available

Item_ID	Store_ID	Availability	Item_Location

PriceOption

Item_ID	Store_ID	Price

Store Traffic

Store_ID	Time	Traffic

5. Data Type Declaration

Relational Names	Attributes	Data Types
Client	Client_ID	VARCHAR(20)
	F_Name	VARCHAR(20)
	L_Name	VARCHAR(20)
	Email	VARCHAR(20)
	Contact	BIGINT(11)
	L_ID	VARCHAR(20)

Relational Names	Attributes	Data Types
Session	Client_ID	VARCHAR(20)
	Start_TimeStamp	TIMESTAMP
	End_TimeStamp	TIMESTAMP

Relational Names	Attributes	Data Types
Item	Item_ID	VARCHAR(20)
	Item_Name	VARCHAR(20)

Relational Names	Attributes	Data Types
PromotionOffer	Promotion_ID	VARCHAR(20)
	PromotionType	VARCHAR(20)
	Store_ID	VARCHAR(20)

Relational Names	Attributes	Data Types
Store	Store_ID	VARCHAR(20)
	Store_Name	VARCHAR(20)

Relatoinal Names	Attributes	Data Types
Location	Location_ID	VARCHAR(20)
	Zip_Code	INT
	Lattitude	DECIMAL(25,23)
	Longitude	DECIMAL(25,23)

Relational Names	Attributes	Data Types
Help Desk	Call_ID	VARCHAR(20)
	Request_ID	VARCHAR(20)
	RequestDesciption	VARCHAR(20)
	Client_ID	VARCHAR(20)
	Store_Sr_Num	VARCHAR(20)
	Request_Status	VARCHAR(20)

Relational Names	Attributes	Data Types
MembershipOption	Membership_ID	VARCHAR(20)
	Membership_Description	VARCHAR(20)
	Store_ID	VARCHAR(20)

Relational Names	Attributes	Data Types
Store_Details	Serial_Number	VARCHAR(30)
	Store_ID	VARCHAR(20)
	Pharmacy	BOOLEAN
	Gas_Station	BOOLEAN
	Address	VARCHAR(50)
	L_ID	VARCHAR(20)

Relational Names	Attributes	Data Types
Item_Details	Item_ID	VARCHAR(20)
	Hyperlink	VARCHAR(120)
	Price	FLOAT
	Descriptions	VARCHAR(120)
	Store_Sr_Num	VARCHAR(20)
	Availability	VARCHAR(20)
	Item_Location	VARCHAR(20)

Relational Names	Attributes	Data Types
StoreTraffic	Store_ID	VARCHAR(20)
	Time_Period	VARCHAR(20)
	Traffic	VARCHAR(20)

6. Normalization

6.1. Remove Partial Dependencies:

All tables seem to be in 1NF, and no partial dependencies are apparent.

6.2. Remove Transitive Dependencies:

All tables seem to be in 2NF, and no transitive dependencies are apparent.

6.3. Remove Remaining Dependencies:

All tables are now in 3NF. No remaining dependencies.

7. Creation of Database with SQL Statements

7.1. Location:

```
CREATE TABLE Location (
    Location_ID VARCHAR(20),
    Zip_Code INT,
    Lattitude DECIMAL(25,23),
    Longitude DECIMAL(25,23),
    PRIMARY KEY (Location_ID)
);
```

7.2. Client:

```
CREATE TABLE Client (
    Client_ID VARCHAR(20),
    F_Name VARCHAR(20),
    L_Name VARCHAR(20),
    Email VARCHAR(40),
    Contact BIGINT(11),
    L_ID VARCHAR(20),
    PRIMARY KEY (Client_ID),
        FOREIGN KEY (L_ID) REFERENCES Location(Location_ID)
);
```

7.3. Session:

```
CREATE TABLE Session (
    Client_ID VARCHAR(20),
    Start_TimeStamp TIMESTAMP,
    End_TimeStamp TIMESTAMP,
    PRIMARY KEY (Client_ID, Start_TimeStamp),
    FOREIGN KEY (Client_ID) REFERENCES Client(Client_ID)
);
```

7.4. Store:

```
CREATE TABLE Store (
    Store_ID VARCHAR(20),
    Store_Name VARCHAR(20),
        Store_Timings varchar(20),
    PRIMARY KEY (Store_ID)
);
```

7.5. Store_Details:

```
CREATE TABLE Store_Details (
    Serial_Number varchar(30),
    Store_ID VARCHAR(20),
    Pharmacy BOOLEAN,
    Gas_Station Boolean,
    Address varchar(50),
    L_ID VARCHAR(20),
    PRIMARY KEY (Serial_Number),
    FOREIGN KEY (Store_ID) REFERENCES Store(Store_ID),
    FOREIGN KEY (L_ID) REFERENCES Location(Location_ID)

);
```

7.6. Item:

```
CREATE TABLE Item (
    Item_ID VARCHAR(20),
    Item_Name VARCHAR(20),
    PRIMARY KEY (Item_ID)
    );
```

7.7. Item_Details:

```
CREATE TABLE Item_details (
    Item_ID VARCHAR(20),
```

```
    Hyperlink VARCHAR(120),
    Price float,
    Descriptions VARCHAR(120),
    Store_Sr_Num VARCHAR(20),
        Availability Varchar(20),
    Item_Location Varchar(20),
    PRIMARY KEY (Item_ID, Store_Sr_Num),
        FOREIGN KEY (Item_ID) REFERENCES Item(Item_ID),
    FOREIGN KEY (Store_Sr_Num) REFERENCES Store_Details(Serial_Number)
);
```

7.8. PromotionOffer:

```
CREATE TABLE PromotionOffer (
    Promotion_ID VARCHAR(20),
    PromotionType VARCHAR(20),
    Store_ID VARCHAR(20),
    PRIMARY KEY (Promotion_ID),
    FOREIGN KEY (Store_ID) REFERENCES Store(Store_ID)
);
```

7.9. HelpDesk:

```
CREATE TABLE HelpDesk (
    Call_ID VARCHAR(20),
    Request_ID VARCHAR(20),
    RequestDescription VARCHAR(20),
    Client_ID VARCHAR(20),
    Store_Sr_Num Varchar(20),
    Request_Status VARCHAR(20),
    PRIMARY KEY (Call_ID),
    FOREIGN KEY (Client_ID) REFERENCES Client(Client_ID),
    FOREIGN KEY (Store_Sr_Num) REFERENCES Store_Details(Serial_Number)
);
```

7.10. MembershipOption:

```
CREATE TABLE MembershipOption (
    Membership_ID VARCHAR(20),
    Membership_Description VARCHAR(20),
    Store_ID VARCHAR(20),
    PRIMARY KEY (Membership_ID),
    FOREIGN KEY (Store_ID) REFERENCES Store(Store_ID)
);
```

7.11. StoreTraffic:

```
CREATE TABLE StoreTraffic (
    Store_ID VARCHAR(20),
    Time_period Varchar(20),
    Traffic VARCHAR(20),
    PRIMARY KEY (Store_ID, Time_period),
    FOREIGN KEY (Store_ID) REFERENCES Store(Store_ID)
);
```

8. Population of Database

Sample data was inserted into each table to ensure the database is populated for testing and development purposes. The following records were added to each table, maintaining data consistency and validity.

8.1. Insertion Of Table Location

INSERT INTO Location (Location_ID, Zip_Code, Lattitude, Longitude)
VALUES

    ('L1', 75081,33.03364483352096, -96.82584643629059),
    ('L2', 75075, 33.042373925337245, -96.70668683794484),
    ('L3', 75093,33.024730807286716, -96.83334374762822),
    ('L4', 75080, 33.005155199794544, -96.72976548890776),
    ('L5', 75075,33.00507343837356, -96.7699564772466),
    ('L6', 75075, 33.0109674833112, -96.77027720334245),
    ('L7', 75074,33.04487011039476, -96.700020437452),
    ('L8', 75080, 32.965070896271, -96.7506748041237),
    ('L9', 75024,33.08153351525038, -96.76487152697649),
    ('L10', 75074, 33.06025736953061, -96.69276405946044),
    ('L11', 75023,33.06180008766675, -96.70345630413705),
    ('L12', 75080, 33.08153351525038, -96.76487152697649),
    ('L13', 75080,32.99350830023068, -96.75016125806196),
    ('L14', 75080, 32.99351378578118, -96.7486700722981),
    ('L15', 75080,32.99372223645754, -96.74747319958543),
    ('L16', 75080, 32.99486322087502, -96.74976884074007),
    ('L17', 75252,32.99913178223901, -96.77243000436805),
    ('L18', 75080, 32.982357671675004, -96.76284434742736),
    ('L19', 75252,32.998438918833, -96.77555303733077),
    ('L21', 75080,32.99842504547647, -96.73359790514527),
    ('L22', 75080, 33.001401432248144, -96.73220680514513);

	Location_ID	Zip_Code	Lattitude	Longitude
▶	L1	75081	33.0336448335209600000000	-96.8258464362905900000000
	L10	75074	33.0602573695306100000000	-96.6927640594604400000000
	L11	75023	33.0618000876667500000000	-96.7034563041370500000000
	L12	75080	33.0815335152503800000000	-96.7648715269764900000000
	L13	75080	32.9935083002306800000000	-96.7501612580619600000000
	L14	75080	32.9935137857811800000000	-96.7486700722981000000000
	L15	75080	32.9937222364575400000000	-96.7474731995854300000000
	L16	75080	32.9948632208750200000000	-96.7497688407400700000000
	L17	75252	32.9991317822390100000000	-96.7724300043680500000000
	L18	75080	32.9823576716750040000000	-96.7628443474273600000000
	L19	75252	32.9984389188330000000000	-96.7755530373307700000000
	L2	75075	33.0423739253372450000000	-96.7066868379448400000000
	L21	75080	32.9984250454764700000000	-96.7335979051452700000000
	L22	75080	33.0014014322481440000000	-96.7322068051451300000000
	L3	75093	33.0247308072867160000000	-96.8333437476282200000000
	L4	75080	33.0051551997945440000000	-96.7297654889077600000000
	L5	75075	33.0050734383735600000000	-96.7699564772466000000000
	L6	75075	33.0109674833112000000000	-96.7702772033424500000000
	L7	75074	33.0448701103947600000000	-96.7000204374520000000000
	L8	75080	32.9650708962710000000000	-96.7506748041237000000000
	L9	75024	33.0815335152503800000000	-96.7648715269764900000000

8.2. Insertion Of Table Client

INSERT INTO Client (Client_ID, F_Name, L_Name, Email, Contact, L_ID)

VALUES

('C1', 'John', 'Doe', 'john.doe@email.com', 1234567890,'L13'),

('C2', 'Jane', 'Smith', 'jane.smith@email.com', 9876543210,'L14'),

('C3', 'Mike', 'Johnson', 'mike.johnson@email.com', 5551234567,'L15'),

('C4', 'Emily', 'Williams', 'emily.williams@email.com', 7890123456,'L16'),

('C5', 'David', 'Jones', 'david.jones@email.com', 2345678901, 'L17'),

('C6', 'Sarah', 'Brown', 'sarah.brown@email.com', 8765432109,'L18'),

('C7', 'Chris', 'Miller', 'chris.miller@email.com', 3210987654, 'L19'),

('C8', 'Amanda', 'Clark', 'amanda.clark@email.com', 6543210987,null),

('C9', 'Brian', 'Taylor', 'brian.taylor@email.com', 9876543210,'L21'),

('C10', 'Linda', 'Martin', 'linda.martin@email.com', 1234567890,'L22');

	Client_ID	F_Name	L_Name	Email	Contact	L_ID
▶	C1	John	Doe	john.doe@email.com	1234567890	L13
	C10	Linda	Martin	linda.martin@email.com	1234567890	L22
	C2	Jane	Smith	jane.smith@email.com	9876543210	L14
	C3	Mike	Johnson	mike.johnson@email.com	5551234567	L15
	C4	Emily	Williams	emily.williams@email.com	7890123456	L16
	C5	David	Jones	david.jones@email.com	2345678901	L17
	C6	Sarah	Brown	sarah.brown@email.com	8765432109	L18
	C7	Chris	Miller	chris.miller@email.com	3210987654	L19
	C8	Amanda	Clark	amanda.clark@email.com	6543210987	NULL
	C9	Brian	Taylor	brian.taylor@email.com	9876543210	L21

8.3. Insertion Of Table Session

INSERT INTO Session (Client_ID, Start_TimeStamp, End_TimeStamp)

VALUES

    ('C1', '2023-11-21 10:00:00', '2023-11-21 12:00:00'),

    ('C2', '2023-11-21 14:00:00', '2023-11-21 16:00:00'),

     ('C3', '2023-11-21 10:00:00', '2023-11-21 12:00:00'),

    ('C4', '2023-11-21 14:00:00', '2023-11-21 16:00:00'),

    ('C5', '2023-11-22 09:30:00', '2023-11-22 11:30:00'),

    ('C6', '2023-11-22 13:45:00', '2023-11-22 15:45:00'),

    ('C7', '2023-11-23 11:00:00', '2023-11-23 13:00:00'),

    ('C8', '2023-11-23 15:30:00', '2023-11-23 17:30:00'),

    ('C9', '2023-11-24 12:15:00', '2023-11-24 14:15:00'),

    ('C10', '2023-11-24 16:45:00', '2023-11-24 18:45:00'),

    ('C2', '2023-11-25 10:30:00', '2023-11-25 12:30:00'),

    ('C6', '2023-11-25 14:00:00', '2023-11-25 16:00:00'),

    ('C8', '2023-11-26 11:30:00', '2023-11-26 13:30:00'),

    ('C8', '2023-11-26 14:45:00', '2023-11-26 16:45:00'),

    ('C9', '2023-11-27 10:00:00', '2023-11-27 12:00:00'),

    ('C1', '2023-11-27 13:15:00', '2023-11-27 15:15:00'),

    ('C4', '2023-11-28 12:45:00', '2023-11-28 14:45:00');

Client_ID	Start_TimeStamp	End_TimeStamp
C1	2023-11-21 10:00:00	2023-11-21 12:00:00
C1	2023-11-27 13:15:00	2023-11-27 15:15:00
C10	2023-11-24 16:45:00	2023-11-24 19:45:00
C2	2023-11-21 14:00:00	2023-11-21 16:00:00
C2	2023-11-25 10:30:00	2023-11-25 12:30:00
C3	2023-11-21 10:00:00	2023-11-21 12:30:00
C4	2023-11-21 14:00:00	2023-11-21 15:30:00
C4	2023-11-28 12:45:00	2023-11-28 14:45:00
C5	2023-11-22 09:30:00	2023-11-22 11:30:00
C6	2023-11-22 13:45:00	2023-11-22 15:45:00
C6	2023-11-25 14:00:00	2023-11-25 16:00:00
C7	2023-11-23 11:00:00	2023-11-23 13:00:00
C8	2023-11-23 15:00:00	2023-11-23 17:30:00
C8	2023-11-26 11:30:00	2023-11-26 12:30:00
C8	2023-11-26 14:45:00	2023-11-26 16:45:00
C9	2023-11-24 12:15:00	2023-11-24 14:15:00
C9	2023-11-27 10:00:00	2023-11-27 12:00:00

8.4. Insertion Of Table Store

INSERT INTO Store (Store_ID, Store_Name, Store_Timings)
VALUES

('S1', 'Target',' 7:00 AM - 10:00 PM '),

('S2', 'Costco', '10:00 AM - 8:30 PM '),

('S3', 'Tom Thumb',' 6:00 AM - 11:00 PM '),

('S4', 'Sams Club', '10:00 AM - 8:00 PM '),

('S5', 'Walmart', ' 6:00 AM - 11:00 PM '),

('S6', 'Patel Brothers','10:30 AM - 9:00 PM '),

('S7', 'India Bazaar', '9:00 AM - 9:00 PM '),

('S8', 'Desi Brothers', '10:00 AM - 9:00 PM ');

	Store_ID	Store_Name	Store_Timings
▶	S1	Target	7:00 AM - 10:00 PM
	S2	Costco	10:00 AM - 8:30 PM
	S3	Tom Thumb	6:00 AM - 11:00 PM
	S4	Sams Club	10:00 AM - 8:00 PM
	S5	Walmart	6:00 AM - 11:00 PM
	S6	Patel Brothers	10:30 AM - 9:00 PM
	S7	India Bazaar	9:00 AM - 9:00 PM
	S8	Desi Brothers	10:00 AM - 9:00 PM

8.5. Insertion Of Table Store_Details

INSERT INTO Store_Details (Serial_Number, Store_ID, Pharmacy, Gas_Station , Address, L_ID)

VALUES

('S1L1','S1', True , True,'601 S Plano Rd, Richardson, TX', 'L1'),

('S1L2' ,'S1',True , False, '16731 Coit Rd, Dallas, TX', 'L2'),

('S2L3','S2',True , True , '3800 N Central Expy, Plano, TX', 'L3'),

('S3L4','S3',True , False, '3411 Custer Pkwy, Richardson, TX','L4'),

('S4L5','S4', False ,True, '301 Coit Rd, Plano, TX', 'L5'),

('S5L6','S5', True , False,'425 Coit Rd, Plano, TX', 'L6'),

('S2L7','S2', True , True,'8055 Churchill Way, Dallas, TX', 'L7'),

('S3L8','S3', True , False,'1380 W Campbell Rd, Richardson, TX', 'L8'),

('S6L9','S6', False , False,'6205 Coit Rd STE 201, Plano, TX','L9'),

('S4L10','S4', False , True,'1200 E Spring Creek Pkwy, Plano','L10'),

('S7L11','S7', False , False, '1425 E Belt Line Rd, Richardson, TX', 'L11'),

('S8L12','S8', False , False,'100 S Central Expy Suite 26C, Richardson, TX', 'L12');

	Serial_Number	Store_ID	Pharmacy	Gas_Station	Address	L_ID
▶	S1L1	S1	1	1	601 S Plano Rd, Richardson, TX	L1
	S1L2	S1	1	0	16731 Coit Rd, Dallas, TX	L2
	S2L3	S2	1	1	3800 N Central Expy, Plano, TX	L3
	S2L7	S2	1	1	8055 Churchill Way, Dallas, TX	L7
	S3L4	S3	1	0	3411 Custer Pkwy, Richardson, TX	L4
	S3L8	S3	1	0	1380 W Campbell Rd, Richardson, TX	L8
	S4L10	S4	0	1	1200 E Spring Creek Pkwy, Plano	L10
	S4L5	S4	0	1	301 Coit Rd, Plano, TX	L5
	S5L6	S5	1	0	425 Coit Rd, Plano, TX	L6
	S6L9	S6	0	0	6205 Coit Rd STE 201, Plano, TX	L9
	S7L11	S7	0	0	1425 E Belt Line Rd, Richardson, TX	L11
	S8L12	S8	0	0	100 S Central Expy Suite 26C, Richa…	L12

8.6. Insertion Of Table Item

INSERT INTO Item (Item_ID,Item_Name)

VALUES

('I1', 'Tomato'),

('I2', 'Onions'),

('I3', 'Electric Scooter'),

('I4', 'Bananas'),

('I5', 'Milk'),

('I6', 'Tide Detergent'),

('I7', 'Toilet Paper');

	Item_ID	Item_Name
▶	I1	Tomato
	I2	Onions
	I3	Electric Scooter
	I4	Bananas
	I5	Milk
	I6	Tide Detergent
	I7	Toilet Paper

8.7. Insertion Of Table Item_Details

INSERT INTO Item_details (Item_ID, Hyperlink, Price, Descriptions, Store_Sr_Num, Availability, Item_Location)

VALUES

('I1', 'www.example.com/product1', 2.29, 'Red Roma 1lb', 'S1L1', 'In Stock', 'Aisle 1'),

('I1', 'www.example.com/product2', 2.39, 'Red Roma 1lb', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I1', 'www.example.com/product3', 3.99, 'Red Roma 1lb', 'S2L3', 'In Stock', 'Aisle 3'),

('I1', 'www.example.com/product4', 4.99, 'Red Roma 1lb', 'S3L4', 'In Stock', 'Aisle 4'),

('I1', 'www.example.com/product5', 2.99, 'Red Roma 1lb', 'S4L5', 'Out of Stock', 'Aisle 5'),

('I1', 'www.example.com/product6', 1.99, 'Red Roma 1lb', 'S5L6', 'In Stock', 'Aisle 6'),

('I1', 'www.example.com/product7', 3.69, 'Red Roma 1lb', 'S2L7', 'In Stock', 'Aisle 7'),

('I1', 'www.example.com/product8', 5.99, 'Red Roma 1lb', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I1', 'www.example.com/product9', 3.89, 'Red Roma 1lb', 'S6L9', 'In Stock', 'Aisle 9'),

('I2', 'www.example.com/product1', 2.29, 'White 1lb', 'S1L1', 'In Stock', 'Aisle 2'),

('I2', 'www.example.com/product2', 2.39, 'White 1lb', 'S1L2', 'Out of Stock', 'Aisle 4'),

('I2', 'www.example.com/product3', 3.99, 'White 1lb', 'S2L3', 'In Stock', 'Aisle 1'),

('I2', 'www.example.com/product4', 4.99, 'White 1lb', 'S3L4', 'In Stock', 'Aisle 3'),

('I2', 'www.example.com/product5', 2.99, 'White 1lb', 'S4L5', 'Out of Stock', 'Aisle 2'),

('I2', 'www.example.com/product6', 1.99, 'White 1lb', 'S5L6', 'In Stock', 'Aisle 5'),

('I2', 'www.example.com/product7', 3.69, 'White 1lb', 'S2L7', 'In Stock', 'Aisle 4'),

('I2', 'www.example.com/product8', 5.99, 'White 1lb', 'S3L8', 'Out of Stock', 'Aisle 2'),

('I2', 'www.example.com/product9', 3.89, 'White 1lb', 'S6L9', 'In Stock', 'Aisle 1'),

('I2', 'www.example.com/product10', 2.49, 'White 1lb', 'S4L10', 'In Stock', 'Aisle 10'),

('I3', 'www.example.com/product1', 300, 'Electric Scooter', 'S1L1', 'In Stock', 'Aisle 1'),

('I3', 'www.example.com/product2', 350, 'Electric Scooter', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I3', 'www.example.com/product3', 400, 'Electric Scooter', 'S2L3', 'In Stock', 'Aisle 3'),

('I3', 'www.example.com/product4', 389, 'Electric Scooter', 'S3L4', 'In Stock', 'Aisle 4'),

('I3', 'www.example.com/product5', 349, 'Electric Scooter', 'S4L5', 'Out of Stock', 'Aisle 5'),

('I3', 'www.example.com/product6', 459, 'Electric Scooter', 'S5L6', 'In Stock', 'Aisle 6'),

('I3', 'www.example.com/product7', 599, 'Electric Scooter', 'S2L7', 'In Stock', 'Aisle 7'),

('I3', 'www.example.com/product8', 649, 'Electric Scooter', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I3', 'www.example.com/product9', 549, 'Electric Scooter', 'S4L10', 'In Stock', 'Aisle 9'),

('I4', 'www.example.com/product1', 1.25, 'Bananas per lb', 'S1L1', 'In Stock', 'Aisle 1'),

('I4', 'www.example.com/product2', 1.35, 'Bananas per lb', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I4', 'www.example.com/product3', 1.2, 'Bananas per lb', 'S2L3', 'In Stock', 'Aisle 3'),

('I4', 'www.example.com/product4', 1.1, 'Bananas per lb', 'S7L11', 'In Stock', 'Aisle 4'),

('I4', 'www.example.com/product5', 1.3, 'Bananas per lb', 'S6L9', 'Out of Stock', 'Aisle 5'),

('I4', 'www.example.com/product6', 1.45, 'Bananas per lb', 'S5L6', 'In Stock', 'Aisle 6'),

('I4', 'www.example.com/product7', 0.9, 'Bananas per lb', 'S8L12', 'In Stock', 'Aisle 7'),

('I4', 'www.example.com/product8', 0.95, 'Bananas per lb', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I4', 'www.example.com/product9', 1.0, 'Bananas per lb', 'S4L10', 'In Stock', 'Aisle 9'),

('I7', 'www.example.com/product1', 18, 'Toilet Paper 16', 'S1L1', 'In Stock', 'Aisle 1'),

('I7', 'www.example.com/product2', 11,'Toilet Paper 18', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I7', 'www.example.com/product3', 13, 'Toilet Paper 15', 'S2L3', 'In Stock', 'Aisle 3'),

('I7', 'www.example.com/product4', 14, 'Toilet Paper 18', 'S3L4', 'In Stock', 'Aisle 4'),

('I7', 'www.example.com/product5', 11, 'Toilet Paper 18', 'S4L5', 'Out of Stock', 'Aisle 5'),

('I7', 'www.example.com/product6', 19, 'Toilet Paper 16', 'S5L6', 'In Stock', 'Aisle 6'),

('I7', 'www.example.com/product7', 17, 'Toilet Paper 20', 'S2L7', 'In Stock', 'Aisle 7'),

('I7', 'www.example.com/product8', 16, 'Toilet Paper 22', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I7', 'www.example.com/product9', 15, 'Toilet Paper 10', 'S4L10', 'In Stock', 'Aisle 9'),

('I5', 'www.example.com/product1', 4.99, 'Milk per gallon', 'S1L1', 'In Stock', 'Aisle 1'),

('I5', 'www.example.com/product2', 4.5, 'Milk per gallon', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I5', 'www.example.com/product3', 5.5, 'Milk per gallon', 'S2L3', 'In Stock', 'Aisle 3'),

('I5', 'www.example.com/product4', 5.85, 'Milk per gallon', 'S7L11', 'In Stock', 'Aisle 4'),

('I5', 'www.example.com/product5', 6.75, 'Milk per gallon', 'S6L9', 'Out of Stock', 'Aisle 5'),

('I5', 'www.example.com/product6', 7.35, 'Milk per gallon', 'S5L6', 'In Stock', 'Aisle 6'),

('I5', 'www.example.com/product7', 6.45, 'Milk per gallon', 'S8L12', 'In Stock', 'Aisle 7'),

('I5', 'www.example.com/product8', 7.35, 'Milk per gallon', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I5', 'www.example.com/product9', 5.0, 'Milk per gallon', 'S4L10', 'In Stock', 'Aisle 9'),

('I6', 'www.example.com/product1', 8.99, 'Detergent', 'S1L1', 'In Stock', 'Aisle 1'),

('I6', 'www.example.com/product2', 9.5, 'Detergent', 'S1L2', 'Out of Stock', 'Aisle 2'),

('I6', 'www.example.com/product3', 8.5, 'Detergent', 'S2L3', 'In Stock', 'Aisle 3'),

('I6', 'www.example.com/product4', 10.85, 'Detergent', 'S7L11', 'In Stock', 'Aisle 4'),

('I6', 'www.example.com/product5', 9.75, 'Detergent', 'S6L9', 'Out of Stock', 'Aisle 5'),

('I6', 'www.example.com/product6', 8.35, 'Detergent', 'S5L6', 'In Stock', 'Aisle 6'),

('I6', 'www.example.com/product7', 9.45, 'Detergent', 'S8L12', 'In Stock', 'Aisle 7'),

('I6', 'www.example.com/product8', 10.35, 'Detergent', 'S3L8', 'Out of Stock', 'Aisle 8'),

('I6', 'www.example.com/product9', 11.0, 'Detergent', 'S4L10', 'In Stock', 'Aisle 9');

	Item_ID	Hyperlink	Price	Descriptions	Store_Sr_Num	Availability	Item_Location
▶	I1	www.example.com/product1	2.29	Red Roma 1lb	S1L1	In Stock	Aisle 1
	I1	www.example.com/product2	2.39	Red Roma 1lb	S1L2	Out of Stock	Aisle 2
	I1	www.example.com/product3	3.99	Red Roma 1lb	S2L3	In Stock	Aisle 3
	I1	www.example.com/product7	3.69	Red Roma 1lb	S2L7	In Stock	Aisle 7
	I1	www.example.com/product4	4.99	Red Roma 1lb	S3L4	In Stock	Aisle 4
	I1	www.example.com/product8	5.99	Red Roma 1lb	S3L8	Out of Stock	Aisle 8
	I1	www.example.com/product5	2.99	Red Roma 1lb	S4L5	Out of Stock	Aisle 5
	I1	www.example.com/product6	1.99	Red Roma 1lb	S5L6	In Stock	Aisle 6
	I1	www.example.com/product9	3.89	Red Roma 1lb	S6L9	In Stock	Aisle 9
	I2	www.example.com/product1	2.29	White 1lb	S1L1	In Stock	Aisle 2
	I2	www.example.com/product2	2.39	White 1lb	S1L2	Out of Stock	Aisle 4
	I2	www.example.com/product3	3.99	White 1lb	S2L3	In Stock	Aisle 1
	I2	www.example.com/product7	3.69	White 1lb	S2L7	In Stock	Aisle 4
	I2	www.example.com/product4	4.99	White 1lb	S3L4	In Stock	Aisle 3
	I2	www.example.com/product8	5.99	White 1lb	S3L8	Out of Stock	Aisle 2
	I2	www.example.com/product10	2.49	White 1lb	S4L10	In Stock	Aisle 10
	I2	www.example.com/product5	2.99	White 1lb	S4L5	Out of Stock	Aisle 2
	I2	www.example.com/product6	1.99	White 1lb	S5L6	In Stock	Aisle 5
	I2	www.example.com/product9	3.89	White 1lb	S6L9	In Stock	Aisle 1
	I3	www.example.com/product1	300	Electric Scooter	S1L1	Out of Stock	Aisle 1
	I3	www.example.com/product2	350	Electric Scooter	S1L2	Out of Stock	Aisle 2
	I3	www.example.com/product3	400	Electric Scooter	S2L3	In Stock	Aisle 3
	I3	www.example.com/product7	599	Electric Scooter	S2L7	In Stock	Aisle 7
	I3	www.example.com/product4	389	Electric Scooter	S3L4	In Stock	Aisle 4

Item_ID	Hyperlink	Price	Descriptions	Store_Sr_Num	Availability	Item_Location
I3	www.example.com/product8	649	Electric Scooter	S3L8	Out of Stock	Aisle 8
I3	www.example.com/product9	549	Electric Scooter	S4L10	In Stock	Aisle 9
I3	www.example.com/product5	349	Electric Scooter	S4L5	Out of Stock	Aisle 5
I3	www.example.com/product6	459	Electric Scooter	S5L6	In Stock	Aisle 6
I4	www.example.com/product1	1.25	Bananas per lb	S1L1	In Stock	Aisle 1
I4	www.example.com/product2	1.35	Bananas per lb	S1L2	Out of Stock	Aisle 2
I4	www.example.com/product3	1.2	Bananas per lb	S2L3	In Stock	Aisle 3
I4	www.example.com/product8	0.95	Bananas per lb	S3L8	Out of Stock	Aisle 8
I4	www.example.com/product9	1	Bananas per lb	S4L10	In Stock	Aisle 9
I4	www.example.com/product6	1.45	Bananas per lb	S5L6	In Stock	Aisle 6
I4	www.example.com/product5	1.3	Bananas per lb	S6L9	Out of Stock	Aisle 5
I4	www.example.com/product4	1.1	Bananas per lb	S7L11	In Stock	Aisle 4
I4	www.example.com/product7	0.9	Bananas per lb	S8L12	In Stock	Aisle 7
I5	www.example.com/product1	4.99	Milk per gallon	S1L1	In Stock	Aisle 1
I5	www.example.com/product2	4.5	Milk per gallon	S1L2	Out of Stock	Aisle 2
I5	www.example.com/product3	5.5	Milk per gallon	S2L3	In Stock	Aisle 3
I5	www.example.com/product8	7.35	Milk per gallon	S3L8	Out of Stock	Aisle 8
I5	www.example.com/product9	5	Milk per gallon	S4L10	In Stock	Aisle 9
I5	www.example.com/product6	7.35	Milk per gallon	S5L6	In Stock	Aisle 6
I5	www.example.com/product5	6.75	Milk per gallon	S6L9	Out of Stock	Aisle 5
I5	www.example.com/product4	5.85	Milk per gallon	S7L11	In Stock	Aisle 4
I5	www.example.com/product7	6.45	Milk per gallon	S8L12	In Stock	Aisle 7
I6	www.example.com/product1	8.99	Detergent	S1L1	In Stock	Aisle 1
I6	www.example.com/product2	9.5	Detergent	S1L2	Out of Stock	Aisle 2

I6	www.example.com/product3	8.5	Detergent	S2L3	In Stock	Aisle 3
I6	www.example.com/product8	10.35	Detergent	S3L8	Out of Stock	Aisle 8
I6	www.example.com/product9	11	Detergent	S4L10	In Stock	Aisle 9
I6	www.example.com/product6	8.35	Detergent	S5L6	In Stock	Aisle 6
I6	www.example.com/product5	9.75	Detergent	S6L9	Out of Stock	Aisle 5
I6	www.example.com/product4	10.85	Detergent	S7L11	In Stock	Aisle 4
I6	www.example.com/product7	9.45	Detergent	S8L12	In Stock	Aisle 7
I7	www.example.com/product1	18	Toilet Paper 16	S1L1	In Stock	Aisle 1
I7	www.example.com/product2	11	Toilet Paper 18	S1L2	Out of Stock	Aisle 2
I7	www.example.com/product3	13	Toilet Paper 15	S2L3	In Stock	Aisle 3
I7	www.example.com/product7	17	Toilet Paper 20	S2L7	In Stock	Aisle 7
I7	www.example.com/product4	14	Toilet Paper 18	S3L4	In Stock	Aisle 4
I7	www.example.com/product8	16	Toilet Paper 22	S3L8	Out of Stock	Aisle 8
I7	www.example.com/product9	15	Toilet Paper 10	S4L10	In Stock	Aisle 9
I7	www.example.com/product5	11	Toilet Paper 18	S4L5	Out of Stock	Aisle 5
I7	www.example.com/product6	19	Toilet Paper 16	S5L6	In Stock	Aisle 6

8.8. Insertion Of Table PromotionOfffer

INSERT INTO PromotionOffer (Promotion_ID, PromotionType, Store_ID)

VALUES

('P1', 'Discount', 'S1'),

('P2', 'Buy One Get One', 'S2'),

('P3','CashBack','S3');

	Promotion_ID	PromotionType	Store_ID
▶	P1	Discount	S1
	P2	Buy One Get One	S2
	P3	CashBack	S3

8.9. Insertion Of Table HelpDesk

INSERT INTO HelpDesk (Call_ID, Request_ID, RequestDescription, Client_ID,Store_Sr_Num, Request_Status)

VALUES

('H1', 'R1', 'Technical Support', 'C1','S1L1', 'Open'),

('H2', 'R1', 'Technical Support', 'C1','S1L1', 'Open'),

('H3', 'R2', 'Product Inquiry', 'C4','S2L3', 'Close'),

('H4', 'R3', 'Technical Support', 'C5','S5L6', 'Close'),

('H5', 'R4', 'Product Inquiry', 'C9','S2L7', 'Close'),

('H6', 'R5', 'Technical Support', 'C3','S7L11', 'Open');

Call_ID	Request_ID	RequestDescription	Client_ID	Store_Sr_Num	Request_Status
H1	R1	Technical Support	C1	S1L1	Open
H2	R1	Technical Support	C1	S1L1	Open
H3	R2	Product Inquiry	C4	S2L3	Close
H4	R3	Technical Support	C5	S5L6	Close
H5	R4	Product Inquiry	C9	S2L7	Close
H6	R5	Technical Support	C3	S7L11	Open

8.10. Insertion Of Table MembershipOption

INSERT INTO MembershipOption (Membership_ID, Membership_Description, Store_ID)

VALUES

('M1', 'Premium Membership', 'S1'),

('M2', 'Basic Membership', 'S2');

Membership_ID	Membership_Description	Store_ID
M1	Premium Membership	S1
M2	Basic Membership	S2

8.11. Insertion Of Table StoreTraffic

INSERT INTO StoreTraffic (Store_ID,Time_Period, Traffic)

VALUES

('S1', 'Morning', 'Low'),

('S1', 'Noon', 'Low'),

('S1', 'Afternoon', 'High'),

('S1', 'Evening', 'High'),

('S1', 'Night', 'Medium'),

('S2', 'Morning', 'Low'),

('S2', 'Noon', 'Low'),

('S2', 'Afternoon', 'High'),

('S2', 'Evening', 'High'),

('S2', 'Night', 'Medium'),

('S3', 'Morning', 'Low'),

('S3', 'Noon', 'Low'),

('S3', 'Afternoon', 'High'),

('S3', 'Evening', 'High'),

('S3', 'Night', 'Medium'),

('S4', 'Morning', 'Low'),

('S4', 'Noon', 'Low'),

('S4', 'Afternoon', 'High'),

('S4', 'Evening', 'High'),

('S4', 'Night', 'Medium'),

('S5', 'Morning', 'Low'),

('S5', 'Noon', 'Low'),

('S5', 'Afternoon', 'High'),

('S5', 'Evening', 'High'),

('S5', 'Night', 'Medium'),

('S6', 'Morning', 'Low'),

('S6', 'Noon', 'Low'),

('S6', 'Afternoon', 'High'),

('S6', 'Evening', 'High'),

('S6', 'Night', 'Medium'),

('S7', 'Morning', 'Low'),

('S7', 'Noon', 'Low'),

('S7', 'Afternoon', 'High'),

('S7', 'Evening', 'High'),

('S7', 'Night', 'Medium'),

('S8', 'Morning', 'Low'),

('S8', 'Noon', 'Low'),

('S8', 'Afternoon', 'High'),

('S8', 'Evening', 'High'),

('S8', 'Night', 'Medium');

Store_ID	Time_period	Traffic
S1	Afternoon	High
S1	Evening	High
S1	Morning	Low
S1	Night	Medium
S1	Noon	Low
S2	Afternoon	High
S2	Evening	High
S2	Morning	Low
S2	Night	Medium
S2	Noon	Low
S3	Afternoon	High
S3	Evening	High
S3	Morning	Low
S3	Night	Medium
S3	Noon	Low
S4	Afternoon	High
S4	Evening	High
S4	Morning	Low
S4	Night	Medium
S4	Noon	Low
S5	Afternoon	High
S5	Evening	High
S5	Morning	Low
S5	Night	Medium
S5	Noon	Low
S6	Afternoon	High
S6	Evening	High
S6	Morning	Low
S6	Night	Medium
S6	Noon	Low
S7	Afternoon	High
S7	Evening	High
S7	Morning	Low
S7	Night	Medium
S7	Noon	Low
S8	Afternoon	High
S8	Evening	High
S8	Morning	Low
S8	Night	Medium
S8	Noon	Low

9. Query Scenario Design

9.1. Show 5 lowest prices, the store name and their address for comparison for bananas.

Select id.Price, s.Store_Name , sd.Address from item_details id

inner join item i

on   i.Item_ID = id.Item_ID

inner join store_details sd

on sd.Serial_Number = id.Store_Sr_Num

inner join store s

on s.Store_ID = sd.Store_ID

where item_name ="Bananas"

order by id.Price

limit 5;

Result:

Price	Store_Name	Address
0.9	Desi Brothers	100 S Central Expy Suite 26C, Richardson, TX
0.95	Tom Thumb	1380 W Campbell Rd, Richardson, TX
1	Sams Club	1200 E Spring Creek Pkwy, Plano
1.1	India Bazaar	1425 E Belt Line Rd, Richardson, TX
1.2	Costco	3800 N Central Expy, Plano, TX

9.2. Show first 3 outlets near client with Client_id = "C5"

Select @c.lgt := Longitude, @c.lat := Lattitude from location l

inner join client c

on l.Location_ID = c.L_ID

where Client_ID = "C5";

select Store_Name, Address, round(sqrt((Longitude -@c.lgt)*(Longitude -@c.lgt)+

(Lattitude - @c.lat)*(Lattitude - @c.lat))*69,2) as distance_in_miles

from location l

inner join store_details sd

on sd.L_ID = l.Location_ID

inner join store s

on sd.Store_ID = s.Store_ID

order by distance_in_miles

limit 3;

Result:

Store_Name	Address	distance_in_miles
Sams Club	301 Coit Rd, Plano, TX	0.6
Walmart	425 Coit Rd, Plano, TX	0.94
Tom Thumb	1380 W Campbell Rd, Richardson, TX	2.87

9.3. List Call ID, Request ID, Description and Status of all the Request calls made for Target stores.

SELECT h.Call_id, h.request_id, h.RequestDescription, Request_Status FROM HelpDesk h

INNER JOIN Store_Details sd

ON sd.Serial_Number = h.Store_Sr_Num

INNER JOIN Store s

ON s.Store_ID = sd.Store_ID

WHERE s.Store_Name = "Target";

Result:

Call_id	request_id	RequestDescription	Request_Status
H1	R1	Technical Support	Open
H2	R1	Technical Support	Open

9.4. List all the store names with addresses where store traffic is low in the noon.

Select store_name,Address from store s

inner join store_details sd

on s.Store_ID = sd.Store_ID

inner join storetraffic st

on st.Store_ID = s.Store_ID

where st.Time_period = "Noon" and st.Traffic ="Low";

Result:

store_name	Address
Target	601 S Plano Rd, Richardson, TX
Target	16731 Coit Rd, Dallas, TX
Costco	3800 N Central Expy, Plano, TX
Costco	8055 Churchill Way, Dallas, TX
Walmart	425 Coit Rd, Plano, TX
Patel Brothers	6205 Coit Rd STE 201, Plano, TX
Desi Brothers	100 S Central Expy Suite 26C, Richardson, TX

9.5.Show 4 store names and addresses where the price for "Electric Scooters" which is in stock and is lowest.

Select id.Price, s.Store_Name , sd.Address from item_details id

inner join item i

on   i.Item_ID = id.Item_ID

inner join store_details sd

on sd.Serial_Number = id.Store_Sr_Num

inner join store s

on s.Store_ID = sd.Store_ID

where item_name ="Electric Scooter" and Availability = "In Stock"

order by id.Price

limit 4;

Result:

Price	Store_Name	Address
389	Tom Thumb	3411 Custer Pkwy, Richardson, TX
400	Costco	3800 N Central Expy, Plano, TX
459	Walmart	425 Coit Rd, Plano, TX
549	Sams Club	1200 E Spring Creek Pkwy, Plano

9.6. Show what is the average time each client spends searching for products on the application.

Select Client_ID, avg((EXTRACT(DAY_MINUTE FROM End_TimeStamp)-
EXTRACT(DAY_MINUTE FROM Start_TimeStamp))/60) as Time
from session
group by Client_ID;

Result:

Client_ID	Time
C1	3.33333333
C10	5.00000000
C2	3.33333333
C3	3.83333333
C4	2.75000000
C5	3.33333333
C6	3.33333333
C7	3.33333333
C8	2.94444444
C9	3.33333333

9.7. Show the nearest 5 store locations for the client with client name "John Doe".

Select @c.lgt := Longitude, @c.lat := Lattitude from location l

inner join client c

on l.Location_ID = c.L_ID

where c.F_Name ="John" and c.L_Name ="Doe";

select Store_Name, Address, round(sqrt((Longitude -@c.lgt)*(Longitude -@c.lgt)+

(Lattitude - @c.lat)*(Lattitude - @c.lat))*69,2) as distance_in_miles

from location l

inner join store_details sd

on sd.L_ID = l.Location_ID

inner join store s

on sd.Store_ID = s.Store_ID

order by distance_in_miles

limit 5;

Result:

Store_Name	Address	distance_in_miles
Sams Club	301 Coit Rd, Plano, TX	0.6
Walmart	425 Coit Rd, Plano, TX	0.94
Tom Thumb	1380 W Campbell Rd, Richardson, TX	2.87
Tom Thumb	3411 Custer Pkwy, Richardson, TX	3.19
Target	601 S Plano Rd, Richardson, TX	4.24

9.8. Show the nearest store with Pharmacy for Client "C7".

Select @c.lgt := Longitude, @c.lat := Lattitude from location l

inner join client c

on l.Location_ID = c.L_ID

where c.Client_ID = "C7";

select Store_Name, Address, round(sqrt((Longitude -@c.lgt)*(Longitude -@c.lgt)+

(Lattitude - @c.lat)*(Lattitude - @c.lat))*69,2) as distance_in_miles

from location l

inner join store_details sd

on sd.L_ID = l.Location_ID

inner join store s

on sd.Store_ID = s.Store_ID

where Pharmacy = true

order by distance_in_miles

limit 1;

Result:

Store_Name	Address	distance_in_miles
Walmart	425 Coit Rd, Plano, TX	0.94

10. Conclusion

While developing a database system for our new Price Comparison application, we embarked on creating a comprehensive schema from scratch, without relying on external references. Our approach began with thoroughly exploring data patterns relevant to the core concept, allowing us to envision how the application's requirements could be practically met.

Upon identifying all necessary data elements, we constructed a relational schema. As the schema evolved into a stable form, our focus shifted towards optimizing its efficiency and uniqueness.

A significant challenge emerged while handling data, particularly in the "Item" and "Store" tables, where repeating data groups posed concerns about redundancy. To address this issue, we strategically decomposed these tables into two distinct entities: "Item_Details" and "Item," as well as "Store_Details" and "Store." This restructuring mitigated redundancy and ensured that all tables adhered to the principles of the Third Normal Form (3NF).

The decision to split tables and normalize the schema represents a pivotal step in enhancing our database design's overall effectiveness and coherence. It resolves immediate concerns and sets the foundation for scalable and maintainable data management in our Price Comparison application.