IFT 530 Adv Database Management Systems

Project Name : A Virtual Supermarket

Final Project Presentation

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Section 1 – Intro and Context

Over the past few years, there has been a substantial increase in the popularity of online shopping, particularly due to the COVID-19 pandemic which has prompted a rapid shift towards e-commerce. While shopping for items such as clothing and electronics online has been common for some time, there has also been a surge in the popularity of virtual supermarkets. These are online stores that allow customers to conveniently order groceries and have them delivered to their doorstep.

Virtual supermarkets are favored by customers because they offer a wide range of products, easy online ordering, and the ability to avoid crowded stores. They are particularly useful when seeking products that cater to specific culinary tastes. However, running a virtual supermarket requires efficient management of inventory, ordering, and payment processing. To effectively manage operations and provide a seamless customer experience, a robust database system is necessary.

This project aims to design and implement a database system for a virtual supermarket specializing in selling grocery items in the USA market. The database will store information on products, prices, nutritional information, and inventory levels, allowing the supermarket to effectively manage its operations. The system will also include an online ordering and payment processing system, ensuring a secure and straightforward checkout experience for customers. By adopting a comprehensive database system, virtual supermarkets can optimize their operations and enhance customer satisfaction, leading to greater business growth and success.

Perks to choosing this project

1. The process of buying things has been made easier.
2. Making stores and creating listings for products has become easier.
3. Convenient access to products.
4. The cost of marketing and advertising has reduced.
5. Consumers have greater flexibility.
6. There are no limitations on reaching clients.
7. It's easier for customers to compare products and prices.
8. Faster response to consumer and market demands.
9. Several payment methods are available.

Thus, developing a database system for them seems like a logical and feasible approach.

Context

During our initial phase, we focused on the ORM model and established primary foreign keys associated with it.

Subtypes were incorporated for the products, and we aimed to enhance the Purchaser's details. To achieve this, we utilized a Nested Query in Couchbase, merging the Address Information and Purchaser's Favorites List data into the same Purchaser bucket. During the final phase, adjustments were made to the Materials table. The most significant addition to the final project was the user interface (UI).

We developed our UI with a focus on user-friendliness, ensuring that there are distinct views for both Administrators and Purchasers.

In this context, the term "Purchaser" refers to the buyer. Similar to other ecommerce applications, we have included a login page, which users can access through Google login. New customers can create an account to join the Virtual Supermarket Application.

In contrast, the Administrator has their own set of privileges and user page. They can log in and monitor stockroom availability and inventory. Consequently, we have included the same database in both SQL and Couchbase.

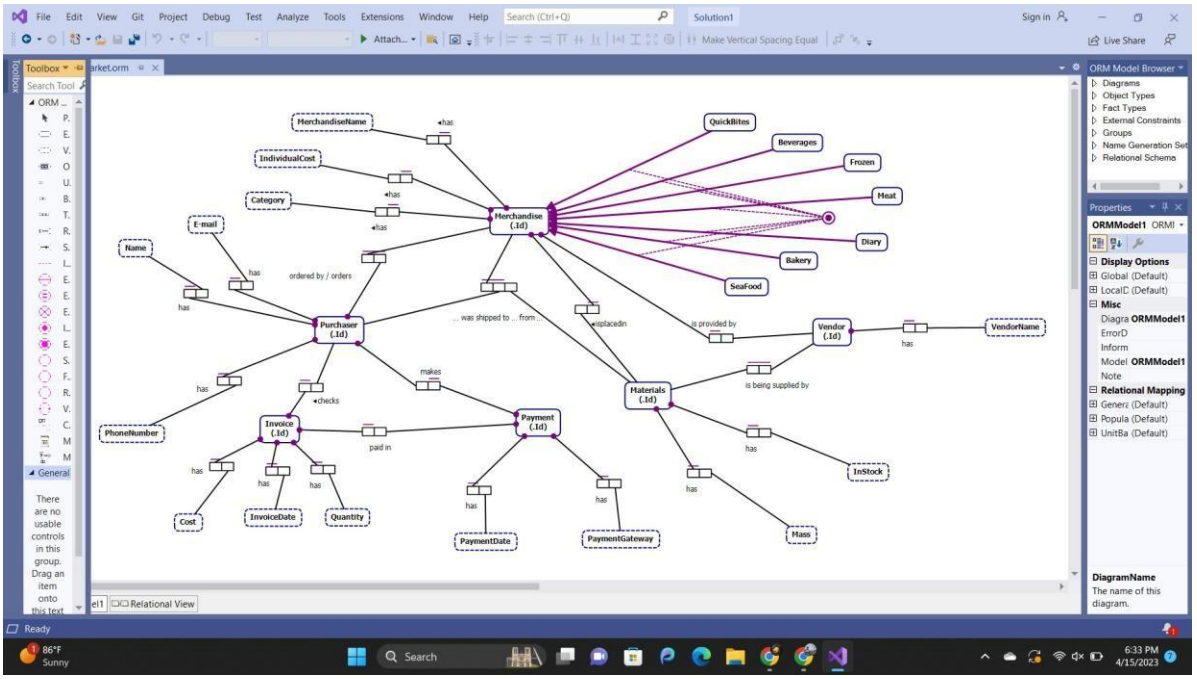
Vendors are responsible for adding stock to the Materials section, and these items are subsequently sold to Purchasers when ordered through our Materials section.

We have showcased our concepts using both SQL and SQL++.

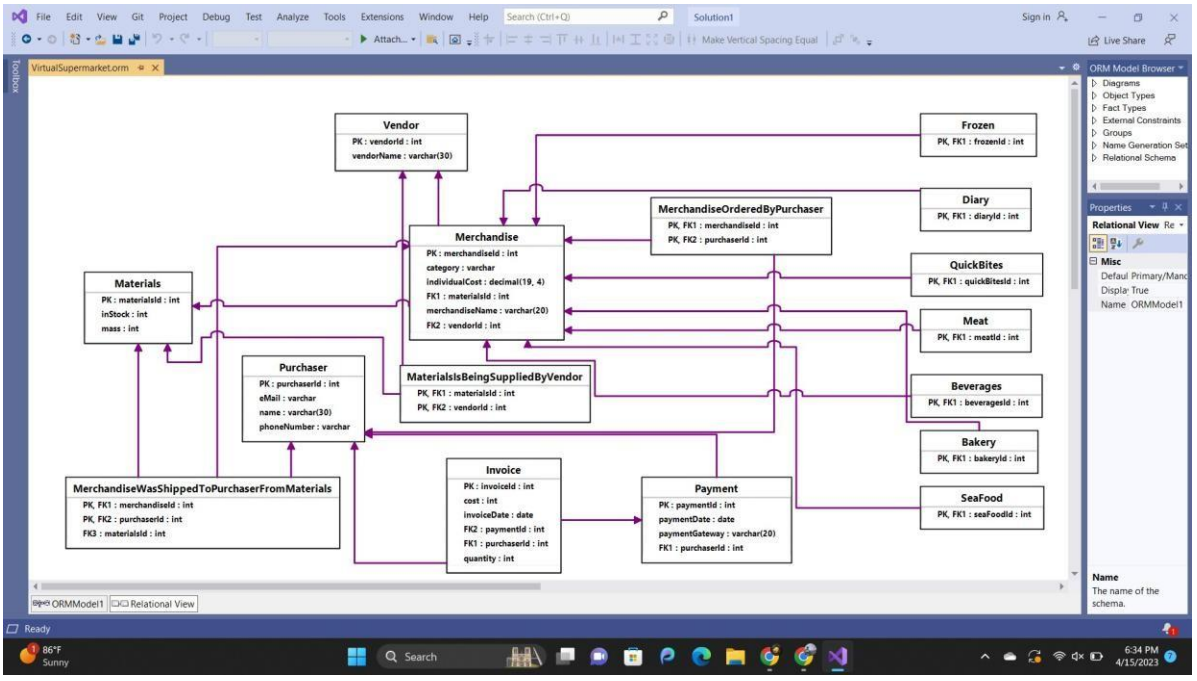
Questions that our Database will answer:

1. Which payment gateway is most frequently utilized by purchasers?
2. Which purchaser has used the greatest variety of payment methods when paying for an order?
3. Which purchaser has placed the largest number of orders in our system?
4. What is the ratio between the number of merchandise and their mass? This enables us to comprehend the constraints of materials space and whether we can meet the demands of supply and demand.
5. To how many departments does each vendor provide supplies?

Section 2 - ORM Diagram



Section 3 - Relational Schema



Section 4 – SQL Database

Description of Entities and Attributes

1. Merchandise:

   Merchandise will provide a catalog of products that are identified by a unique MerchandiseId (Primary Key). The Merchandise Entity possesses the subsequent characteristics: MerchandiseId, MerchandiseName, ShelfLife, IndividualCost and Category. It has the following subtypes: QuickBites, Dairy, Beverages, Frozen, Meat, Pantry and Bakery.

2. Invoice:

   Invoice entity holds a record of every order placed by purchasers. Every invoice is identified by its unique identifier i.e., InvoiceId. The Entity Invoice has the following attributes: InvoiceId, Quantity, InvoiceDate and Cost.

3. Vendor:

   A vendor in the context of a database refers to a supplier who provides goods and replenishes the inventory. Vendors offer a variety of products, and some vendors may supply the same products as others. Each vendor has a unique identifier, known as VendorId, which serves as the primary key, along with the attribute VendorName.

4. Materials:

   Materials entity is employed to depict the entirety of products accessible for purchase. The goods are dispensed to customers from this entity. Within this object, we can determine the quantity of stock for every individual product. Each merchandise is differentiated by its specific MaterialsId, and has the attributes of InStock and Mass.

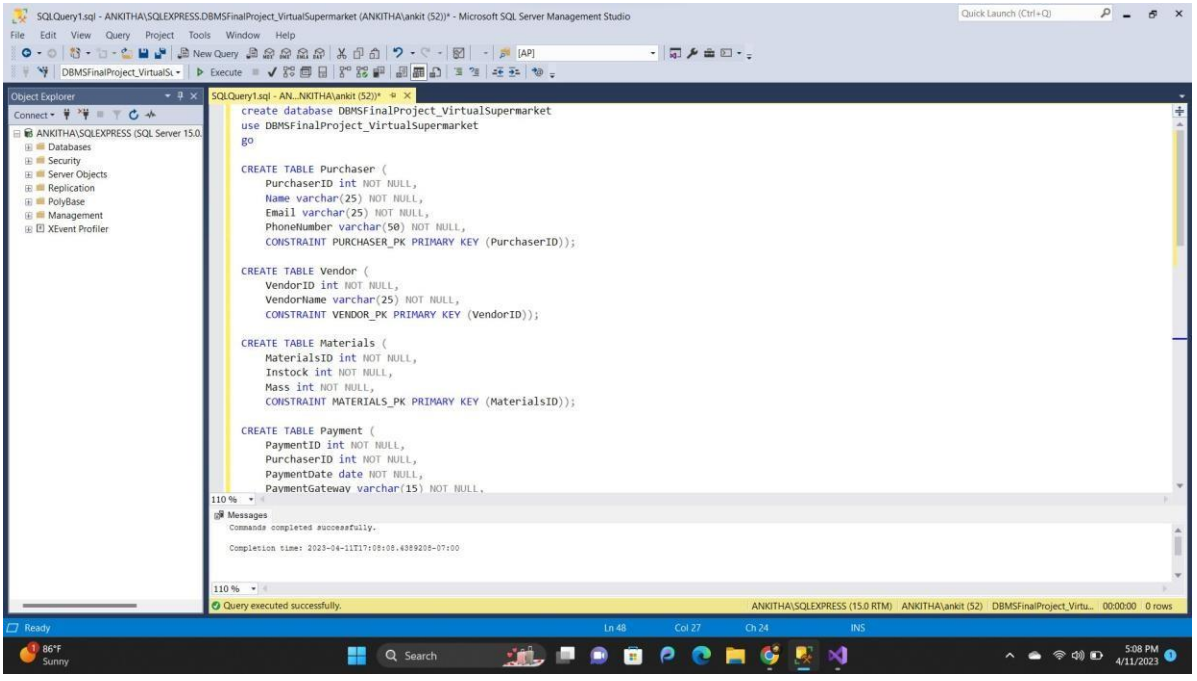
5. Purchaser:

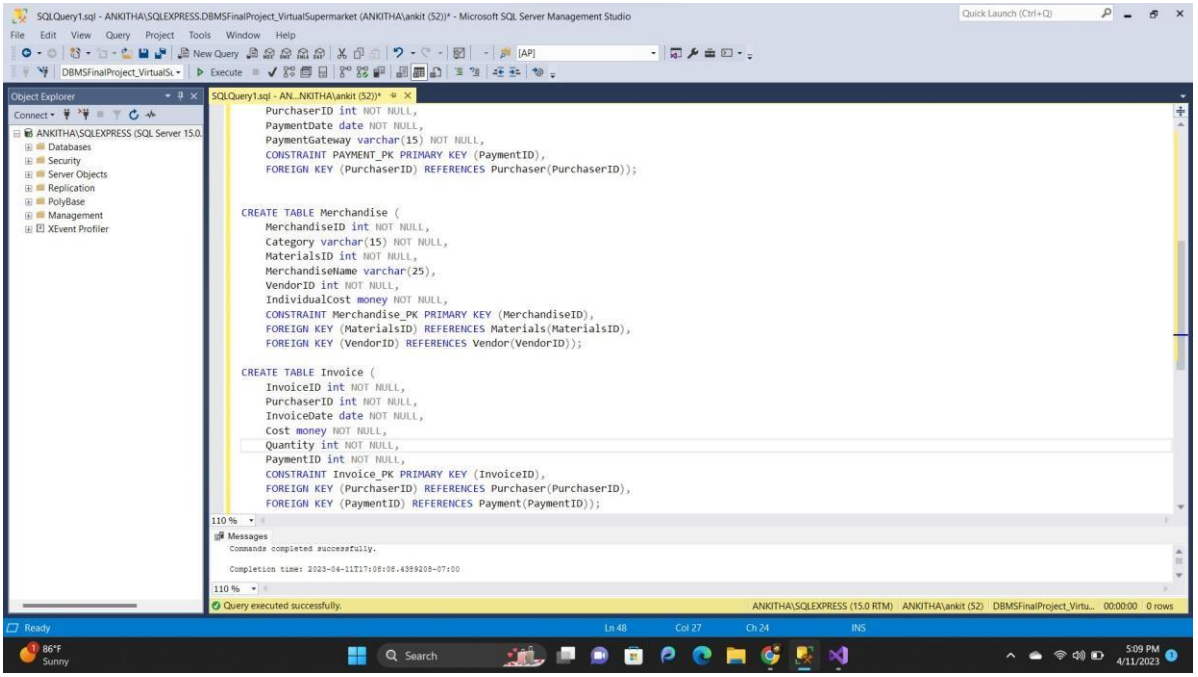
   A Purchaser refers to anyone who uses our services to order items from our list of available merchandise. Each Purchaser is given a distinct identifier, known as PurchaserId, which serves as the primary key. The Purchaser's attributes include PurchaserId, Name, E-mail, DateofBirth, and PhoneNumber.

6. Payment:

   Payment entity keeps track of the payments done by the purchaser. Each record of payment can be tracked due to its primary key PaymentId, it also keeps track of purchasers and their corresponding payment records. It has the attributes PaymentGateway and PaymentDate.

The attached screenshots serve as evidence of the successful creation of our database.





Below are the SQL queries that were used to create tables, define their properties and set their associated data types. They also contain key constraints such as primary keys and foreign keys.

DDL Statements

Creating Tables

We have created six tables in our database, namely: Purchaser, Merchandise, Invoice, Payment, Materials, and Vendor.

Source Code:

```
create database DBMSFinalProject_VirtualSupermarket

use DBMSFinalProject_VirtualSupermarket

go

CREATE TABLE Purchaser (

    PurchaserID int NOT NULL,
```

```
    Name varchar(25) NOT NULL,
    Email varchar(25) NOT NULL,
    PhoneNumber varchar(50) NOT NULL,
    CONSTRAINT PURCHASER_PK PRIMARY KEY (PurchaserID));
CREATE TABLE Vendor (
        VendorID int NOT NULL,
        VendorName varchar(25) NOT NULL,
        CONSTRAINT VENDOR_PK PRIMARY KEY (VendorID));
CREATE TABLE Materials (
        MaterialsID int NOT NULL,
        Instock int NOT NULL,
        Mass int NOT NULL,
        CONSTRAINT MATERIALS_PK PRIMARY KEY (MaterialsID));
CREATE TABLE Payment (
        PaymentID int NOT NULL,
        PurchaserID int NOT NULL,
        PaymentDate date NOT NULL,
        PaymentGateway varchar(15) NOT NULL,
        CONSTRAINT PAYMENT_PK PRIMARY KEY (PaymentID),
        FOREIGN KEY (PurchaserID) REFERENCES Purchaser(PurchaserID));
```

```
CREATE TABLE Merchandise (
        MerchandiseID int NOT NULL,
        Category varchar(15) NOT NULL,
        MaterialsID int NOT NULL,
        MerchandiseName varchar(25),
        VendorID int NOT NULL,
        IndividualCost money NOT NULL,
        CONSTRAINT Merchandise_PK PRIMARY KEY (MerchandiseID),
        FOREIGN KEY (MaterialsID) REFERENCES Materials(MaterialsID),
        FOREIGN KEY (VendorID) REFERENCES Vendor(VendorID));
CREATE TABLE Invoice (
        InvoiceID int NOT NULL,
        PurchaserID int NOT NULL,
        InvoiceDate date NOT NULL,
        Cost money NOT NULL,
        Quantity int NOT NULL,
        PaymentID int NOT NULL,
        CONSTRAINT Invoice_PK PRIMARY KEY (InvoiceID),
        FOREIGN KEY (PurchaserID) REFERENCES Purchaser(PurchaserID),
        FOREIGN KEY (PaymentID) REFERENCES Payment(PaymentID));
```

DML Statements - Inserting data into tables

Adding data to the tables that were created earlier using DML (Data Manipulation Language) statements.

- Inserting values into the Purchaser Table.

Insert into Purchaser values (1,'Ankitha','ankitha@gmail.com','4073886675');

Insert into Purchaser values (2,'Sandeep','sandeep@gmail.com','4073886674');

Insert into Purchaser values (3,'Himasree','himasree@gmail.com','4073886673');

Insert into Purchaser values (4,'Indu','indu@gmail.com','4073886672');

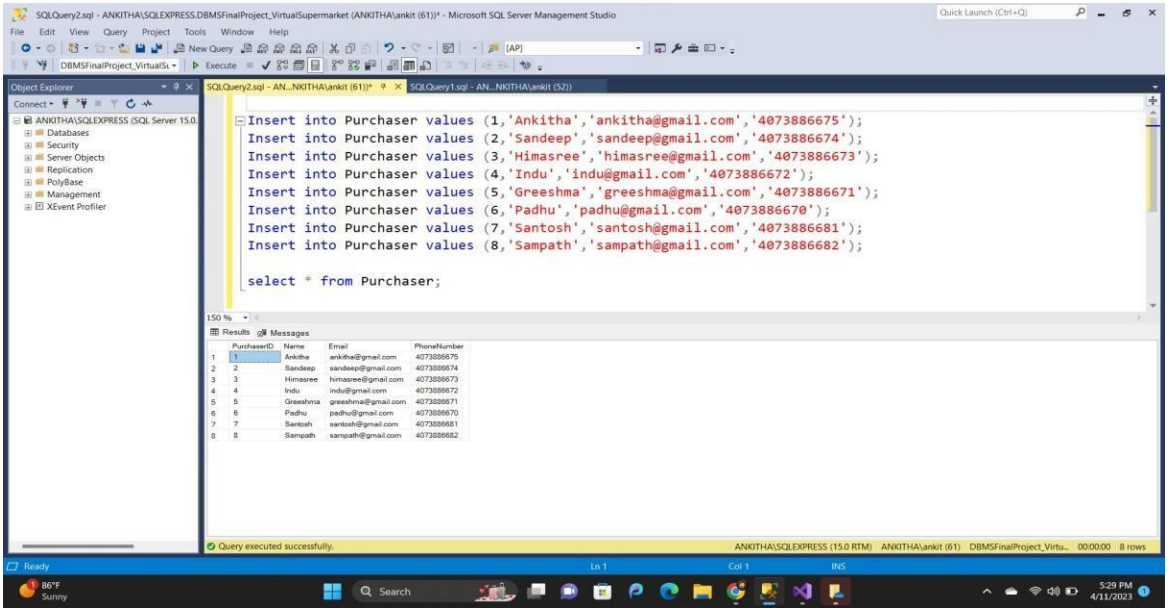
Insert into Purchaser values (5,'Greeshma','greeshma@gmail.com','4073886671');

Insert into Purchaser values (6,'Padhu','padhu@gmail.com','4073886670');

Insert into Purchaser values (7,'Santosh','santosh@gmail.com','4073886681');

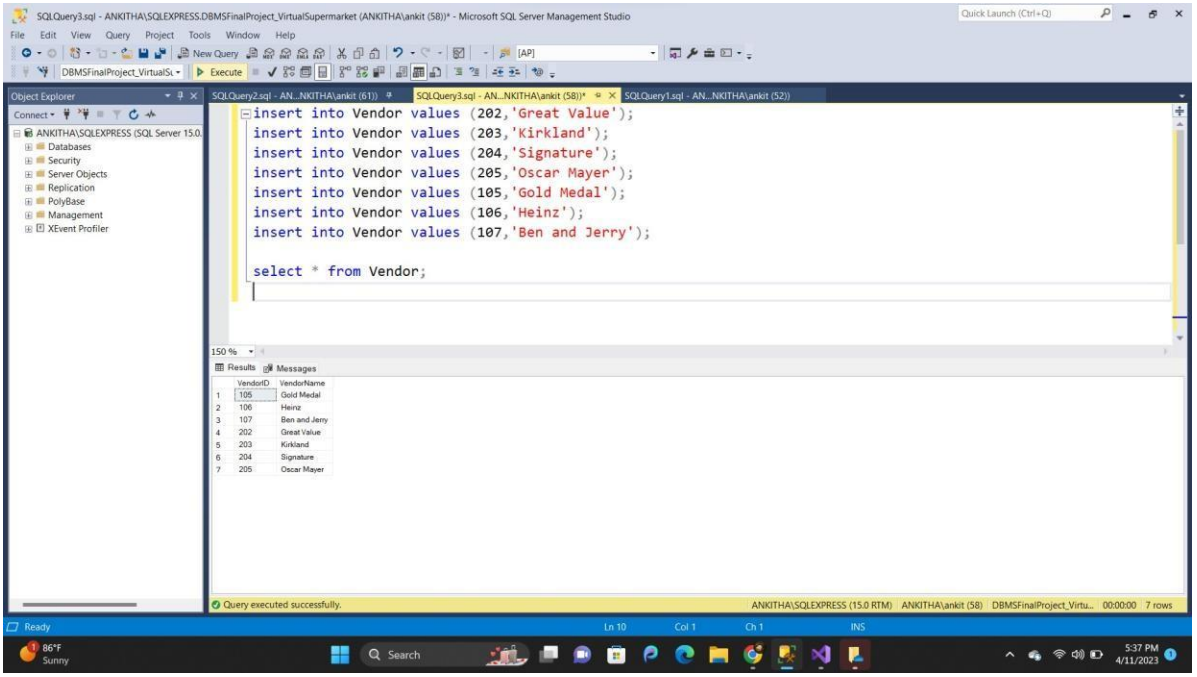
Insert into Purchaser values (8,'Sampath','sampath@gmail.com','4073886682');

select * from Purchaser;



- Inserting values into Vendor Table

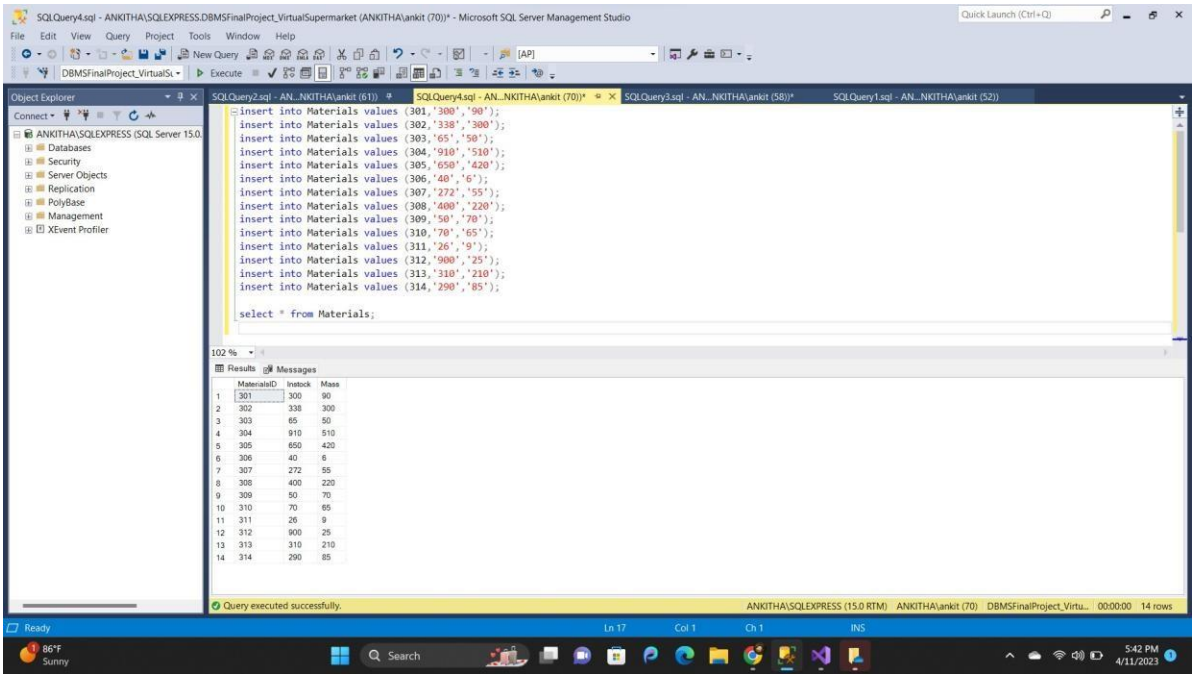
```
insert into Vendor values (202,' Great Value');
insert into Vendor values (203,'Kirkland');
insert into Vendor values (204,'Signature');
insert into Vendor values (205,'Oscar Mayer');
insert into Vendor values (105,' Gold Medal');
insert into Vendor values (106,'Heinz');
insert into Vendor values (107,'Ben and Jerry');
select * from Vendor;
```



- Inserting values into Materials Table

```
insert into Materials values (301,'300','90');
insert into Materials values (302,'338','300');
insert into Materials values (303,'65','50');
insert into Materials values (304,'910','510');
insert into Materials values (305,'650','420');
```

```
insert into Materials values (306,'40','6');

insert into Materials values (307,'272','55');

insert into Materials values (308,'400','220');

insert into Materials values (309,'50','70');

insert into Materials values (310,'70','65');

insert into Materials values (311,'26','9');

insert into Materials values (312,'900','25');

insert into Materials values (313,'310','210');

insert into Materials values (314,'290','85');

select * from Materials;
```



- Inserting values into Payment Table

```
insert into Payment values (1300,5,'2023-03-11','Credit);

insert into Payment values (1301,2,'2023-03-07','CashOnDelivery');

insert into Payment values (1302,7,'2023-02-09','Apple Pay');

insert into Payment values (1303,6,'2023-02-02','Apple Pay');
```

insert into Payment values (1304,3,' 2023-02-03','Google pay');

insert into Payment values (1305,1,' 2023-01-22','Google pay');

insert into Payment values (1306,4,'2023-01-19','Credit');

insert into Payment values (1307,8,' 2023-03-28','Debit');

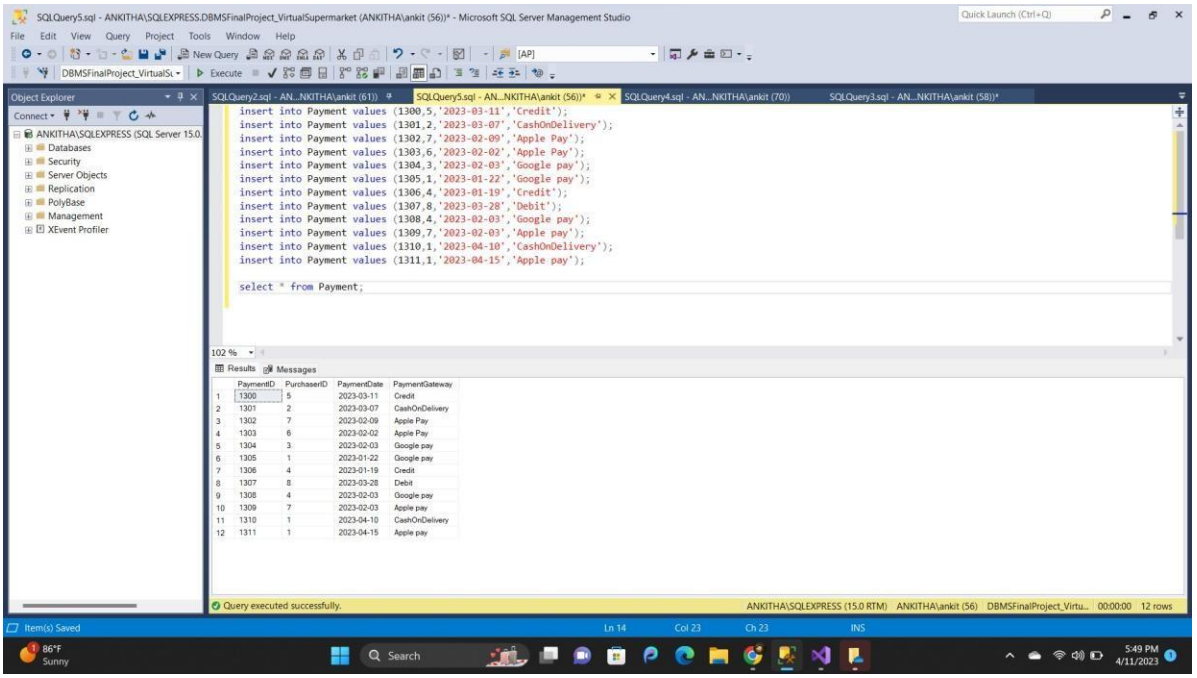
insert into Payment values (1308,4,'2023-02-03','Google pay');

insert into Payment values (1309,7,'2023-02-03','Apple pay');

insert into Payment values (1310,1,'2023-04-10','CashOnDelivery');

insert into Payment values (1311,1,'2023-04-15','Apple pay');

select * from Payment;



- Inserting values into Invoice Table

insert into Invoice values (1600,5,'2023-01-21','350','25',1300);

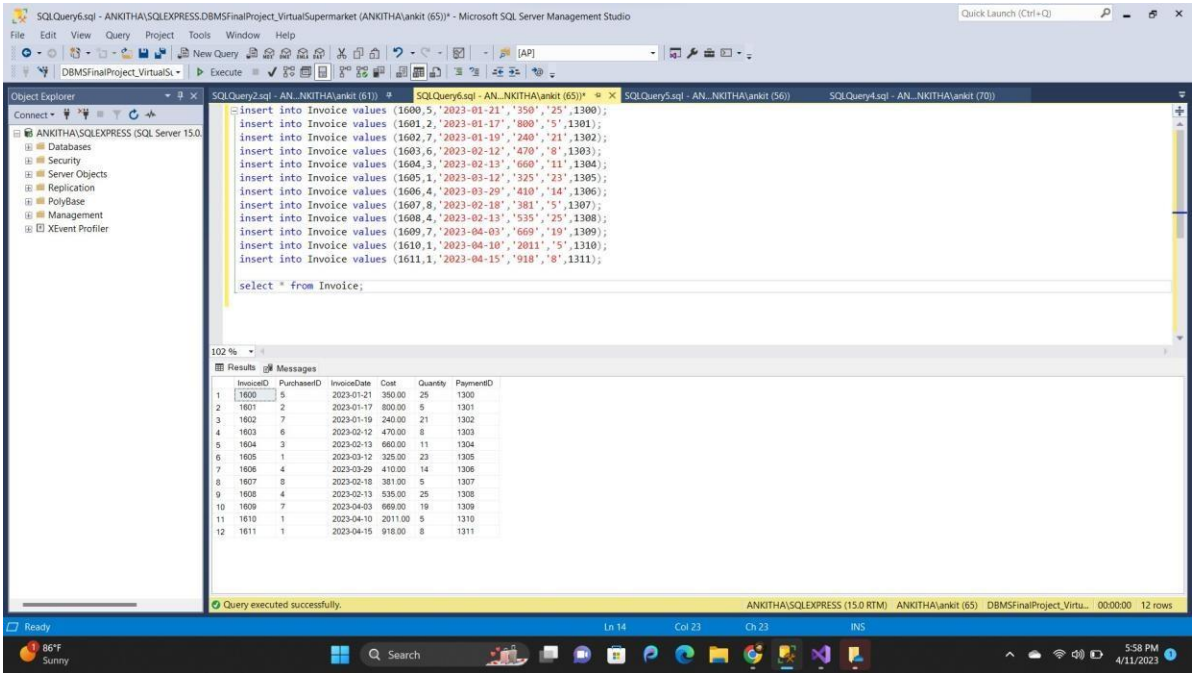
insert into Invoice values (1601,2,'2023-01-17','800','5',1301);

insert into Invoice values (1602,7,'2023-01-19','240','21',1302);

insert into Invoice values (1603,6,'2023-02-12','470','8',1303);

insert into Invoice values (1604,3,'2023-02-13','660','11',1304);

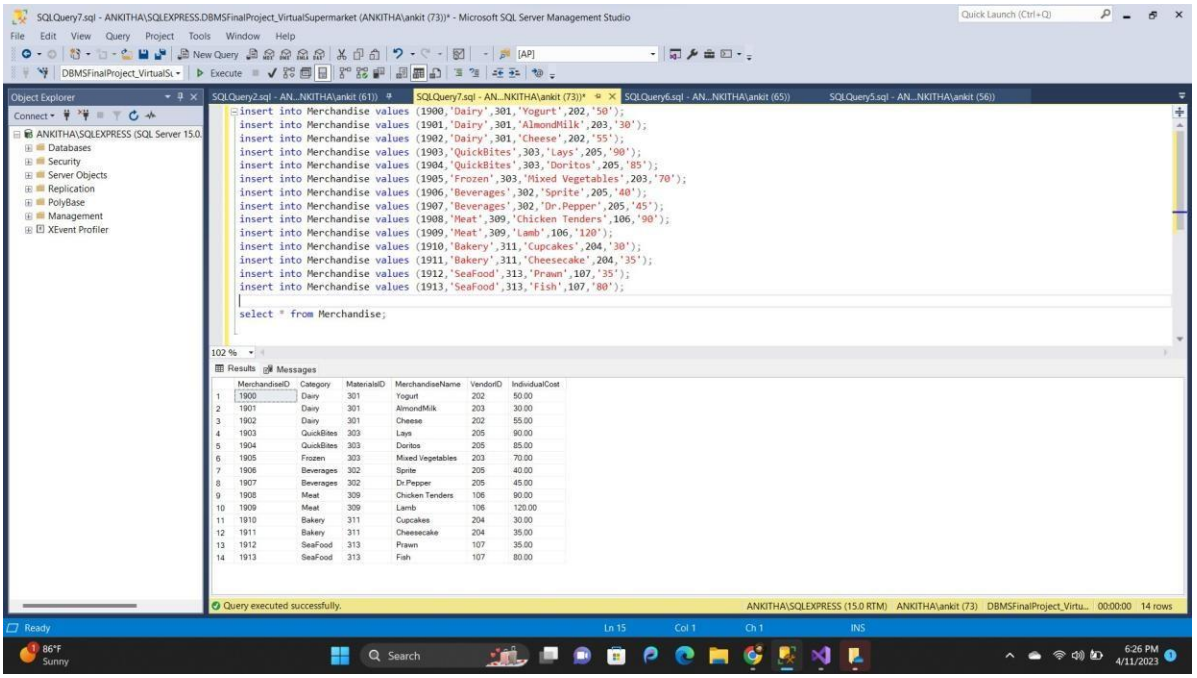
```
insert into Invoice values (1605,1,'2023-03-12','325','23',1305);
insert into Invoice values (1606,4,'2023-03-29','410','14',1306);
insert into Invoice values (1607,8,'2023-02-18','381','5',1307);
insert into Invoice values (1608,4,'2023-02-13','535','25',1308);
insert into Invoice values (1609,7,'2023-04-03','669','19',1309);
insert into Invoice values (1610,1,'2023-04-10','2011','5',1310);
insert into Invoice values (1611,1,'2023-04-15','918','8',1311);
select * from Invoice;
```



- Inserting values into Merchandise Table

```
insert into Merchandise  values  (1900,'Dairy',301,'Yogurt',202,' 50');
insert into Merchandise values (1901,'Dairy',301,'AlmondMilk',203,' 30');
insert into Merchandise values  (1902,'Dairy',301,'Cheese',202,' 55');
insert into Merchandise values (1903,'QuickBites',303,'Lays',205,'90');
insert into Merchandise values (1904,'QuickBites',303,'Doritos',205,'85');
insert into Merchandise values (1905,'Frozen',303,'Mixed Vegetables',203,'70');
```

```
insert into Merchandise values (1906,'Beverages',302,'Sprite',205,'40');
insert into Merchandise values (1907,'Beverages',302,'Dr.Pepper',205,'45');
insert into Merchandise values (1908,'Meat',309,'Chicken Tenders',106,'90');
insert into Merchandise values (1909,'Meat',309,'Lamb',106,'120');
insert into Merchandise values (1910,'Bakery',311,'Cupcakes',204,'30');
insert into Merchandise values (1911,'Bakery',311,'Cheesecake',204,'35');
insert into Merchandise values (1912,'SeaFood',313,'Prawn',107,'35');
insert into Merchandise values (1913,'SeaFood',313,'Fish',107,'80');
select * from Merchandise;
```



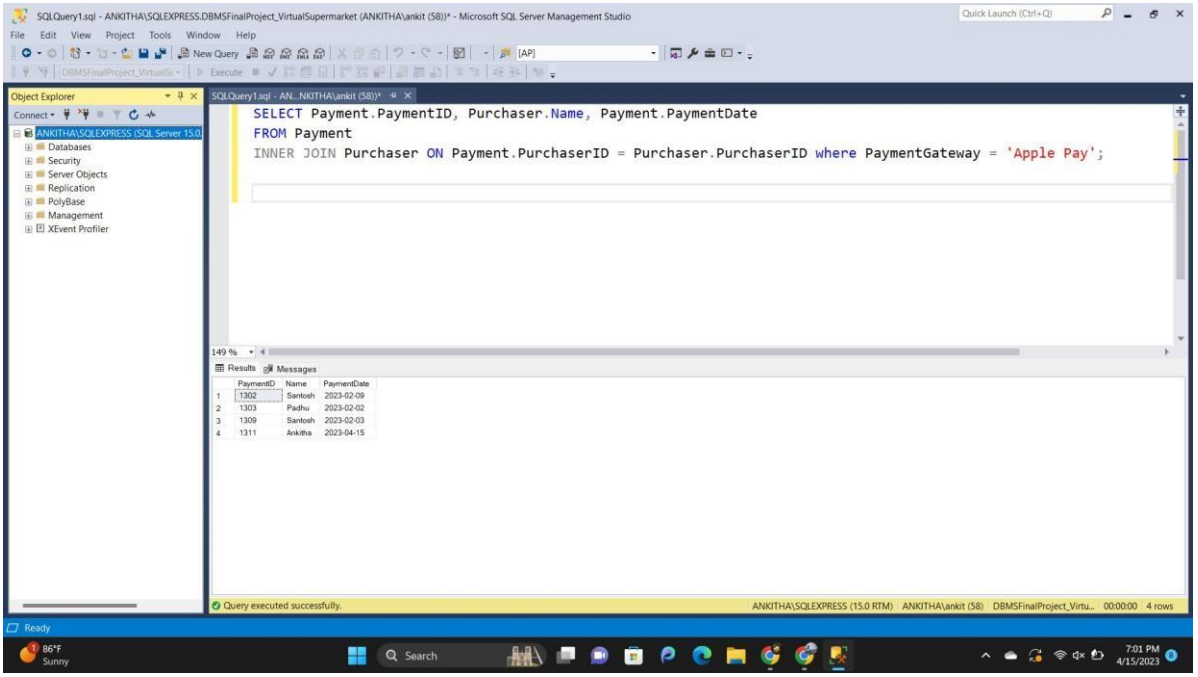
Additional DDL Query

- **Displaying the PaymentID, Purchaser Name, and payment Date for the transactions made by purchasers who utilized Apple Pay as their chosen payment gateway.**

Query:

```
SELECT Payment.PaymentID, Purchaser.Name, Payment.PaymentDate

FROM Payment

 INNER JOIN Purchaser ON Payment.PurchaserID = Purchaser.PurchaserID where

PaymentGateway = 'Apple Pay';
```

Output:



Additional DML Queries

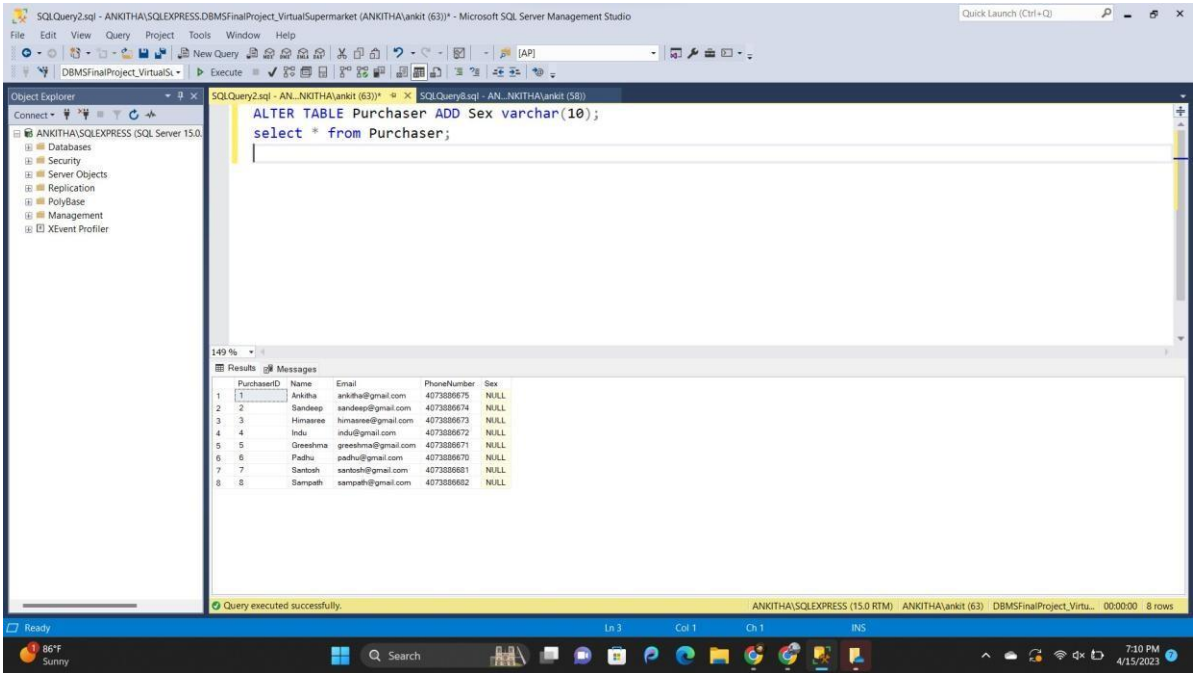
- **Adding the column Sex to Purchaser table**

Query:

ALTER TABLE Purchaser ADD Sex varchar(10);

select * from Purchaser;

Output:



149 %

Results | Messages

	PurchaserID	Name	Email	PhoneNumber	Sex
1	1	Ankitha	ankitha@gmail.com	4073886675	NULL
2	2	Sandeep	sandeep@gmail.com	4073886674	NULL
3	3	Himasree	himasree@gmail.com	4073886673	NULL
4	4	Indu	indu@gmail.com	4073886672	NULL
5	5	Greeshma	greeshma@gmail.com	4073886671	NULL
6	6	Padhu	padhu@gmail.com	4073886670	NULL
7	7	Santosh	santosh@gmail.com	4073886681	NULL
8	8	Sampath	sampath@gmail.com	4073886682	NULL

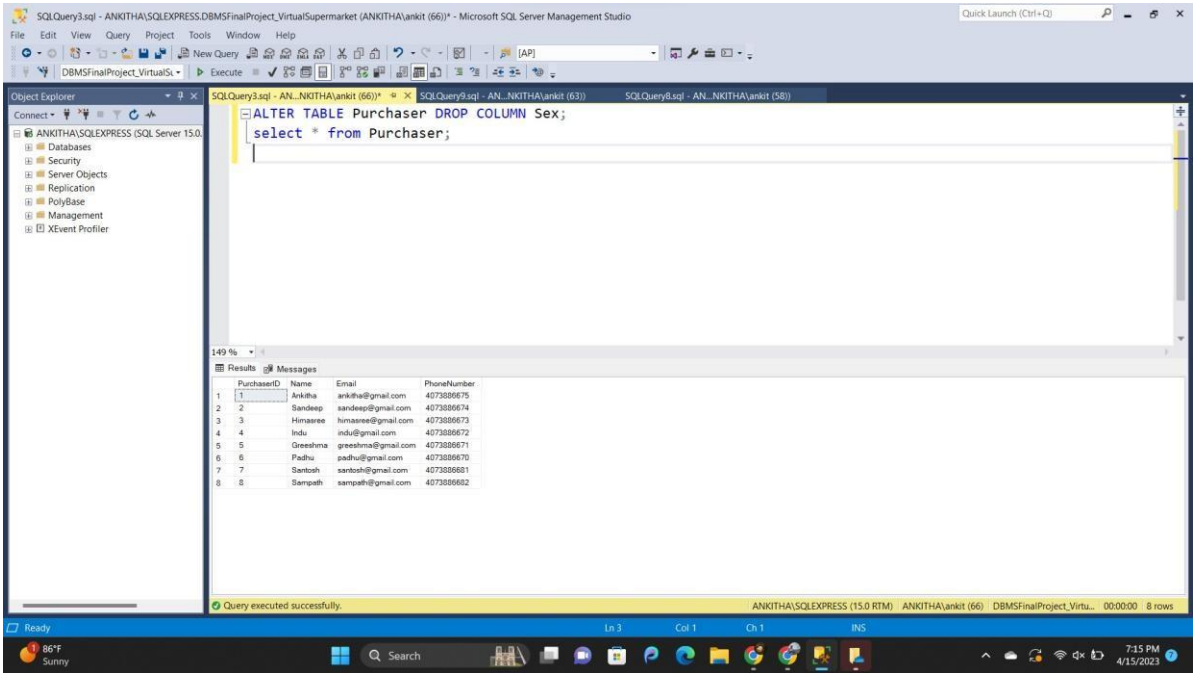
- **Deleting the column Sex from Purchaser table**

Query:

ALTER TABLE Purchaser DROP COLUMN Sex;

select * from Purchaser;

Output:



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Results Messages

	PurchaserID	Name	Email	PhoneNumber
1	1	Ankitha	ankitha@gmail.com	4073886675
2	2	Sandeep	sandeep@gmail.com	4073886674
3	3	Himasree	himasree@gmail.com	4073886673
4	4	Indu	indu@gmail.com	4073886672
5	5	Greeshma	greeshma@gmail.com	4073886671
6	6	Padhu	padhu@gmail.com	4073886670
7	7	Santosh	santosh@gmail.com	4073886681
8	8	Sampath	sampath@gmail.com	4073886682

Stored Procedure – 1

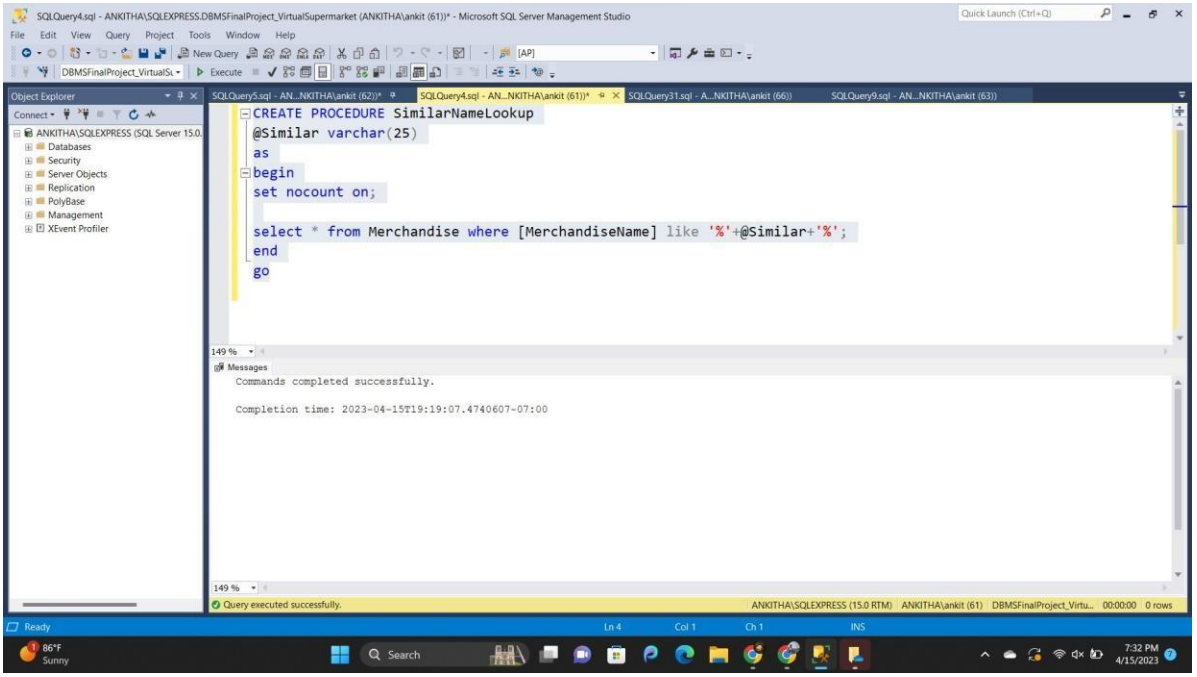
Creating a search query that identifies merchandise with names related to the specified search term. For instance, a search for 'cake' would return all items containing 'cake' in their names, such as Cupcake and Cheesecake."

Query:

CREATE PROCEDURE SimilarNameLookup

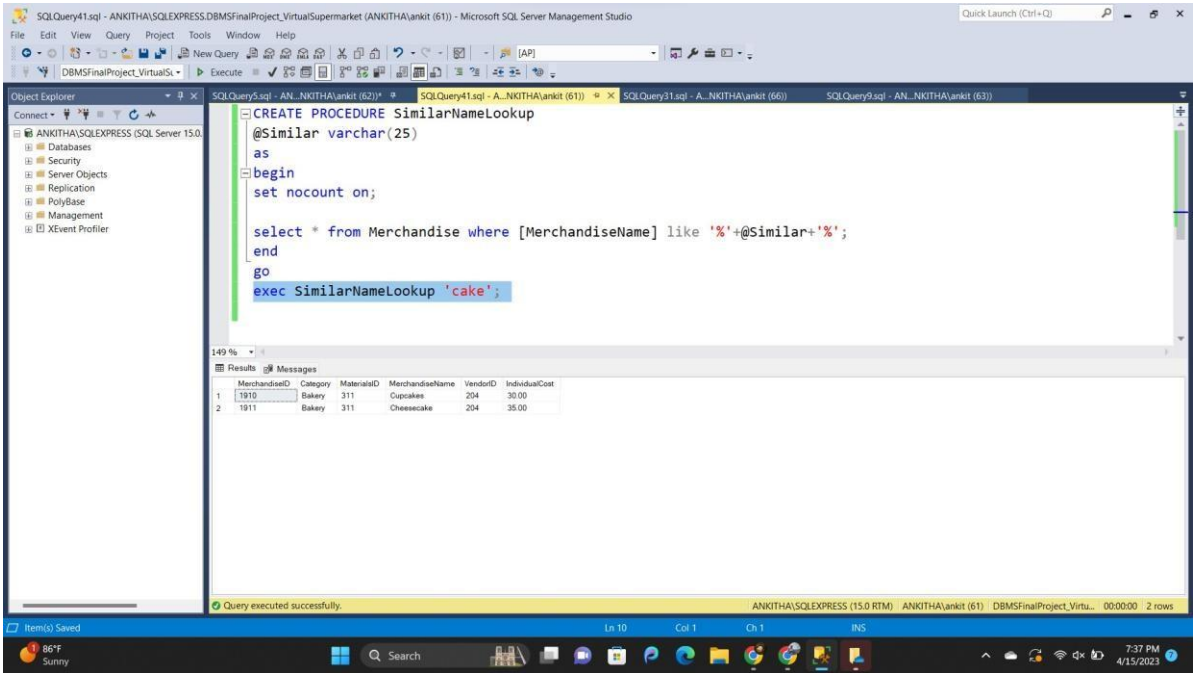
```
@Similar varchar(25) as begin

set nocount on;

select * from Merchandise where [MerchandiseName] like '%'+@Similar+'%';

end

go
```

Output:



Creating a query to execute the stored procedure:

```
exec SimilarNameLookup 'cake';
```



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Results | Messages

	MerchandiseID	Category	MaterialsID	MerchandiseName	VendorID	IndividualCost
1	1910	Bakery	311	Cupcakes	204	30.00
2	1911	Bakery	311	Cheesecake	204	35.00

Stored Procedure – 2

Generating a query that displays the PaymentID, PurchaserID, PaymentGateway, and date of payment for transactions occurring within a specified time period. The query includes data validation measures to confirm that the date is entered in the correct format.

Query:

```
CREATE PROCEDURE DateRange
    @RangeStart varchar(50) = NULL, @RangeEnd varchar(50) = NULL AS
IF @RangeStart IS NULL OR @RangeEnd IS NULL
```

THROW 65000, 'The query requires the start and end values of the range to be specified in order to execute.', 1;

IF NOT (ISDATE(@RangeStart) = 1 AND ISDATE(@RangeEnd) = 1)

THROW 65001, 'Please ensure that the date is entered in the correct format of YYYY-MM-DD.', 1;

IF CAST(@RangeStart AS date) > CAST(@RangeEnd AS date)

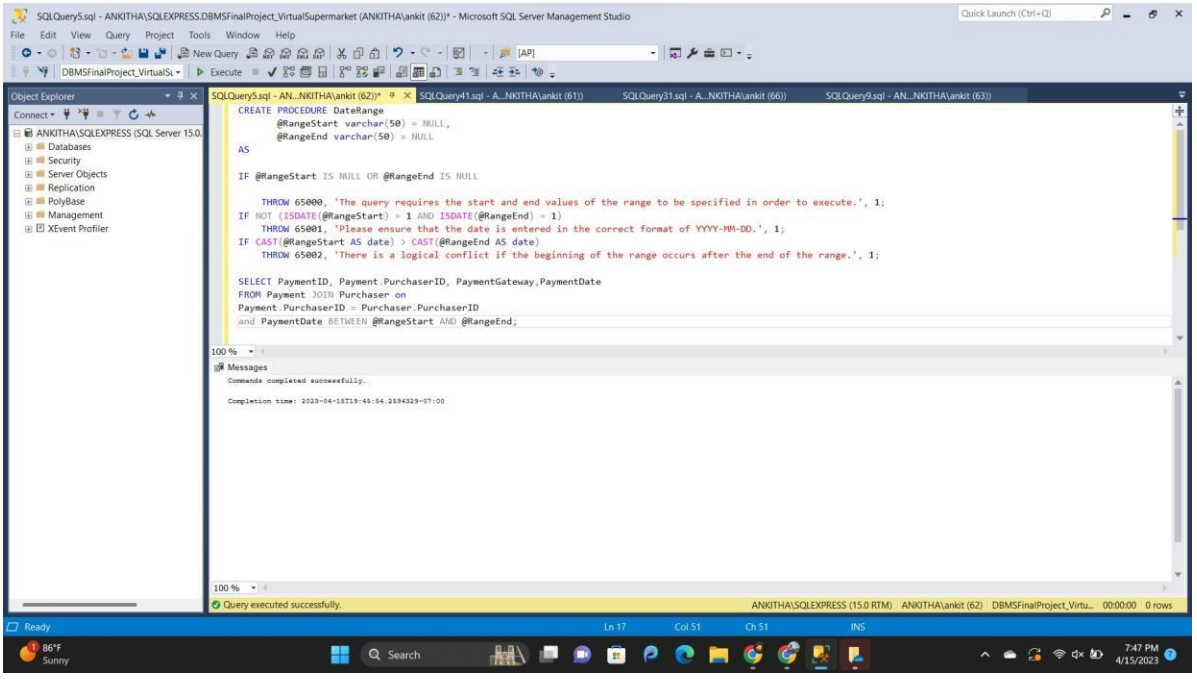
THROW 65002, 'There is a logical conflict if the beginning of the range occurs after the end of the range.', 1;

SELECT PaymentID, Payment.PurchaserID, PaymentGateway,PaymentDate

FROM Payment JOIN Purchaser on

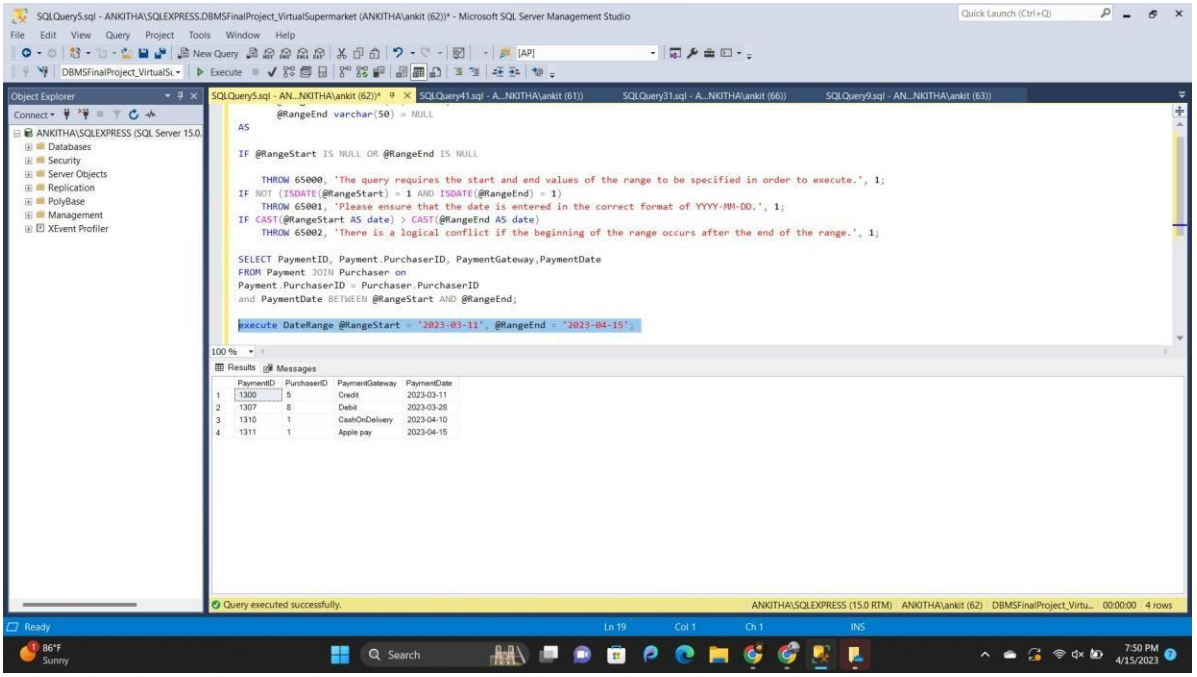
Payment.PurchaserID = Purchaser.PurchaserID

and PaymentDate BETWEEN @RangeStart AND @RangeEnd;



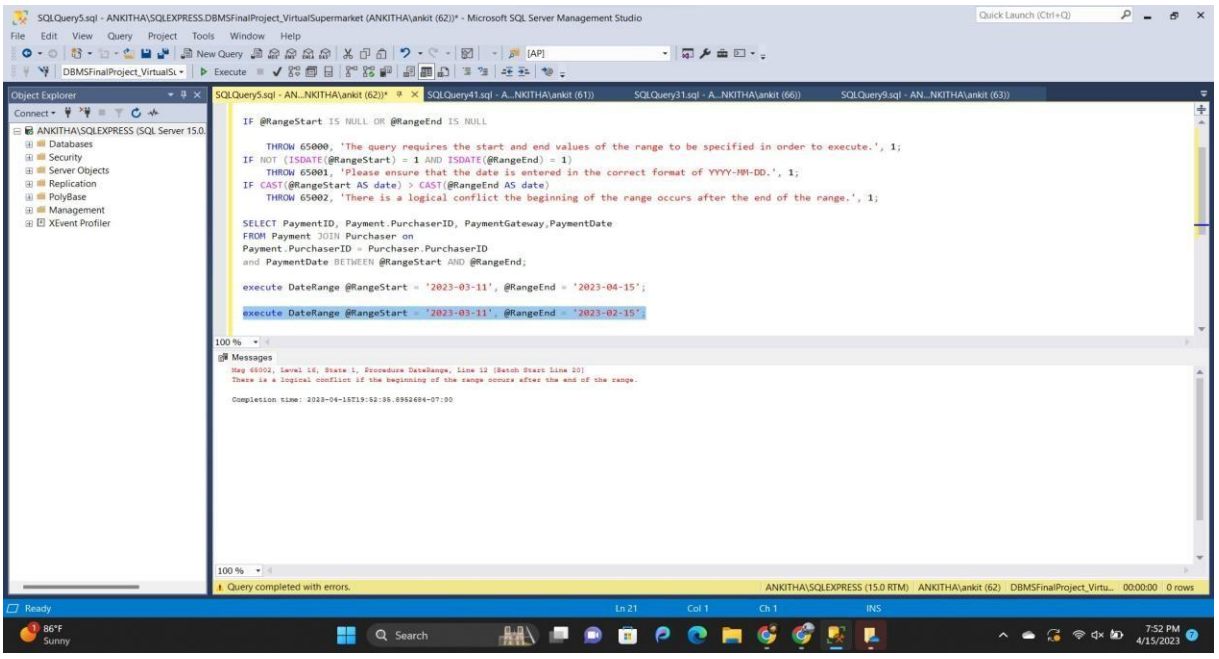
Creating a query to execute the stored procedure:

execute DateRange @RangeStart = '2023-03-11', @RangeEnd = '2023-04-15';



If the end date is specified before the start date, the Stored Procedure will generate the following error.

execute DateRange @RangeStart = '2023-03-11', @RangeEnd = '2023-02-15';



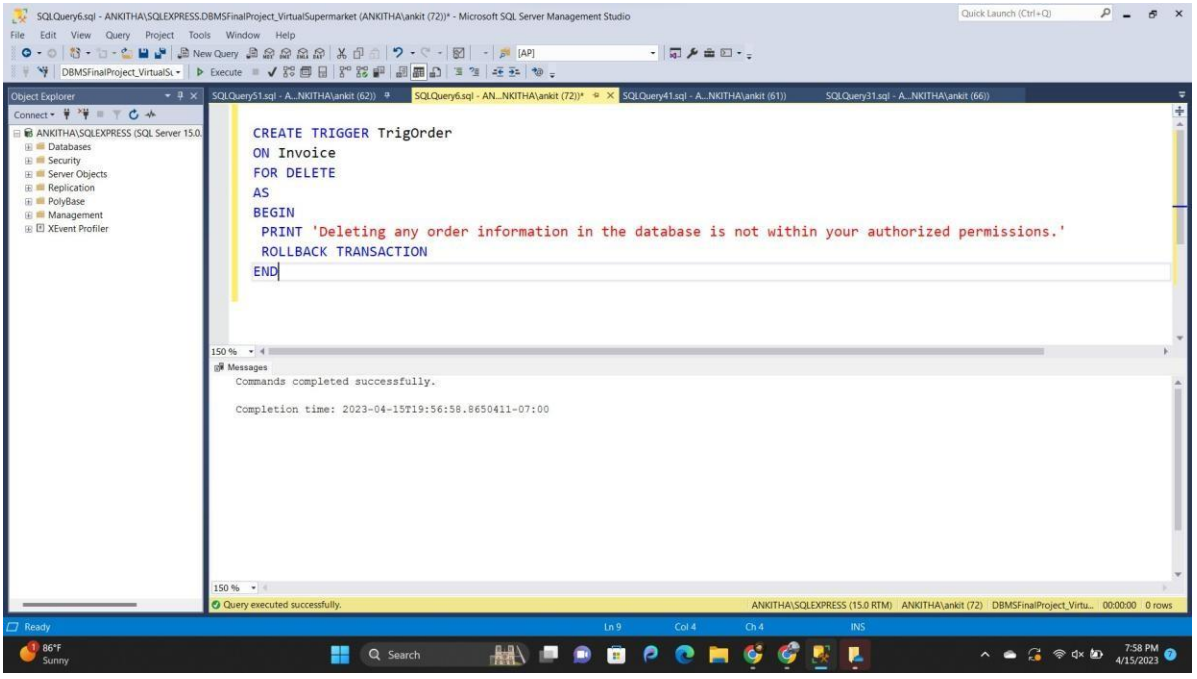
Trigger - 1

A Delete Trigger that activates when triggered: Whenever an attempt is made to delete a record from the Invoice table, this trigger will be activated.

Query:

```
CREATE TRIGGER TrigOrder ON Invoice

FOR DELETE AS BEGIN

 PRINT 'Deleting any order information in the database is not within your authorized permissions.'

ROLLBACK TRANSACTION

END
```

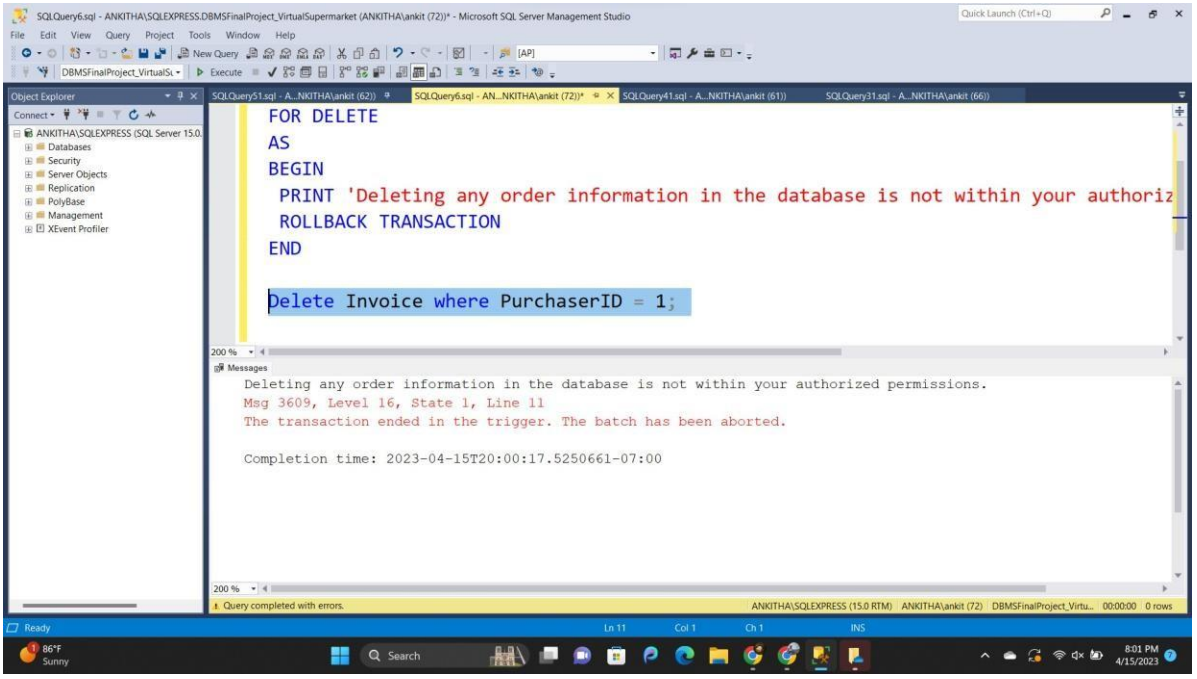
Output:



Creating a Query to Execute the Trigger:

Delete Invoice where PurchaserID = 1;

Output:



Trigger - 2

Creating a trigger on the 'invoice' table that activates every time a new invoice is added to the table. The trigger will automatically populate the 'invoiceDate' column with today's date.

Query:

Create trigger DateUpdate on Invoice

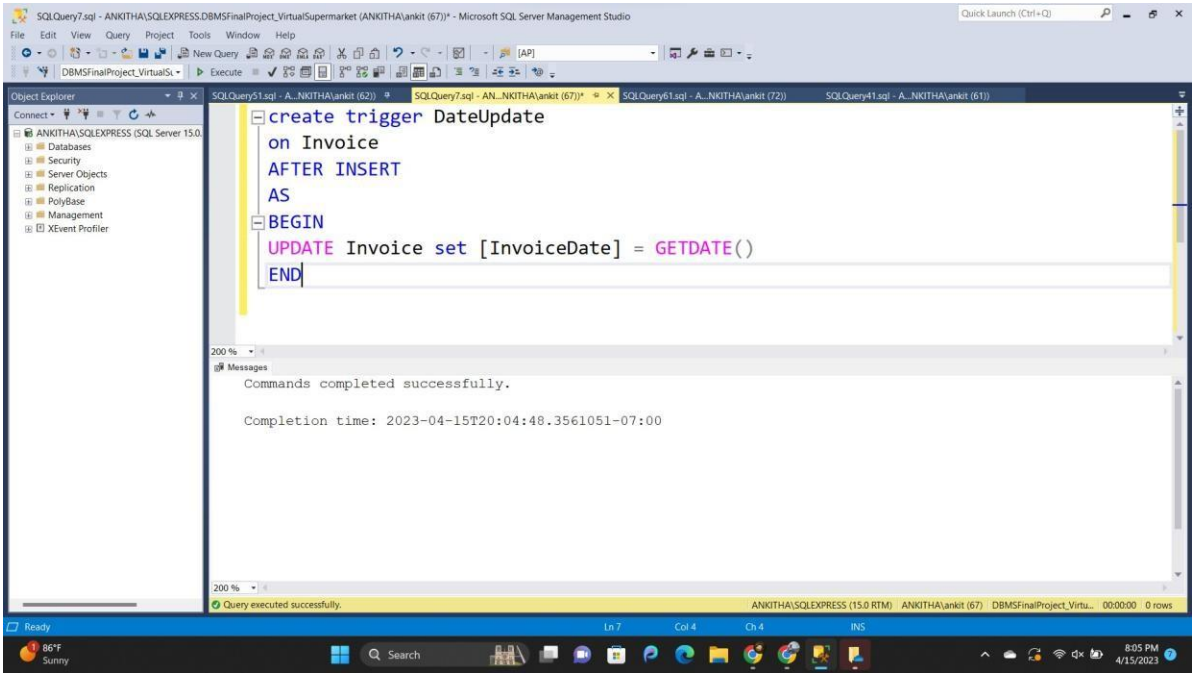
AFTER INSERT

AS BEGIN

UPDATE Invoice set [InvoiceDate] = GETDATE()

END

Output

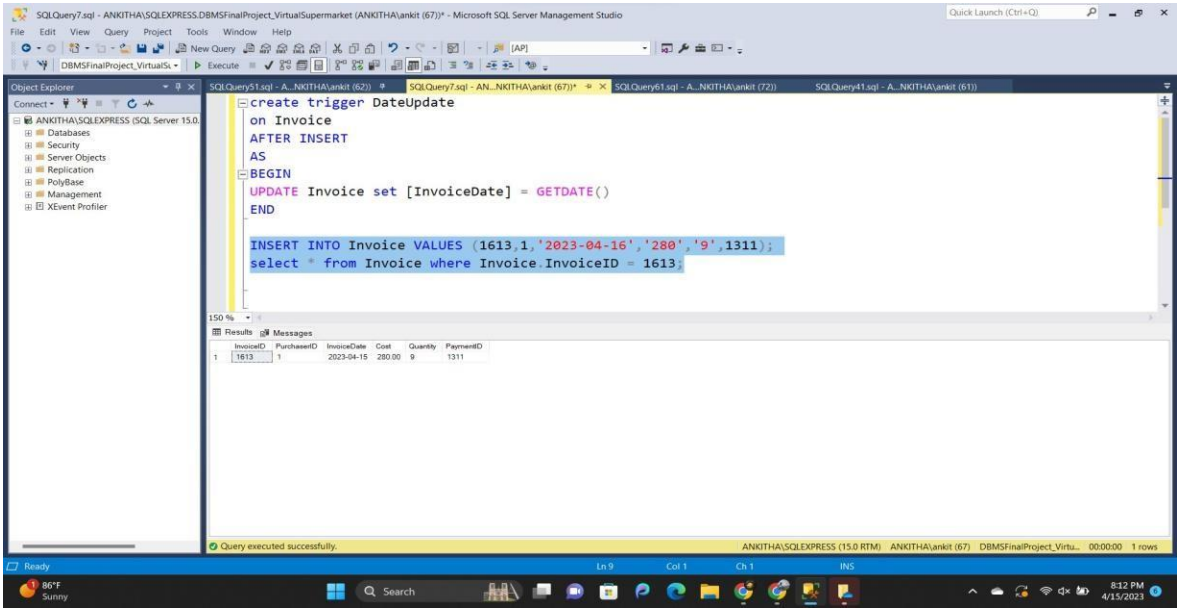


Creating a Query to Execute the Trigger:

INSERT INTO Invoice VALUES (1613,1,'2023-04-16','280','9',1311);

select * from Invoice where Invoice.InvoiceID = 1613;

Output:



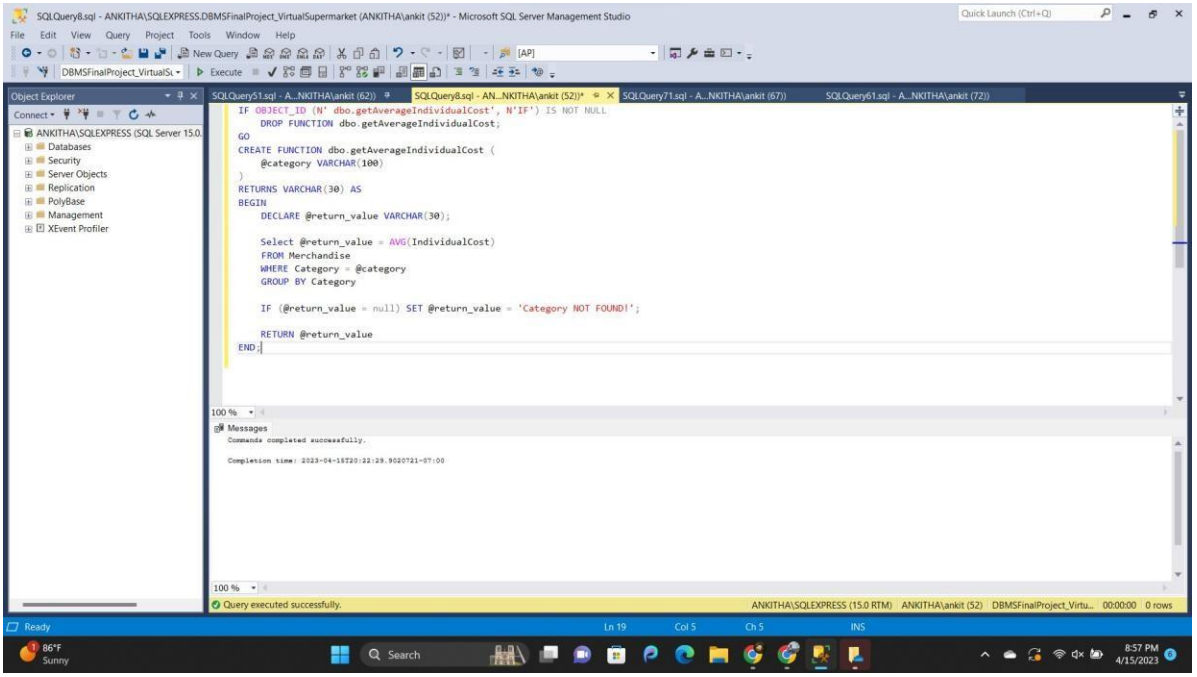
User Defined Function

Creating a User-Defined Function that accepts a 'Category' parameter, calculates the average unit cost for that specific category, and returns the resulting value.

Query:

```
IF OBJECT_ID (N' dbo.getAverageIndividualCost', N'IF') IS NOT NULL
   DROP FUNCTION dbo.getAverageIndividualCost;
GO
CREATE FUNCTION dbo.getAverageIndividualCost (
        @category VARCHAR(100))
RETURNS VARCHAR(30) AS
BEGIN
        DECLARE @return_value VARCHAR(30);
        Select @return_value = AVG(IndividualCost)
        FROM Merchandise
        WHERE Category = @category
        GROUP BY Category
   IF (@return_value = null) SET @return_value = 'Category NOT FOUND!';
   RETURN @return_value
   END;
```

Output:



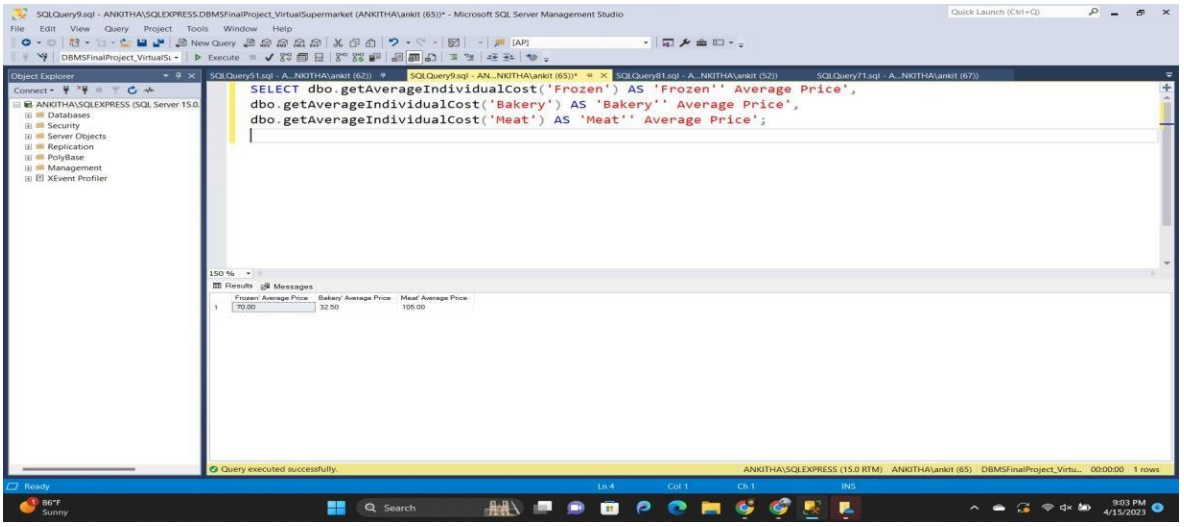
Creating a query to invoke the function:

SELECT dbo.getAverageIndividualCost('Frozen') AS 'Frozen" Average Price',

dbo.getAverageIndividualCost('Bakery') AS 'Bakery" Average Price',

dbo.getAverageIndividualCost('Meat') AS 'Meat" Average Price';

Output:



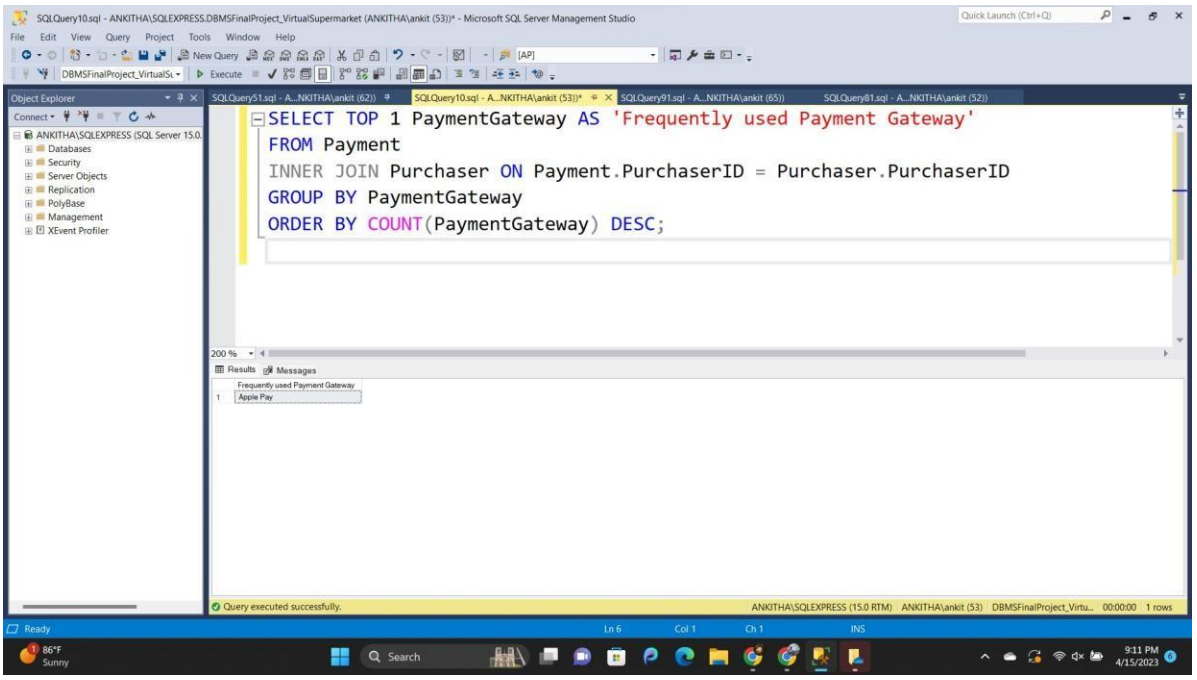
Queries that our database can respond to:

1. Which payment gateway is most frequently utilized by purchasers?

Query:

```
SELECT TOP 1 PaymentGateway
AS 'Frequently used Payment Gateway'
FROM Payment
INNER JOIN Purchaser ON Payment.PurchaserID = Purchaser.PurchaserID
GROUP BY PaymentGateway
ORDER BY COUNT(PaymentGateway) DESC;
```

Output:



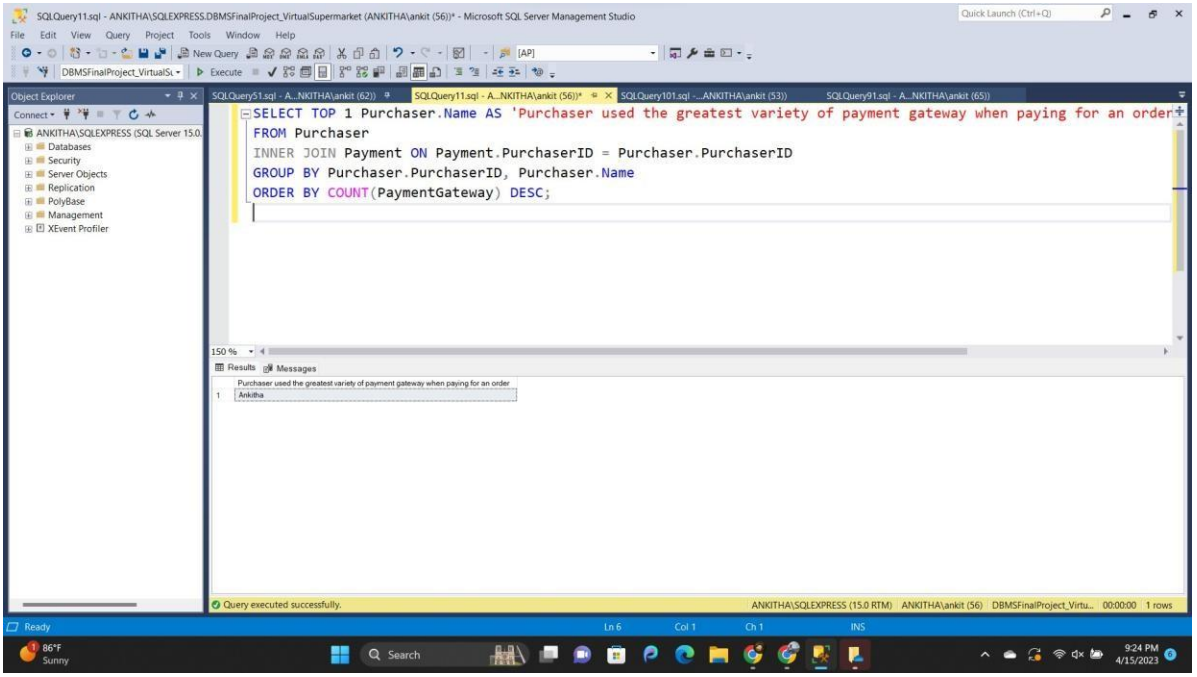
2. Which purchaser has used the greatest variety of payment gateway when paying for an order?

Query:

```
SELECT TOP 1 Purchaser.Name
```

```
AS 'Purchaser used the greatest variety of payment gateway when paying for an order'

FROM Purchaser

INNER JOIN Payment ON Payment.PurchaserID = Purchaser.PurchaserID

GROUP BY Purchaser.PurchaserID, Purchaser.Name

ORDER BY COUNT(PaymentGateway) DESC;
```

Output:



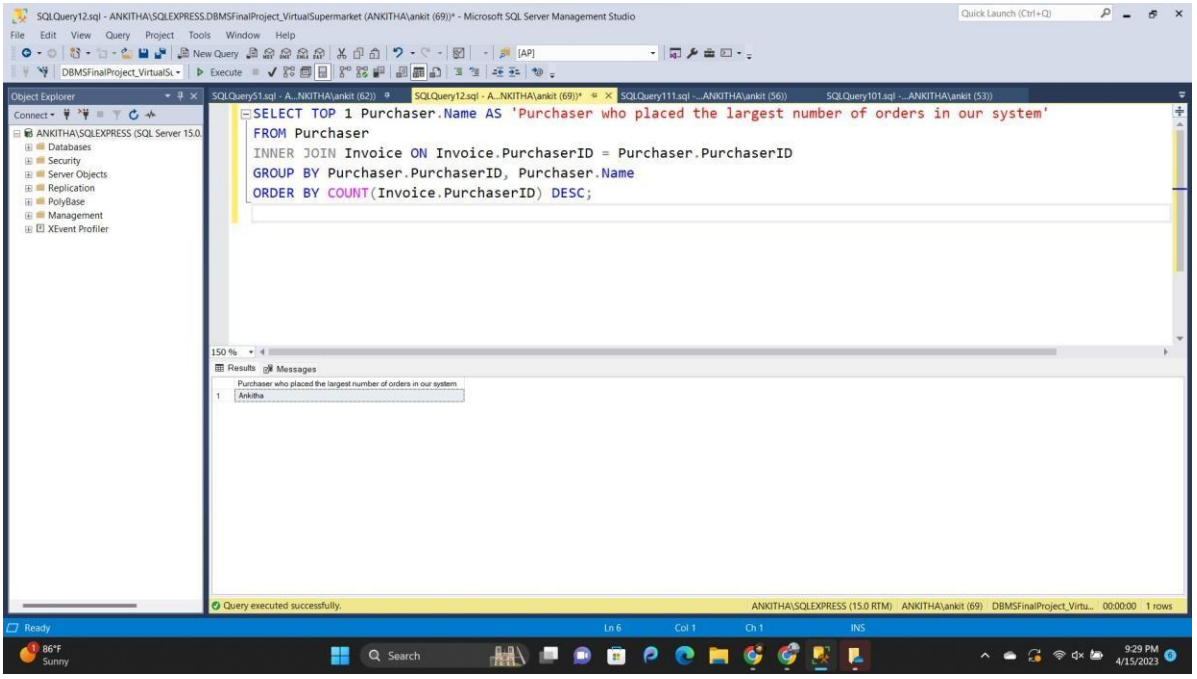
3. Which purchaser has placed the largest number of orders in our system?

Query:

```
SELECT TOP 1 Purchaser.Name

AS 'Purchaser who placed the largest number of orders in our system'

FROM Purchaser

INNER JOIN Invoice ON Invoice.PurchaserID = Purchaser.PurchaserID
```

```
GROUP BY Purchaser.PurchaserID, Purchaser.Name

ORDER BY COUNT(Invoice.PurchaserID) DESC;
```

Output:

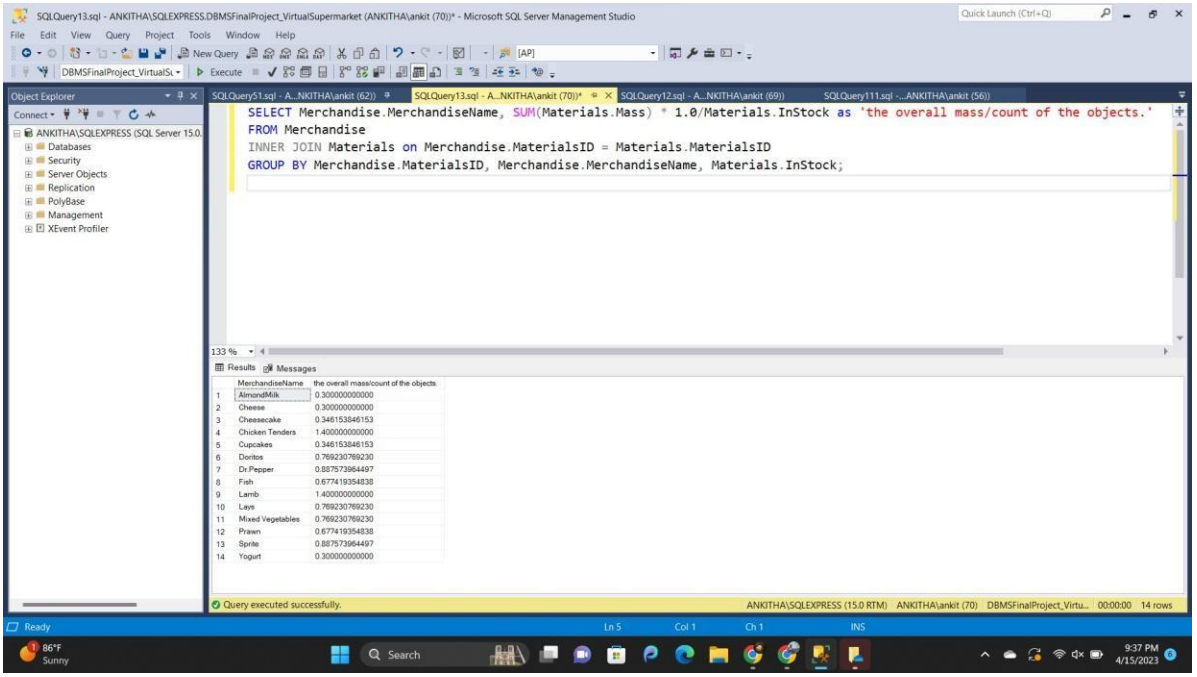


4. What is the ratio between the number of merchandise and their mass? This enables us to comprehend the constraints of materials space and whether we can meet the demands of supply and demand.

Query:

```
SELECT Merchandise.MerchandiseName,

SUM(Materials.Mass) * 1.0/Materials.InStock as 'the overall mass/count of the objects.'

FROM Merchandise

INNER JOIN Materials on Merchandise.MaterialsID = Materials.MaterialsID

GROUP BY Merchandise.MaterialsID, Merchandise.MerchandiseName, Materials.InStock;
```

Output:



Results Messages

	MerchandiseName	the overall mass/count of the objects.
1	AlmondMilk	0.300000000000
2	Cheese	0.300000000000
3	Cheesecake	0.346153846153
4	Chicken Tenders	1.400000000000
5	Cupcakes	0.346153846153
6	Doritos	0.769230769230
7	Dr.Pepper	0.887573964497
8	Fish	0.677419354838
9	Lamb	1.400000000000
10	Lays	0.769230769230
11	Mixed Vegetables	0.769230769230
12	Prawn	0.677419354838
13	Sprite	0.887573964497
14	Yogurt	0.300000000000

5. To how many categories does each vendor provide supplies?

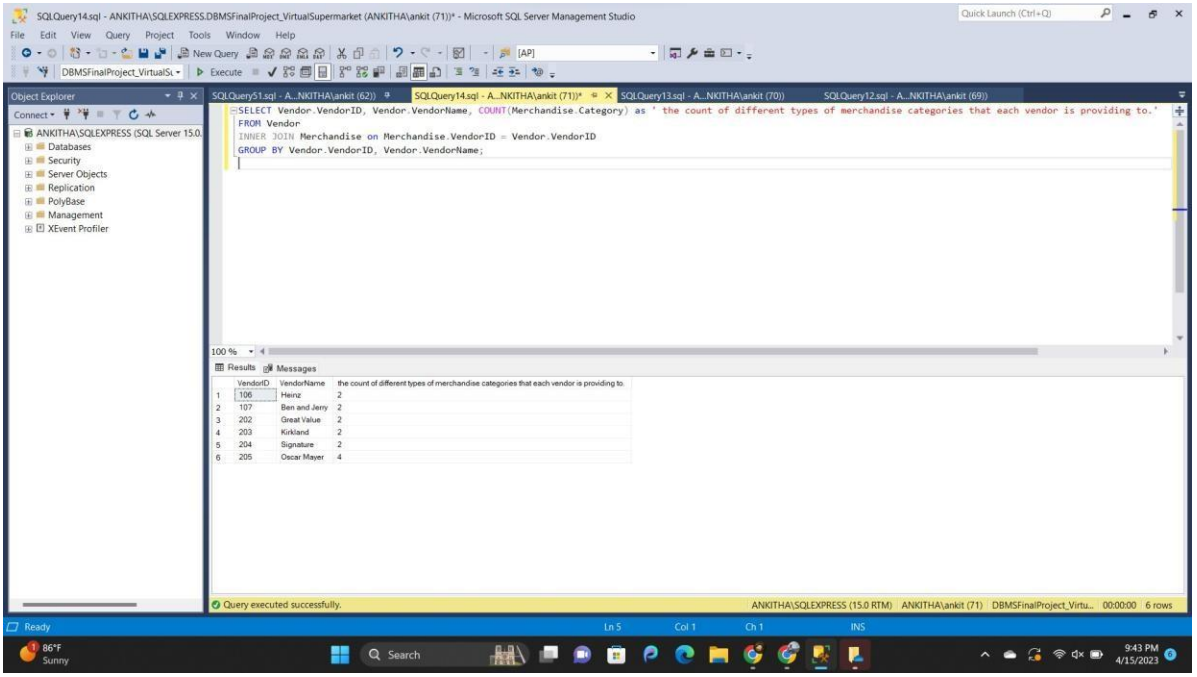
Query:

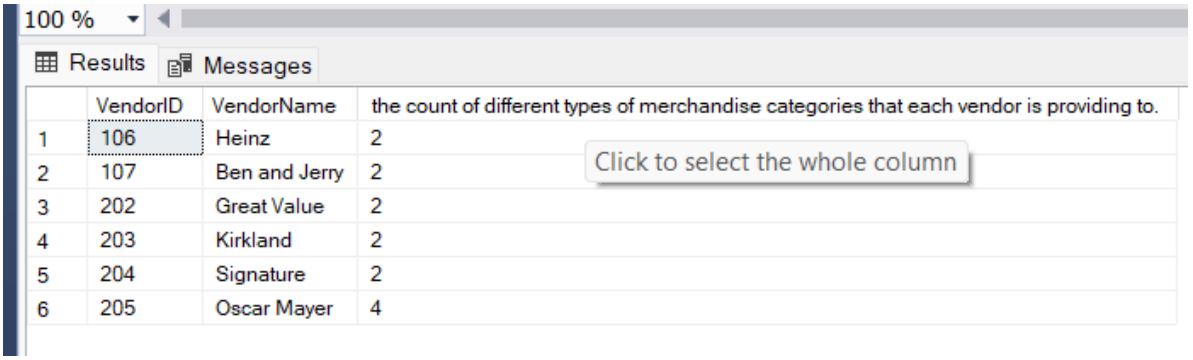
SELECT Vendor.VendorID,

Vendor.VendorName,

```
COUNT(Merchandise.Category)

AS ' the count of different types of merchandise categories that each vendor is providing to.'

FROM Vendor

INNER JOIN Merchandise on Merchandise.VendorID = Vendor.VendorID

GROUP BY Vendor.VendorID, Vendor.VendorName;
```

Output:

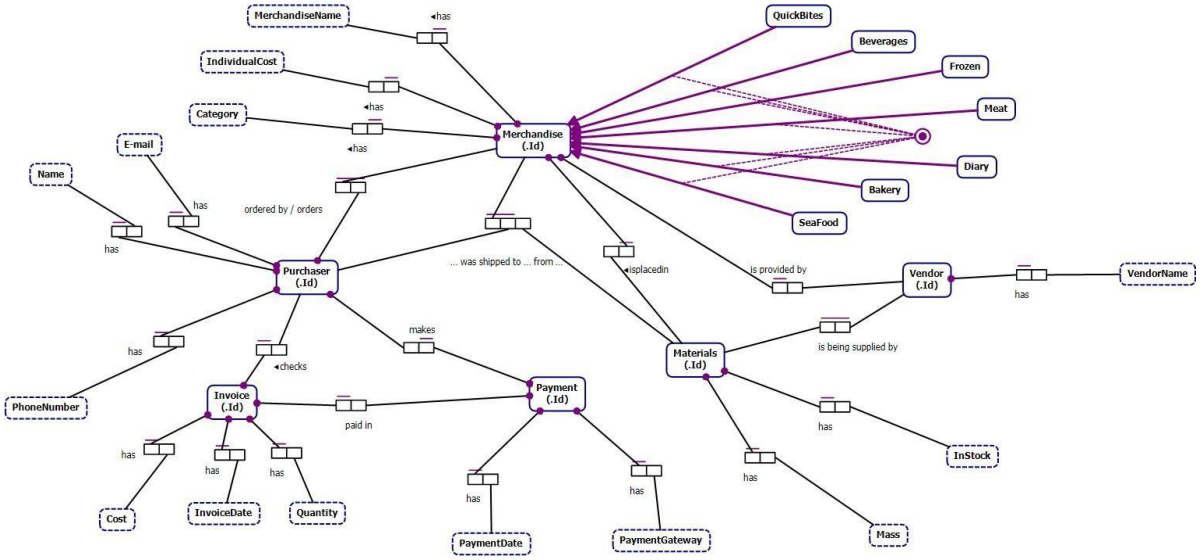




	VendorID	VendorName	the count of different types of merchandise categories that each vendor is providing to.
1	106	Heinz	2
2	107	Ben and Jerry	2
3	202	Great Value	2
4	203	Kirkland	2
5	204	Signature	2
6	205	Oscar Mayer	4

Section 6 - NoSQL

Section 6.1



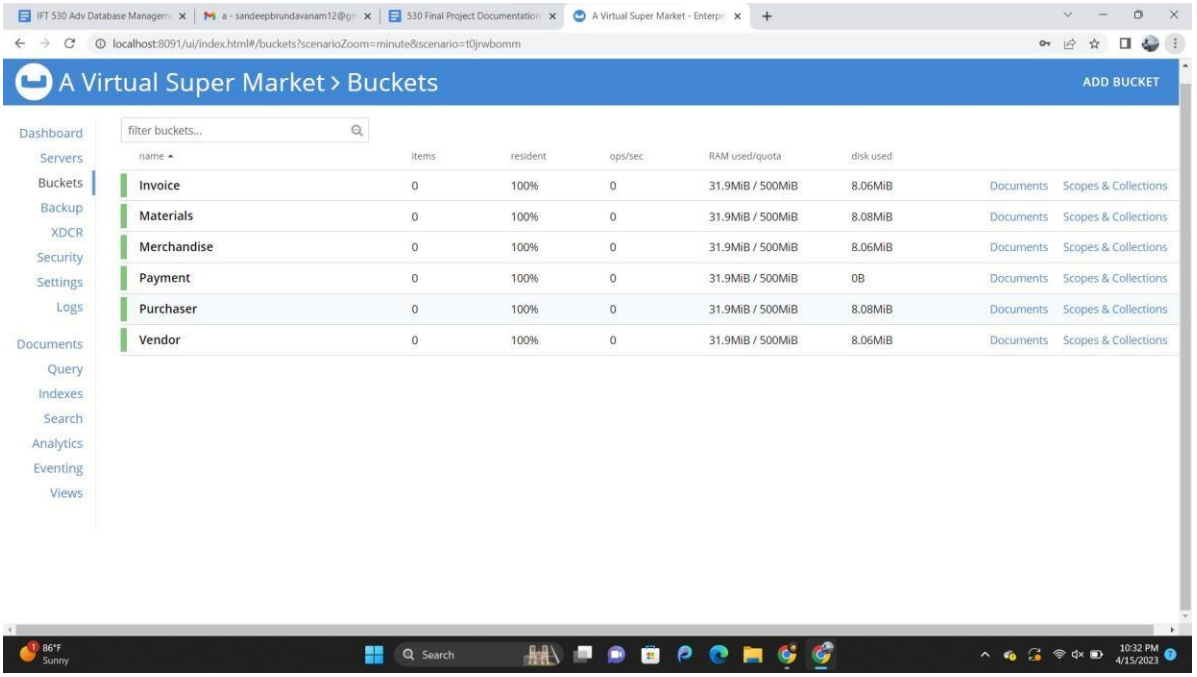
An ORM (Object-Relational Mapping) diagram viewed from a NoSQL standpoint.

There are several subcategories of merchandise available, such as "Meat", "Dairy", "Quick bites", and "Frozen". Each of these subcategories is identified by a unique identifier called MerchandiseId.

The following are the six primary buckets that we have created:

- Purchaser
- Materials
- Merchandise
- Invoice
- Vendor
- Payment

Section 6.2 Bucket Information



Adding Documents in Materials Bucket:

```
insert into Materials (key,value)
values ("301",
{ "MaterialsId": 301,
   "InStock": 300,
   "Mass": 90 }),
 ("302", { "MaterialsId": 302,
   "InStock": 338,
   "Mass": 300 }),
 ("303", { "MaterialsId": 303,
   "InStock": 65,
```

"Mass": 50 }),

("304", { "MaterialsId": 304,

"InStock": 910,

"Mass": 510 }),

("305",

{ "MaterialsId": 305,

"InStock": 650,

"Mass": 420 }),

("306",

{ "MaterialsId": 306,

"InStock": 40,

"Mass": 6 }),

("307",

{ "MaterialsId": 307,

"InStock": 272,

"Mass": 55 }),

("308",

{ "MaterialsId": 308,

"InStock": 400,

"Mass": 220 }),

("309",

{ "MaterialsId": 309,

"InStock": 50,

"Mass": 70 }),

("310",

{ "MaterialsId": 310,

"InStock": 70,

"Mass": 65 }),

("311",

{ "MaterialsId": 311,

"InStock": 26,

"Mass": 9 }),

("312",

{ "MaterialsId": 312,

"InStock": 900,

"Mass": 25 }),

("313",

{ "MaterialsId": 313,

"InStock": 310,

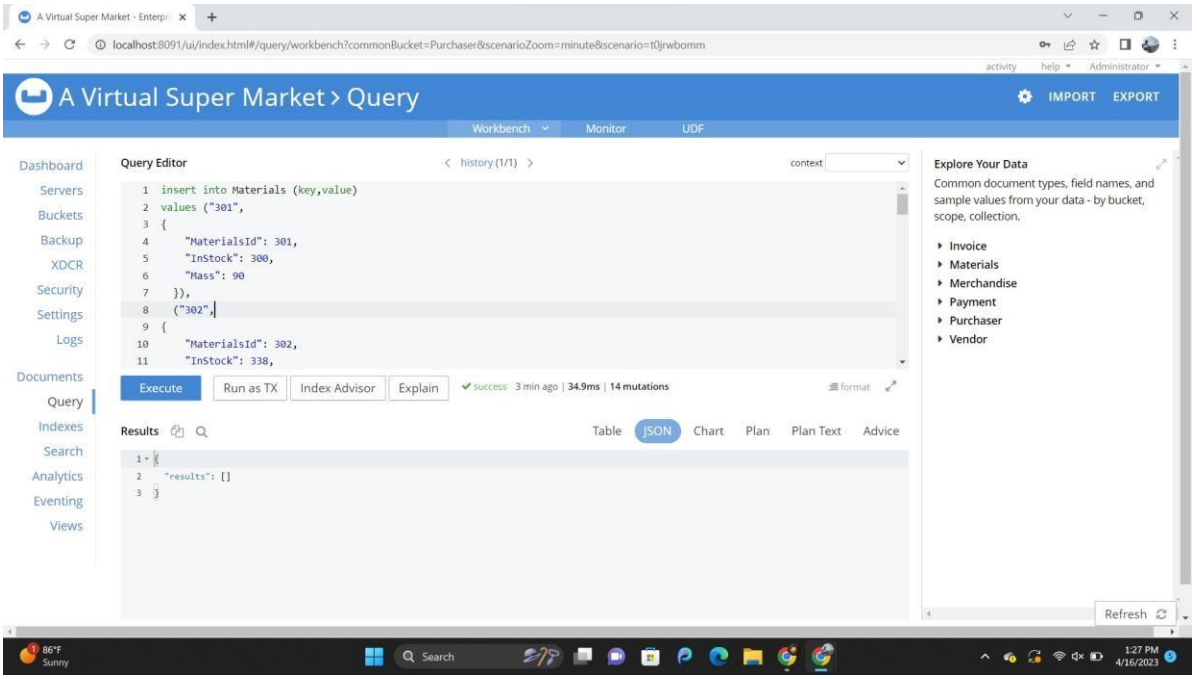
"Mass": 210 }),

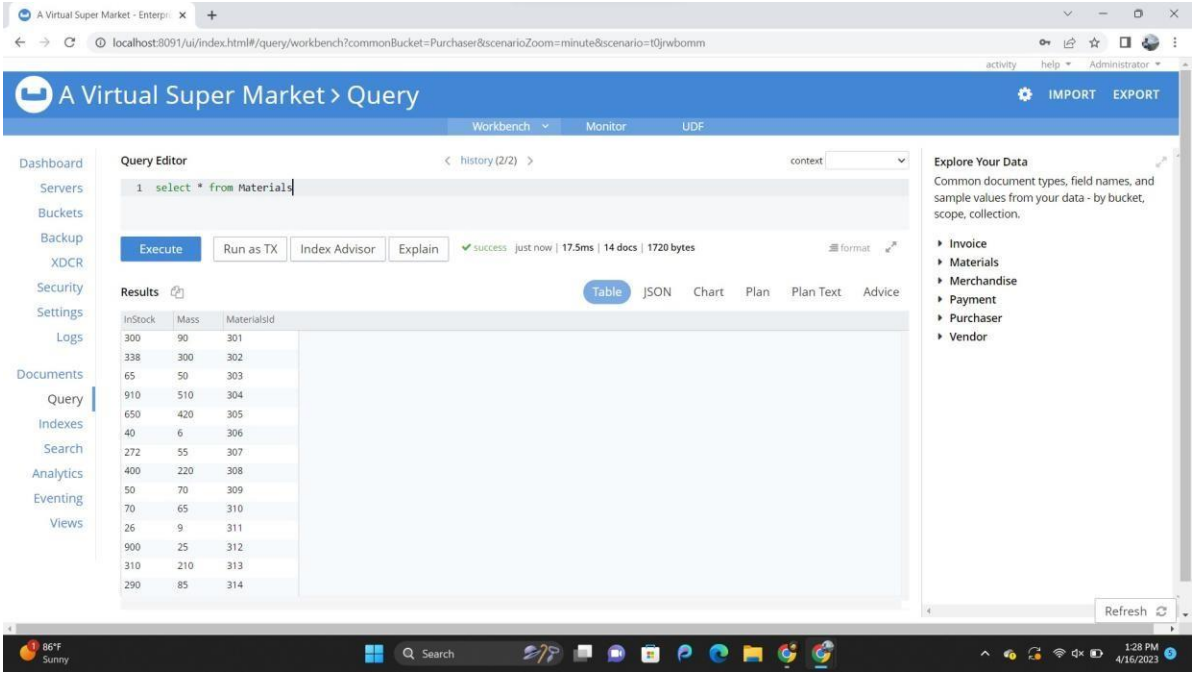
("314",

{ "MaterialsId": 314,

"InStock": 290,

"Mass": 85 })





Adding Documents in Merchandise Bucket:

```
insert into Merchandise (key,value)
values ("1900",
{
    "MerchandiseID": 1900,
    "Category": "Dairy",
    "MaterialsId": 301,
    "MerchandiseName": "Yogurt",
    "VendorId": 202 ,
    "IndividualCost": 50
  }),
  ("1901",
{
    "MerchandiseID": 1901,
    "Category": "Dairy",
    "MaterialsId": 301,
    "MerchandiseName": "AlmondMilk",
    "VendorId": 203 ,
    "IndividualCost": 30
  }),
```

("1902",

{

"MerchandiseID": 1902,

"Category": "Dairy",

"MaterialsId": 301,

"MerchandiseName": "Cheese",

"VendorId": 202 ,

"IndividualCost": 55

}),

("1903",

{

"MerchandiseID": 1903,

"Category": "QuickBites",

"MaterialsId": 303,

"MerchandiseName": "Lays",

"VendorId": 205 ,

"IndividualCost": 90

}),

("1904",

{

```
    "MerchandiseID": 1904,
    "Category": "QuickBites",
    "MaterialsId": 303,
    "MerchandiseName": "Doritos",
    "VendorId": 205 ,
    "IndividualCost": 85
  }),
  ("1905",
{
    "MerchandiseID": 1905,
    "Category": "Frozen",
    "MaterialsId": 303,
    "MerchandiseName": "Mixed Vegtables",
    "VendorId": 203 ,
    "IndividualCost": 70
  }),
  ("1906",
{
    "MerchandiseID": 1906,
    "Category": "Beverages",
```

```
    "MaterialsId": 302,
    "MerchandiseName": "Sprite",
    "VendorId": 205 ,
    "IndividualCost": 40
  }),
  ("1907",
{
    "MerchandiseID": 1907,
    "Category": "Beverages",
    "MaterialsId": 302,
    "MerchandiseName": "Dr.Pepper",
    "VendorId": 205 ,
    "IndividualCost": 45
  }),
  ("1908",
{
    "MerchandiseID": 1908,
    "Category": "Meat",
    "MaterialsId": 309,
    "MerchandiseName": "Chicken Tenders",
```

```
    "VendorId": 106 ,
    "IndividualCost": 90
  }),
  ("1909",
{
    "MerchandiseID": 1909,
    "Category": "Meat",
    "MaterialsId": 309,
    "MerchandiseName": "Lamb",
    "VendorId": 106 ,
    "IndividualCost": 120
  }),
  ("1910",
{
   "MerchandiseID": 1910,
    "Category": "Bakery",
    "MaterialsId": 311,
    "MerchandiseName": "Cupcakes",
    "VendorId": 204 ,
    "IndividualCost": 30
```

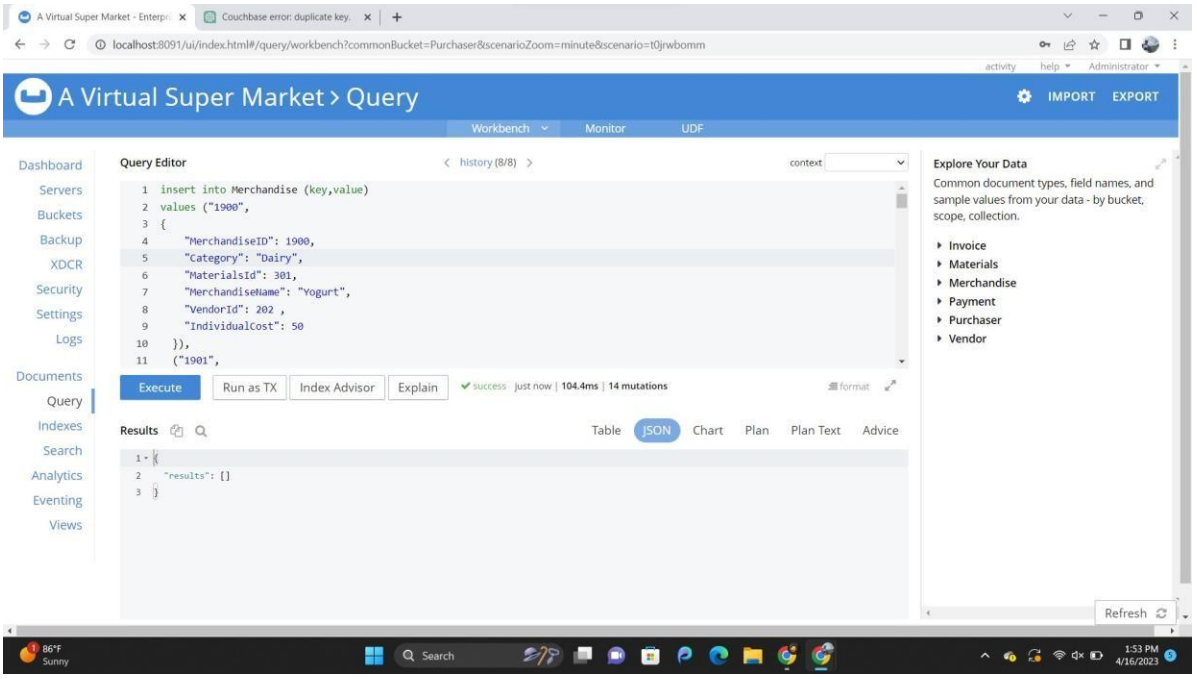
```
  }),
  ("1911",
{
    "MerchandiseID":  1911,
    "Category": "Bakery",
    "MaterialsId": 311,
    "MerchandiseName": "Cheesecake",
    "VendorId": 204 ,
    "IndividualCost": 35
  }),
  ("1912", {
    "MerchandiseID": 1912,
    "Category": "SeaFood",
    "MaterialsId": 313,
    "MerchandiseName": "Prawn",
    "VendorId": 107 ,
    "IndividualCost": 35 }),
  ("1913",
{ "MerchandiseID": 1913,
    "Category": "SeaFood",
```

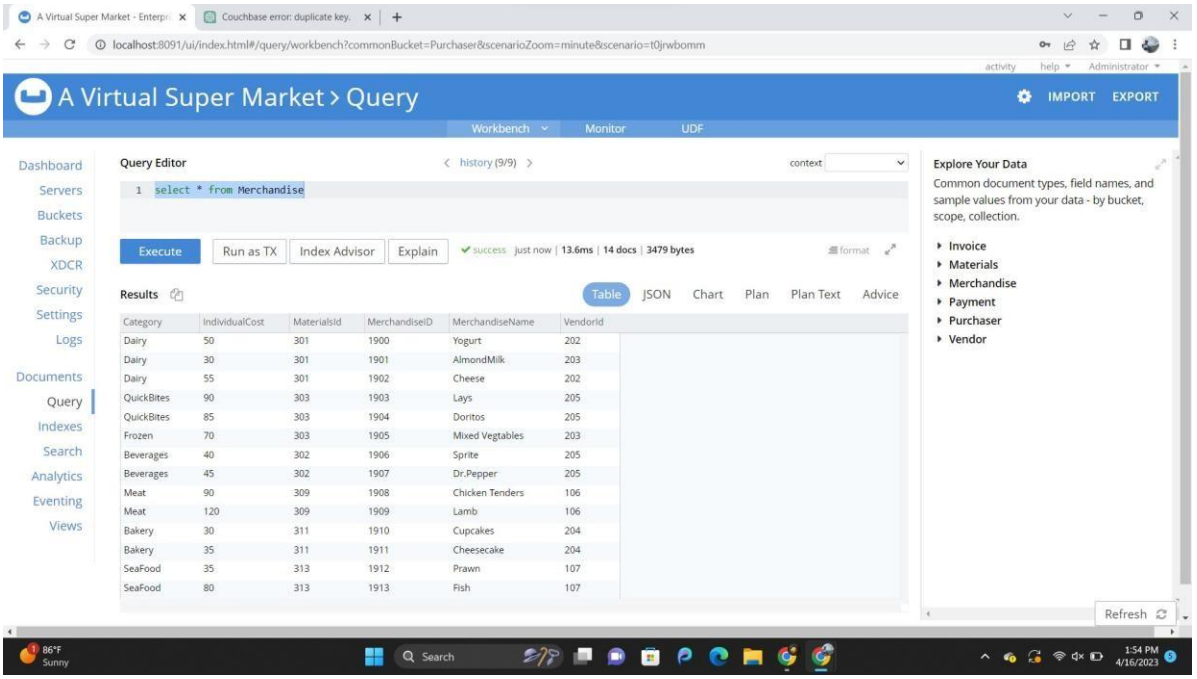
"MaterialsId": 313,

"MerchandiseName": "Fish",

"VendorId": 107 ,

"IndividualCost": 80 })





Adding Documents in Invoice Bucket:

```
insert into Invoice (key,value)
values ("1600",
{
    "InvoiceId": 1600,
    "PurchaserId": 5,
    "InvoiceDate": "01/21/2022",
    "Cost": 350,
    "Quantity": 25,
    "PaymentID":1300
  }),
  ("1601",
{
    "InvoiceId": 1601,
    "PurchaserId": 2,
    "InvoiceDate": "01/17/2023",
    "Cost": 800,
    "Quantity": 5,
    "PaymentID":1301
  }),
```

("1602",

{

"InvoiceId": 1602,

"PurchaserId": 7,

"InvoiceDate": "01/19/2023",

"Cost": 240,

"Quantity": 21,

"PaymentID":1302

}),

("1603",

{

"InvoiceId": 1603,

"PurchaserId": 6,

"InvoiceDate": "02/12/2023",

"Cost": 470,

"Quantity": 8,

"PaymentID":1303

}),

("1604",

{

```
    "InvoiceId": 1604,
    "PurchaserId": 3,
    "InvoiceDate": "02/13/2023",
    "Cost": 660,
    "Quantity": 11,
    "PaymentID":1304
  }),
  ("1605",
{
    "InvoiceId": 1605,
    "PurchaserId": 1,
    "InvoiceDate": "03/12/2023",
    "Cost": 325,
    "Quantity": 23,
    "PaymentID":1305
  }),
  ("1606",
{
    "InvoiceId": 1606,
    "PurchaserId": 4,
```

```
    "InvoiceDate": "03/29/2023",
    "Cost": 410,
    "Quantity": 14,
    "PaymentID":1306
  }),
  ("1607",
{
    "InvoiceId": 1607,
    "PurchaserId": 8,
    "InvoiceDate": "02/18/2023",
    "Cost": 381,
    "Quantity": 5,
    "PaymentID":1307
  }),
  ("1608", {
    "InvoiceId": 1608,
    "PurchaserId": 4,
    "InvoiceDate": "02/13/2023",
    "Cost": 535,
    "Quantity": 25,
```

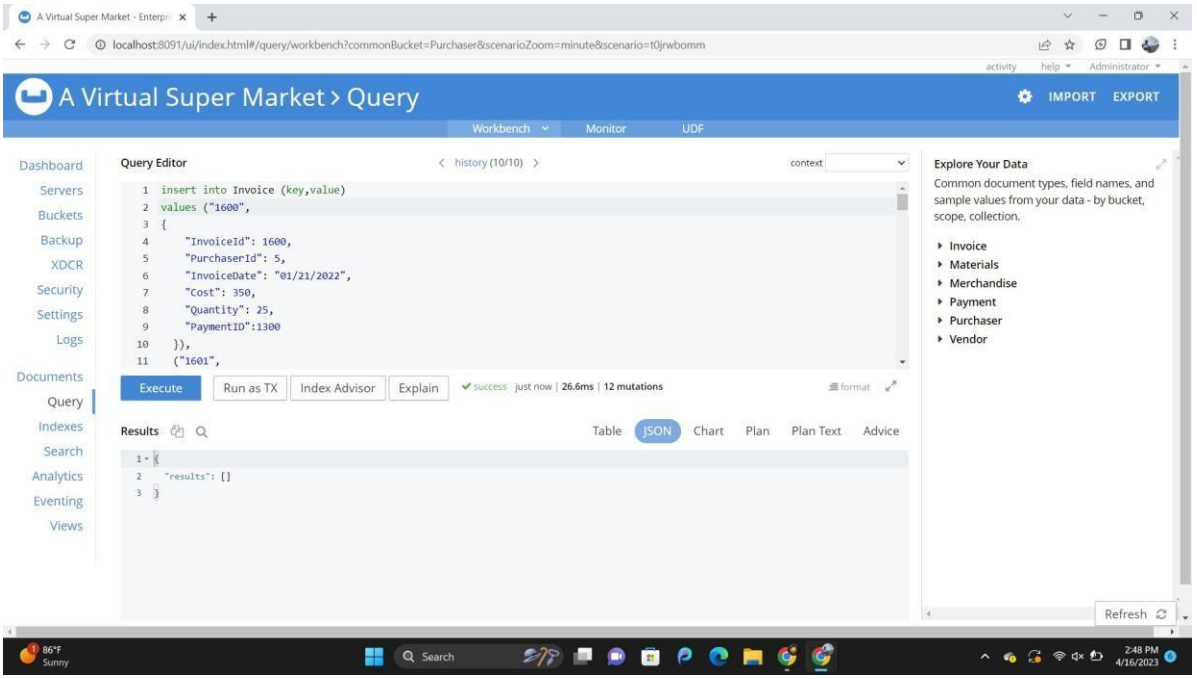
```
   "PaymentID":1308 }),
  ("1609", {
   "InvoiceId": 1609,
    "PurchaserId": 7,
    "InvoiceDate": "03/04/2023",
    "Cost": 669,
    "Quantity": 19,
    "PaymentID":1309
 }),
  ("1610", {
    "InvoiceId": 1610,
    "PurchaserId": 1,
    "InvoiceDate": "04/10/2023",
    "Cost": 2011,
    "Quantity": 5,
    "PaymentID":1310
 }),
  ("1611", {
   "InvoiceId": 1611,
    "PurchaserId": 1,
```

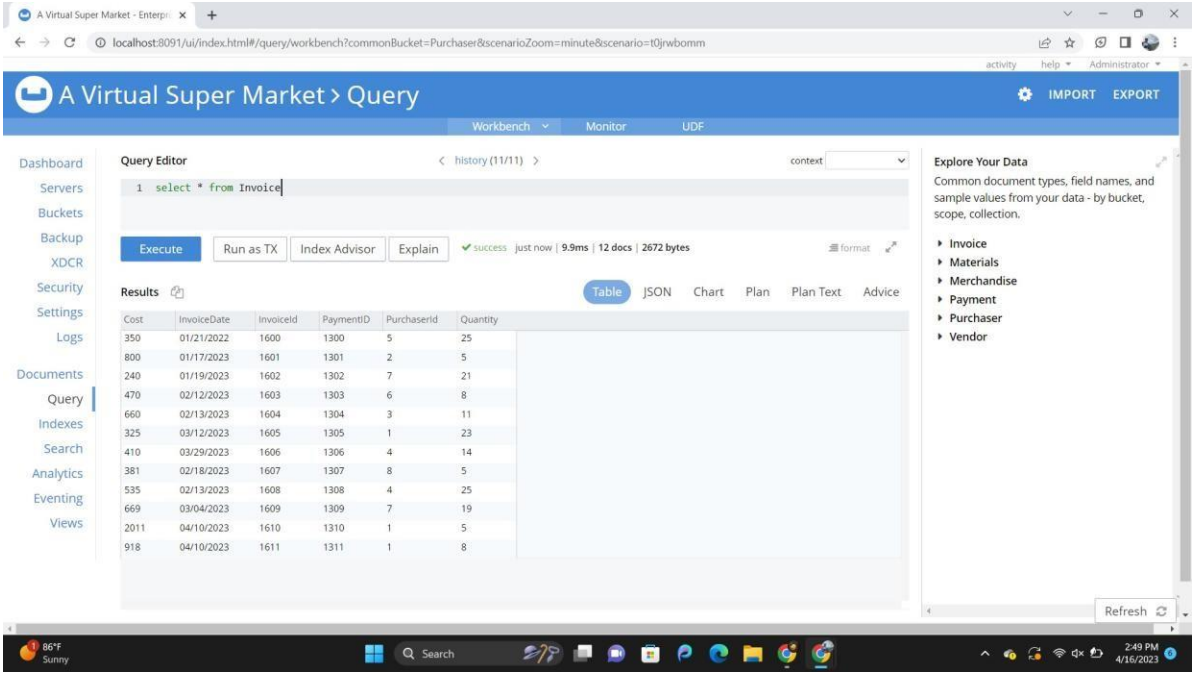
"InvoiceDate": "04/10/2023",

"Cost": 918,

"Quantity": 8,

"PaymentID":1311 })





Adding Documents in Vendor Bucket:

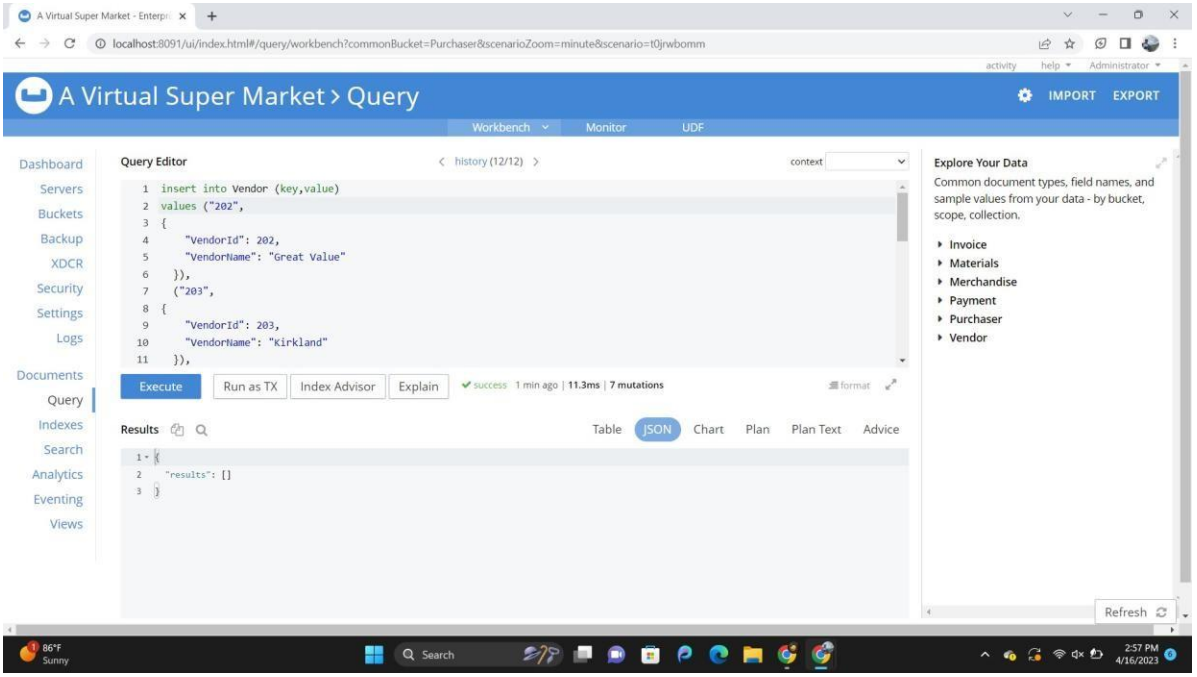
```
insert into Vendor (key,value)
values ("202",
{"VendorId": 202,
   "VendorName": "Great Value" }),
 ("203",
{"VendorId": 203,
 "VendorName": "Kirkland"}),
 ("204",
{ "VendorId": 204,
 "VendorName": "Signature" }),
 ("205",
{ "VendorId": 205,
   "VendorName": "Oscar Mayer"}),
 ("105",
{ "VendorId": 105,
   "VendorName": "Gold Medal"}),
 ("106",
{ "VendorId": 106,
   "VendorName": "Heinz"}),
```

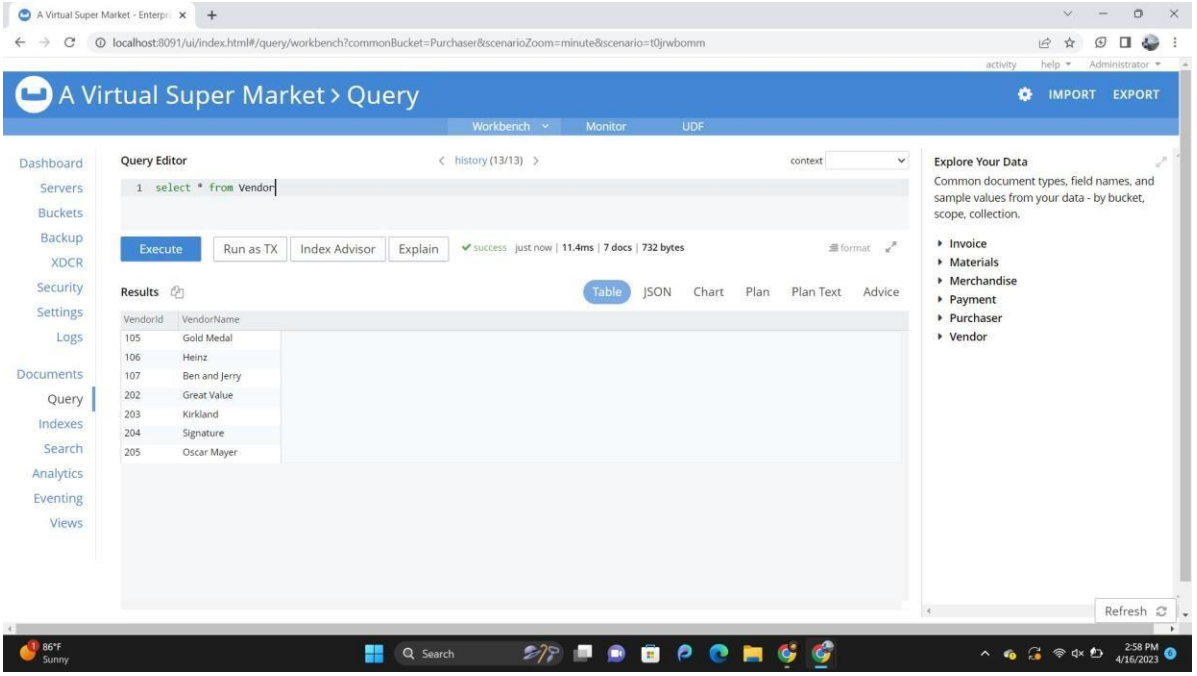
("107",

{ "VendorId": 107,

"VendorName": "Ben and Jerry"

})





Adding Documents in Payment Bucket:

```
insert into Payment (key,value)
values ("1300",
{
    "PaymentID": 1300,
    "PurchaserId": 5,
    "PaymentDate": "03/11/2023",
    "PaymentGateway": "Credit"
  }),
  ("1301",
{
    "PaymentID": 1301,
    "PurchaserId": 2,
    "PaymentDate": "03/07/2023",
    "PaymentGateway": "CashOnDelivery"
  }),
  ("1302",
{
    "PaymentID": 1302,
    "PurchaserId": 7,
```

```
    "PaymentDate": "02/09/2023",
    "PaymentGateway": "Apple pay"
  }),
  ("1303",
{
   "PaymentID": 1303,
    "PurchaserId": 6,
    "PaymentDate": "02/02/2023",
    "PaymentGateway": "Apple pay"
  }),
  ("1304",
{
    "PaymentID": 1304,
    "PurchaserId": 3,
    "PaymentDate": "02/03/2023",
    "PaymentGateway": "Google pay"
  }),
  ("1305",
{
   "PaymentID": 1305,
```

```
    "PurchaserId": 1,
    "PaymentDate": "01/22/2023",
    "PaymentGateway": "Google pay"
  }),
  ("1306",
{
    "PaymentID": 1306,
    "PurchaserId": 4,
    "PaymentDate": "01/19/2023",
    "PaymentGateway": "Credit"
  }),
  ("1307",
{
   "PaymentID": 1307,
    "PurchaserId": 8,
    "PaymentDate": "03/28/2023",
    "PaymentGateway": "Debit"
  }),
  ("1308",
{
```

"PaymentID": 1308,

"PurchaserId": 4,

"PaymentDate": "02/03/2023",

"PaymentGateway": "Google pay"

}),

("1309",

{

"PaymentID": 1309,

"PurchaserId": 7,

"PaymentDate": "02/03/2023",

"PaymentGateway": "Apple pay"

}),

("1310",

{

"PaymentID": 1310,

"PurchaserId": 1,

"PaymentDate": "04/10/2023",

"PaymentGateway": "CashOnDelivery"

}),

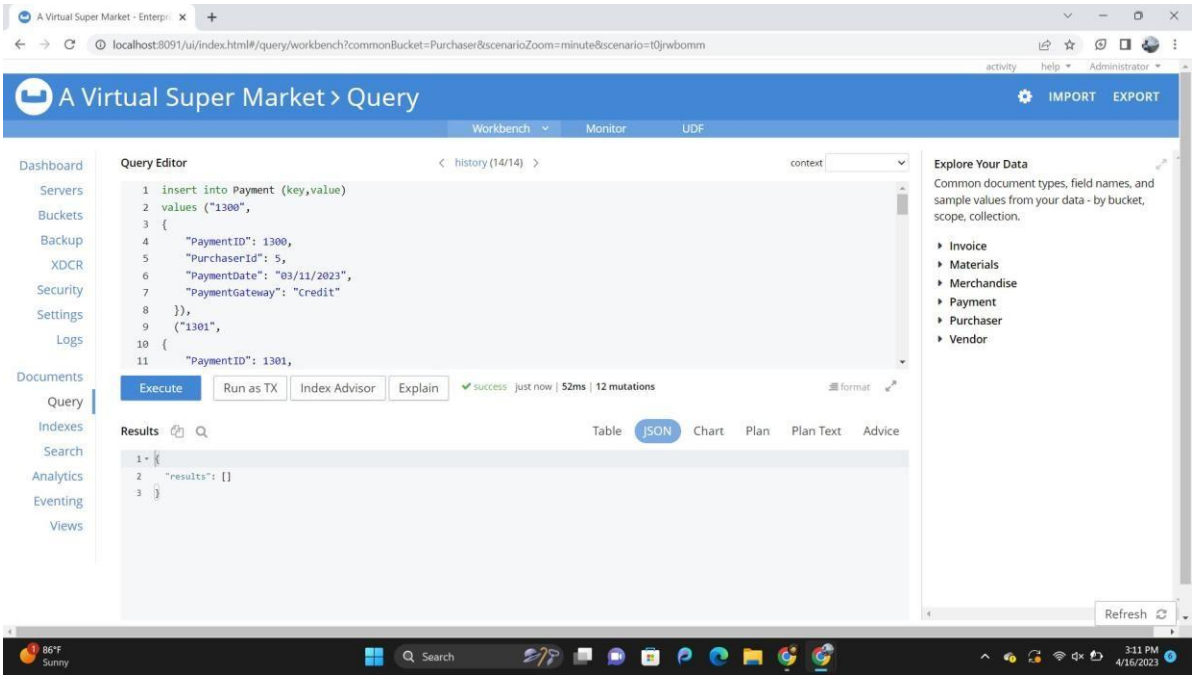
("1311",

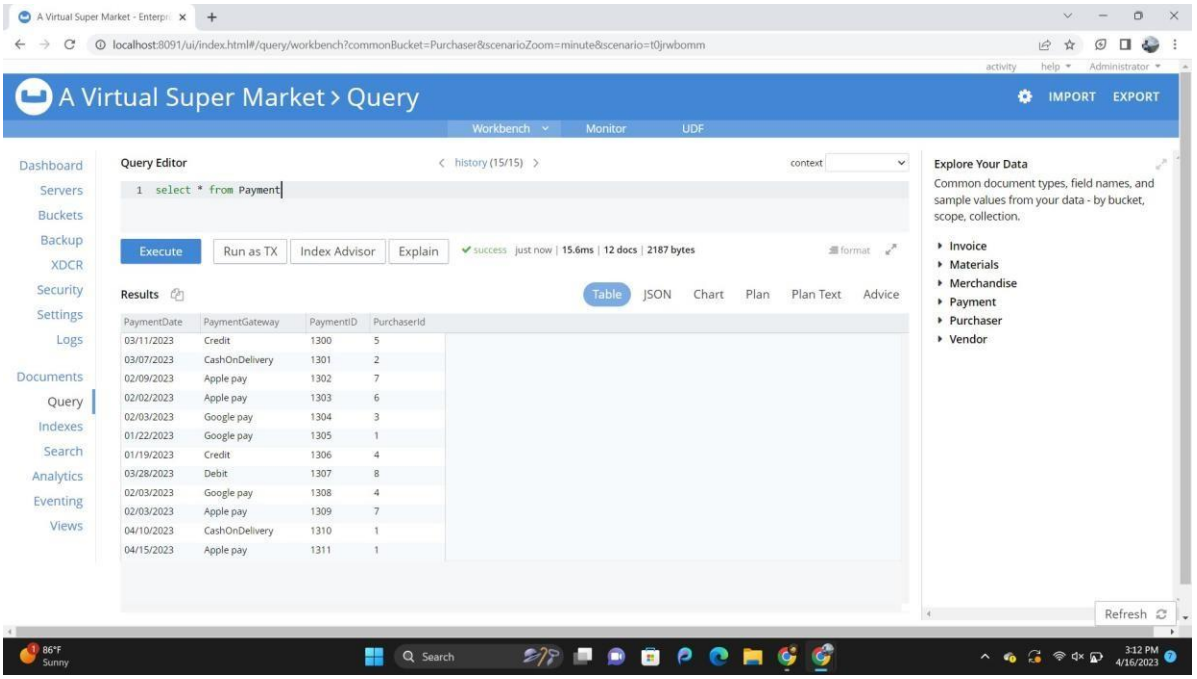
{ "PaymentID": 1311,

"PurchaserId": 1,

"PaymentDate": "04/15/2023",

"PaymentGateway": "Apple pay"})





Section 6.3

One of the conditions was to demonstrate the nesting of two buckets within one. In this case, the Purchaser bucket contains both the Address information and Favourites List, which are combined or nested together.

Customer Bucket Document:


```
[
  { "Purchaser": {
      "PurchaserId": 1,
      "Email": "ankitha@gmail.com",
      "Name": "Ankitha",
      "Phone": 4073886675,
      "address": {
        "city": "Tempe",
        "street": "1-125, Pyramid road",
        "zipcode": "58321"},
      "Favourites List": "Fish"}},
  { "Purchaser": {
      "PurchaserId": 2,
      "Email": "sandeep@gmail.com",
      "Name": "Sandeep",
```

"Phone": 4073886674,

"address": {

"city": "Tempe",

"street": "142/2, Yendada",

"zipcode": "53681" },

"Favourites List": "Mixed Vegetables" } },

{ "Purchaser": {

"PurchaserId": 3,

"Email": "himasree@gmail.com",

"Name": "Himasree",

"Phone": 4073886673,

"address": {

"city": "North Carolina",

"street": "431, Gudiwada",

"zipcode": "52361" },

"Favourites List": "Cupcakes" } },

{ "Purchaser": {

"PurchaserId": 4,

"Email": "indu@gmail.com",

"Name": "Indu",

"Phone": 4073886672,

"address": {

"city": "Seattle",

"street": "751, Gitam",

"zipcode": "52561" },

"Favourites List": "Milk" } },

{ "Purchaser": {

"PurchaserId": 5,

"Email": "greeshma@gmail.com",

"Name": "Greeshma",

"Phone": 4073886671,

"address": {

"city": "Texas",

"street": "754, University st",

"zipcode": "68731" },

"Favourites List": "Cheese" } },

{ "Purchaser": {

"PurchaserId": 6,

"Email": "padhu@gmail.com",

"Name": "Padhu",

"Phone": 4073886670,

"address": {"city": "Boston",

"street": "871, yendada",

"zipcode": "56214" },

"Favourites List": "Lays" } },

{"Purchaser": {

"PurchaserId": 7,

"Email": "santosh@gmail.com",

"Name": "Santosh",

"Phone": 4073886681,

"address": { "city": "North Carolina",

"street": "5621, Anna st",

"zipcode": "45631" },

"Favourites List": "Almond Milk" }},

{"Purchaser": {

"PurchaserId": 8,

"Email": "sampath@gmail.com",

"Name": "Sampath",

"Phone": 4073886682,

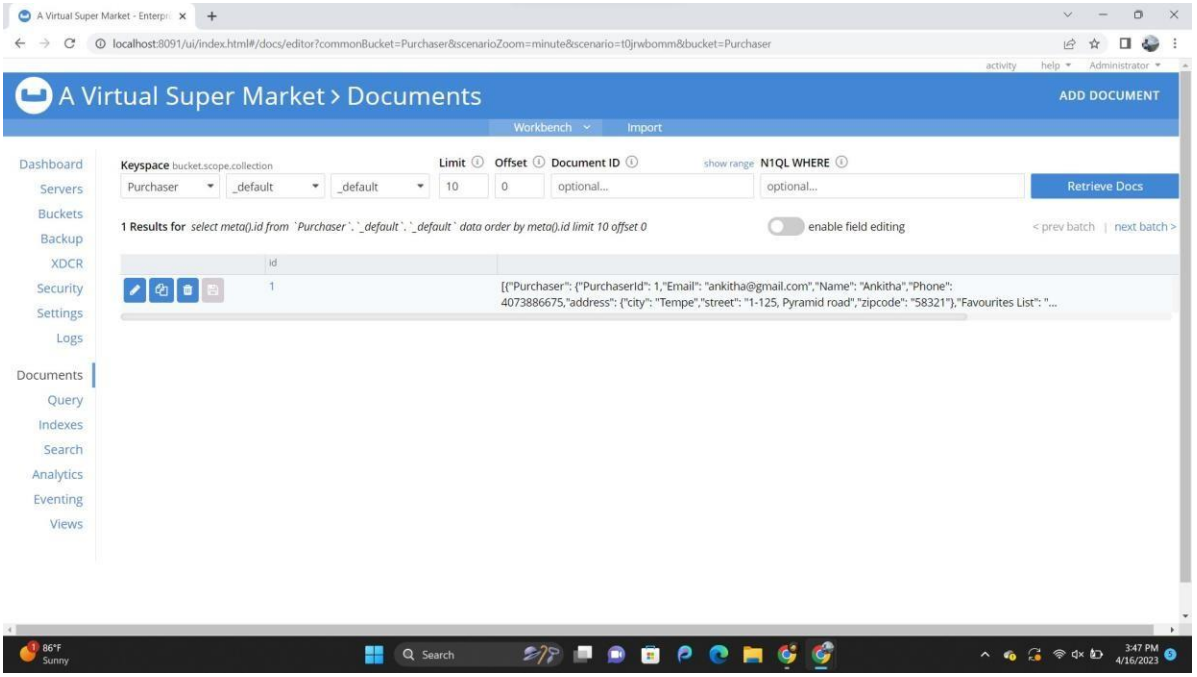
"address": {

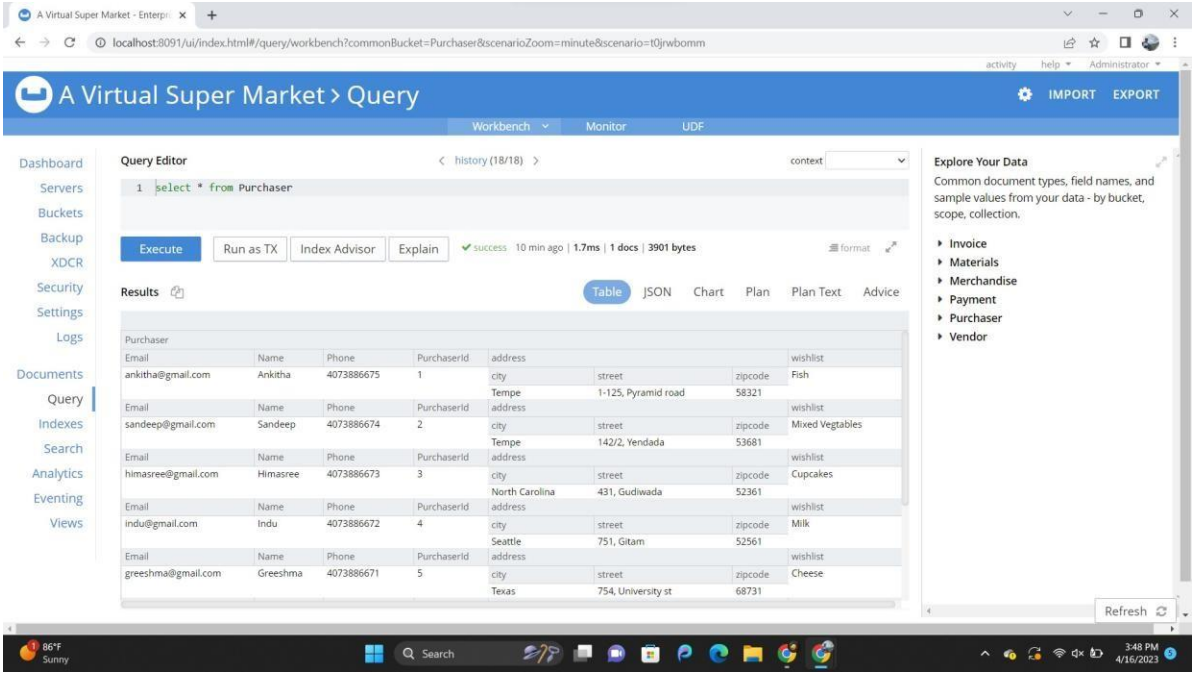
"city": "Illinoi",

"street": "82, Samay st",

"zipcode": "87321" },

"Favourites List": "Cheesecake" } }]





Section 6.4

In order to perform Analytics using Couchbase, we initially generated the Datasets.

CREATE DATASET ON Merchandise;

CREATE DATASET ON Vendor;

CREATE DATASET ON Purchaser;

CREATE DATASET ON Materials;

CREATE DATASET ON Invoice;

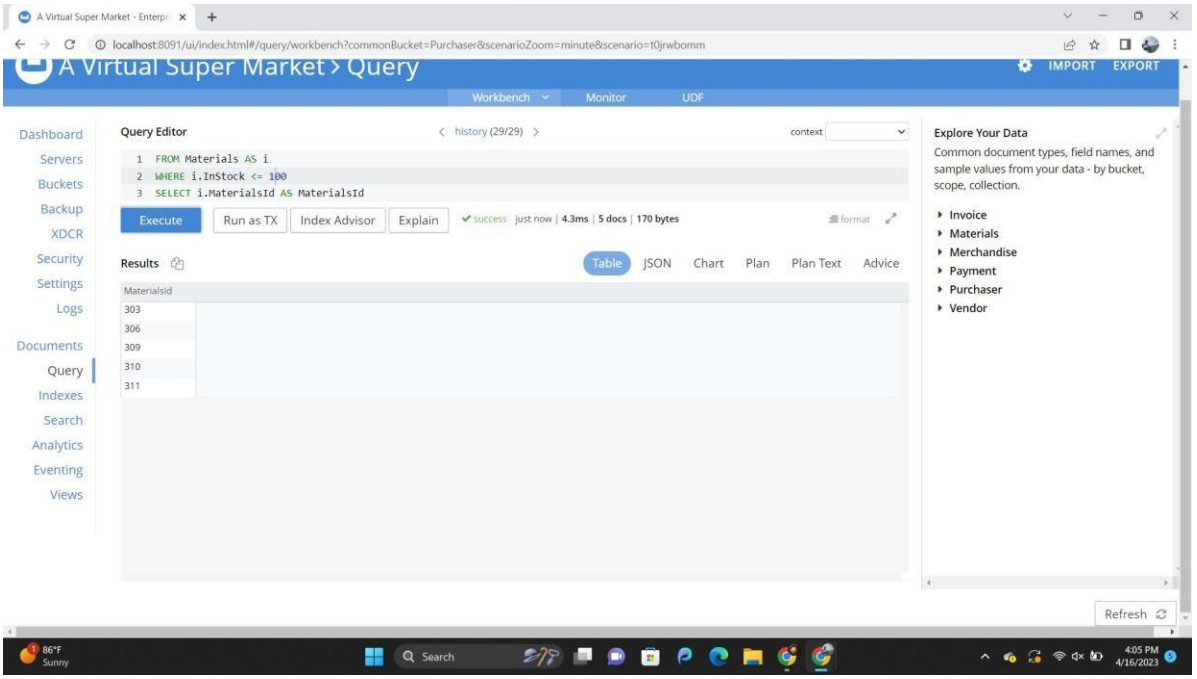
CREATE DATASET ON Payment;

Query 1: Showing the MaterialsId for which the stock quantity is 100 or lower.

FROM Materials AS i

WHERE i.InStock <= 100

SELECT i.MaterialsId AS MaterialsId

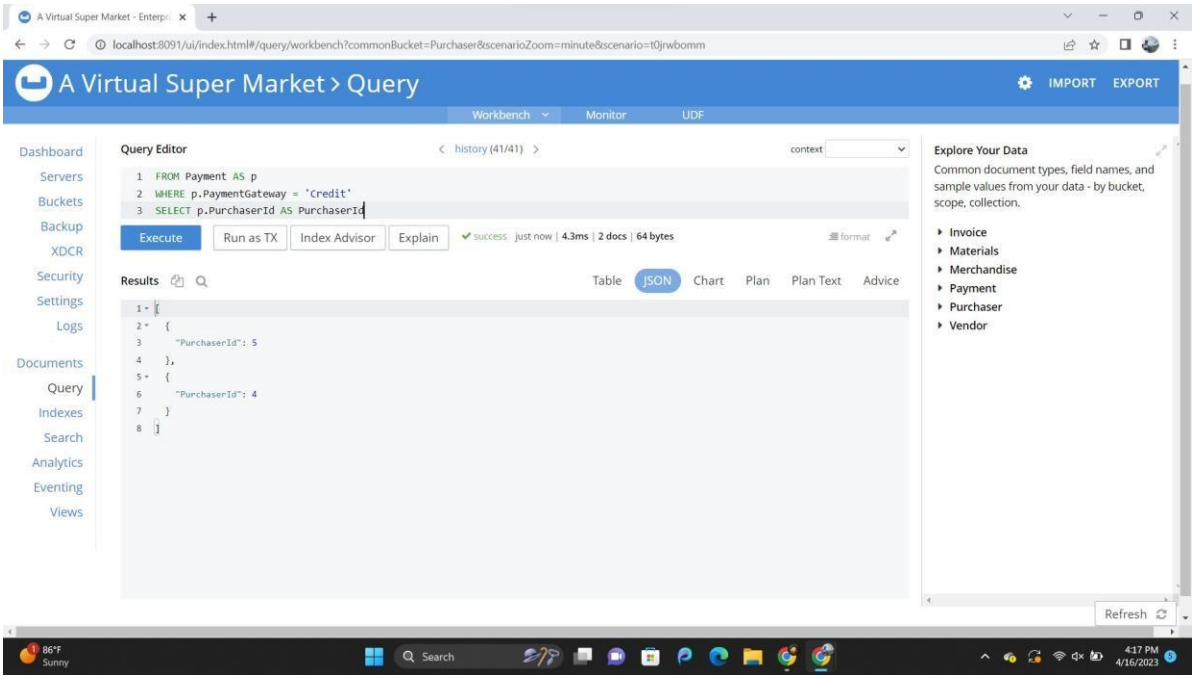


Query 2: Which customers used Apple Pay to pay for their orders?

FROM Payment AS p

WHERE p.PaymentGateway = 'Credit'

SELECT p.PurchaserId AS PurchaserId

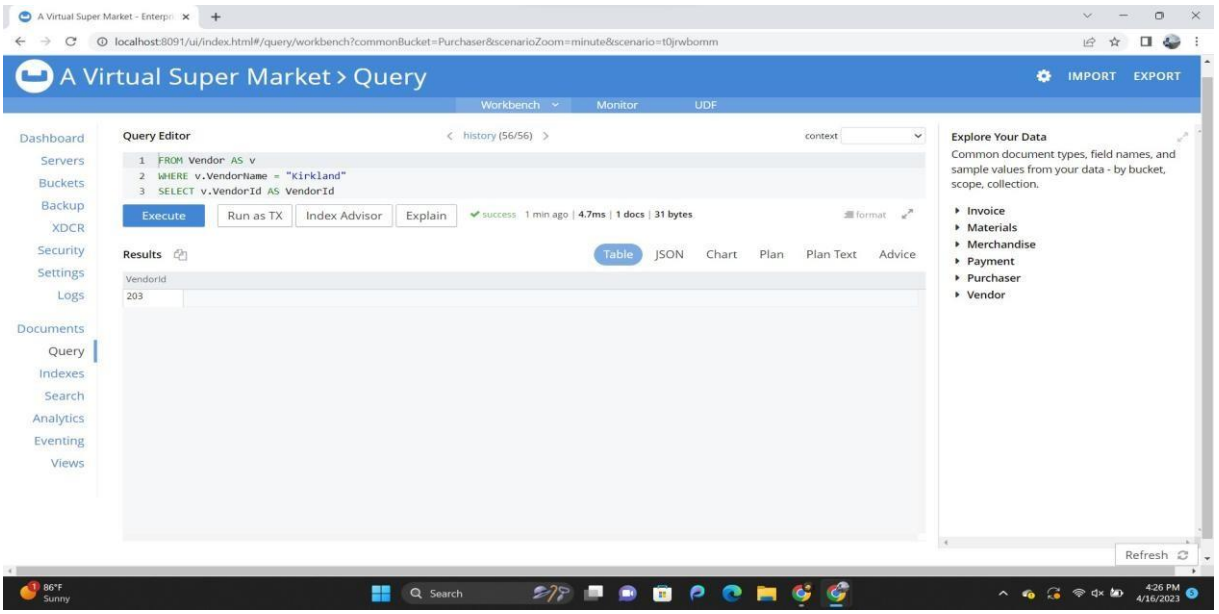


Query 3: Displaying Vendor Id who are selling Kirkland merchandise.

FROM Vendor AS v

WHERE v.VendorName = "Kirkland"

SELECT v.VendorId AS VendorId

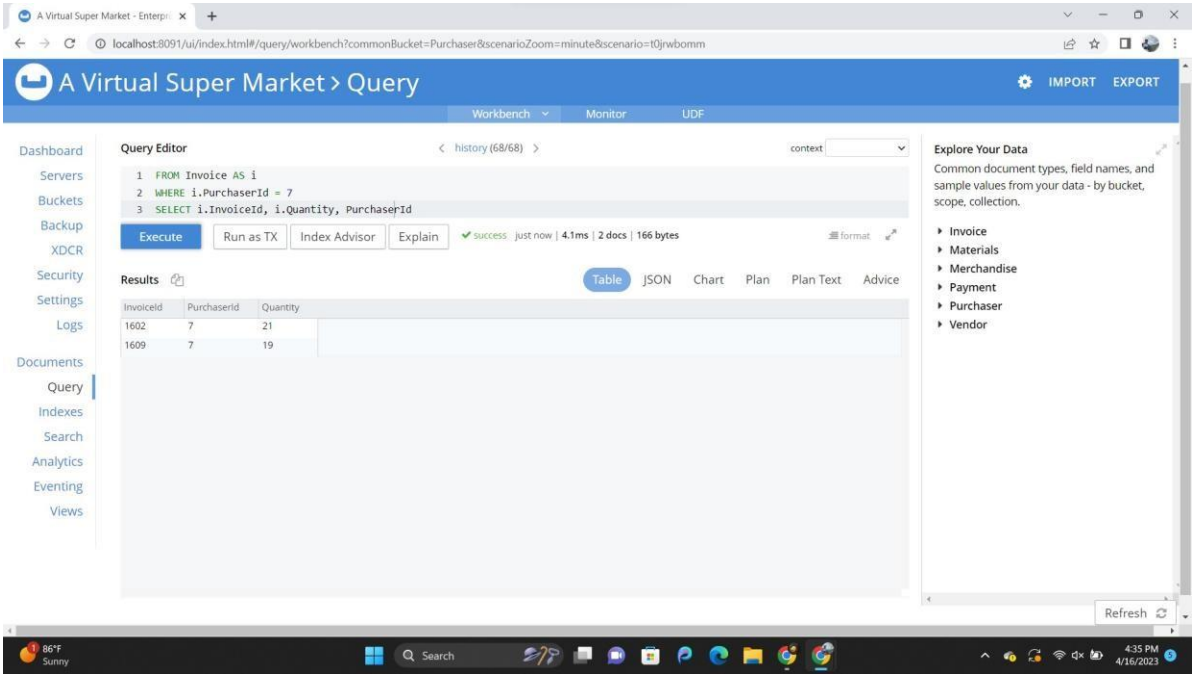


Query 4: Displaying the invoice generated by the purchaser with ID=7.

FROM Invoice AS i

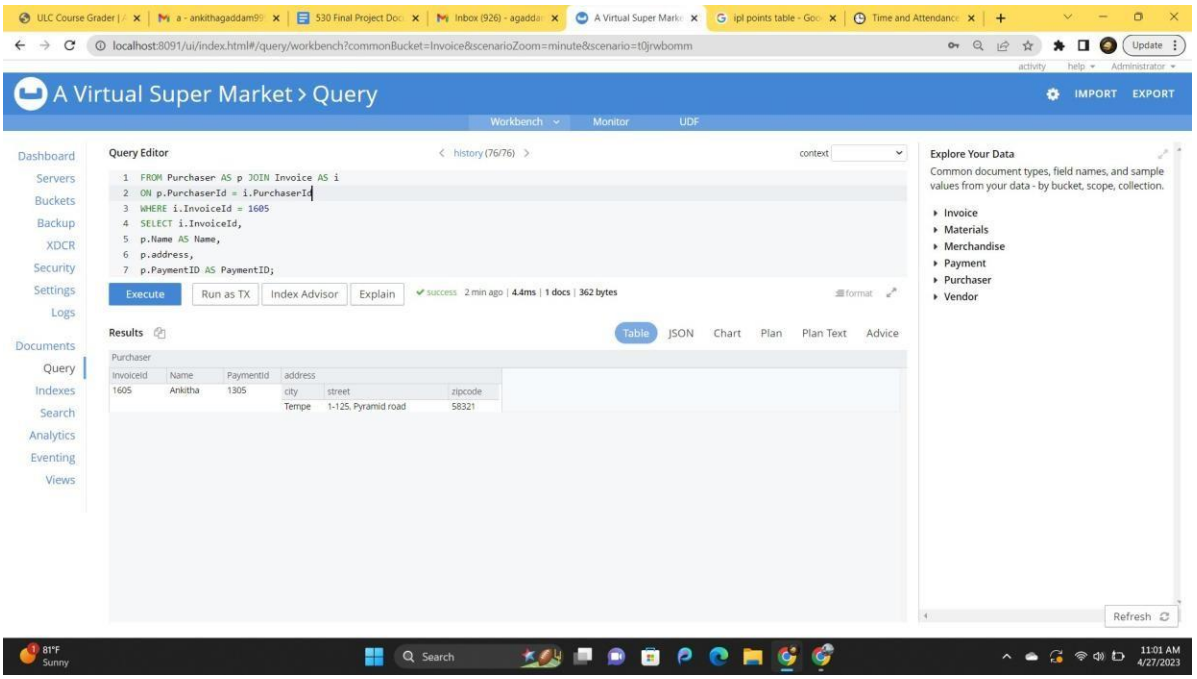
WHERE i.PurchaserId = 7

SELECT i.InvoiceId, i.Quantity, PurchaserId

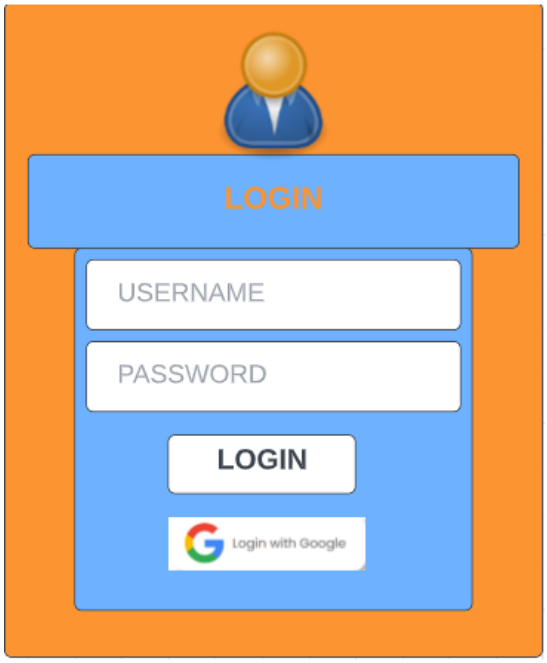


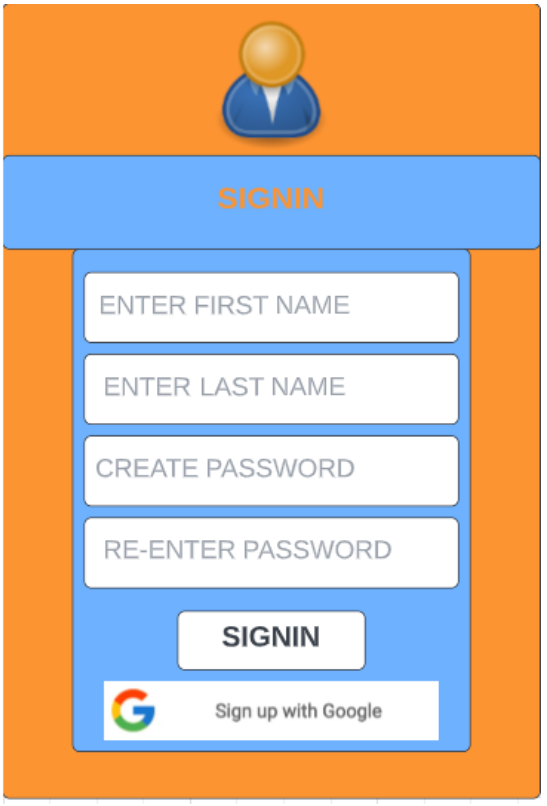
Query 5: Performing a join operation on the purchaser bucket.

```
FROM Purchaser AS p JOIN Invoice AS i

ON p.PurchaserId = i.PurchaserId

WHERE i.InvoiceId = 1605

SELECT i.InvoiceId,

p.Name AS Name,

p.address,

p.PaymentID AS PaymentID;
```



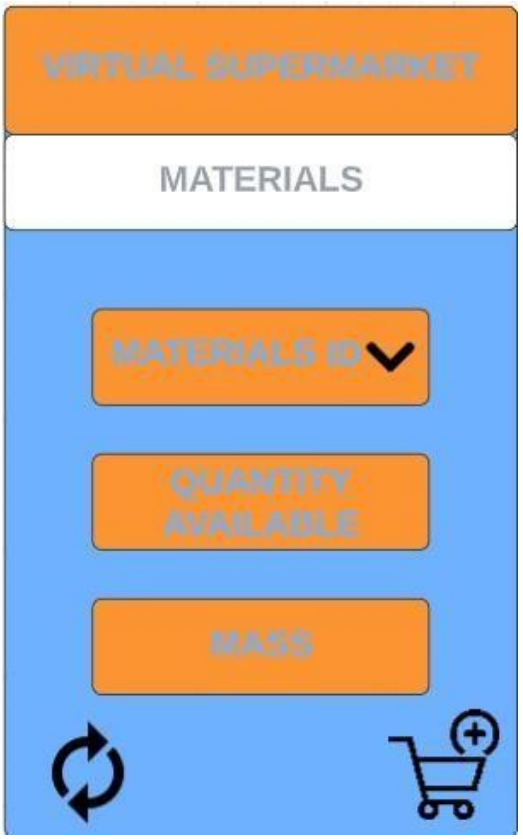
USER INTERFACE





CUSTOMER VIEW

ADMIN VIEW



Section 7

Summary

The purpose of the database system is to efficiently manage the supermarket's operations, including product materials, pricing, stock availability and payment processing. The system will include an online ordering platform that enables purchasers to easily select and purchase products, as well as a secure payment processing system to ensure a seamless checkout experience. By adopting a comprehensive database system, the virtual supermarket will be able to optimize its operations, enhance customer satisfaction, and ultimately achieve greater business growth and success. To improve our database, we added subcategories for every item in the merchandise table by utilizing a distinct merchandise ID. In the invoice table, we merged the purchaser's ID and the total quantity of items purchased columns, which helped us to determine which merchandise was purchased the most by a certain purchaser. We also added a PaymentGateway column in the Payment's table to check payment methods for an invoice, and an InStock column in our Materials table to verify if the purchaser's invoice is available in the stock. To ensure the flexibility and scalability of our database, we utilized NoSQL, which allowed for quick development and iteration. Finally, to create a more realistic approach, we also designed a user interface for our database.