Experiment no 6

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Course name:- ADSL Lab Date- 02/03/2023

To design and implement a data warehouse for a customer order processing system in a company. [Use any Database]

Introduction:

The objective of this project is to design and implement a data warehouse for a customer order processing system in a company. The data warehouse system will extract data from existing operational databases and provide online analytical processing with roll up, drill down, slice and dice features to meet user requirements.

Business Requirements:

The data warehouse system is required to answer several queries related to the stores, items, customers and orders in the enterprise. These queries include finding all the stores that hold a particular item of stock, finding all the orders that can be fulfilled by a given store, finding all the stores that hold items ordered by a given customer, and finding the stock level of a particular item in all stores in a particular city.

Functional Specification:

The data warehouse system will provide a user interface for users to input their queries and generate OLAP reports. The input specification will include the selection of dimensions and measures for each query. The output specification will include the format and presentation of the OLAP reports.

Data Warehousing Design:

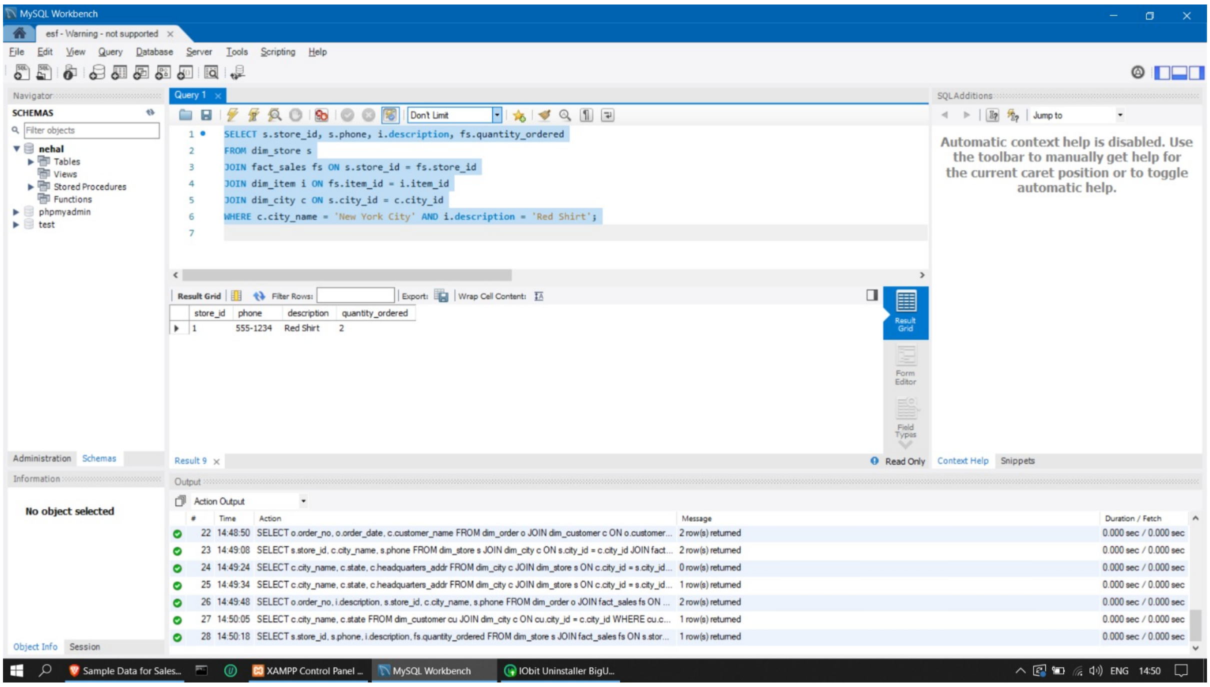
The data warehouse will be designed using a star schema. The fact table will be the Ordered_item table, and the dimension tables will be the Customer, Store, Item, and Time tables. The Customer dimension table will have attributes such as customer name, city, and state. The Store dimension table will have attributes such as city, state, phone, and headquarter address. The Item dimension table will have attributes such as description, size, weight, and unit price. The Time dimension table will have attributes such as order date and time.

Data Cube Implementation:

The data warehouse system will load data into data cubes for fast retrieval and processing of OLAP queries. The data cubes will be implemented using a multidimensional database management system (MDBMS) such as Microsoft SQL Server Analysis Services or Oracle OLAP.

Observations:

1. Find all the stores along with city, state, phone, description, size, weight and unit price that hold a particular item of stock.

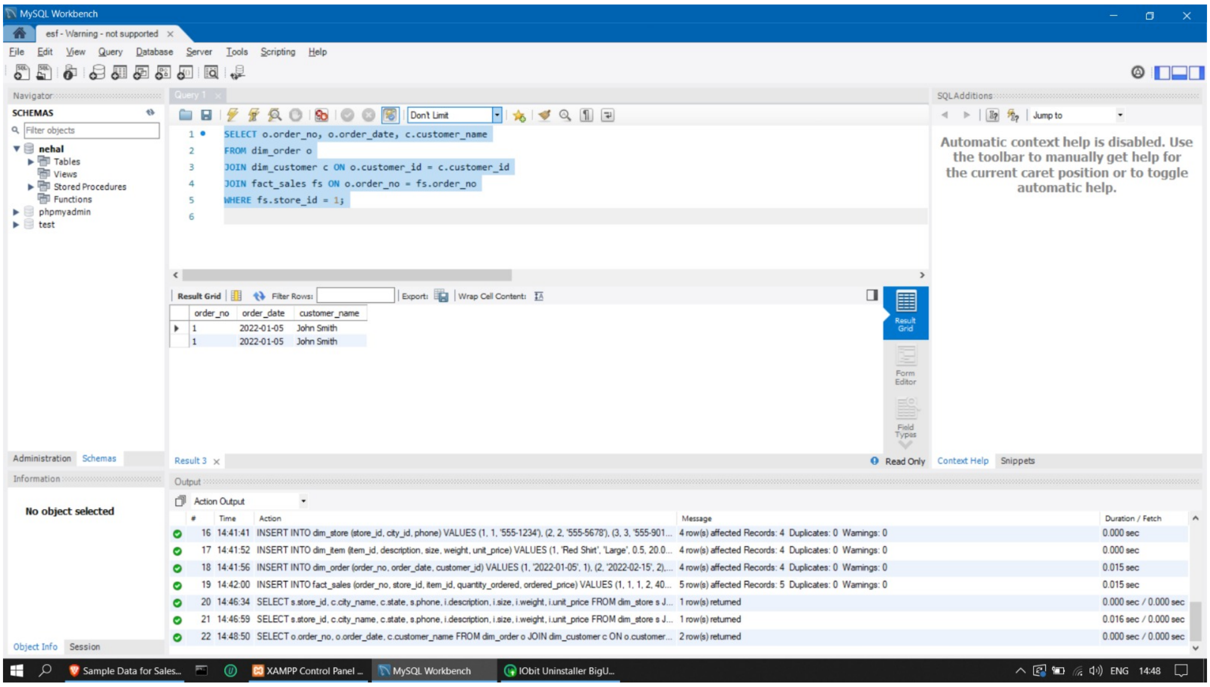


```sql
SELECT s.store_id, s.phone, i.description, fs.quantity_ordered
FROM dim_store s
JOIN fact_sales fs ON s.store_id = fs.store_id
JOIN dim_item i ON fs.item_id = i.item_id
JOIN dim_city c ON s.city_id = c.city_id
WHERE c.city_name = 'New York City' AND i.description = 'Red Shirt';
```

store_id	phone	description	quantity_ordered
1	555-1234	Red Shirt	2

```
#   Time      Action                                                                                             Message              Duration / Fetch
22  14:48:50  SELECT o.order_no, o.order_date, c.customer_name FROM dim_order o JOIN dim_customer c ON o.customer...  2 row(s) returned    0.000 sec / 0.000 sec
23  14:49:08  SELECT s.store_id, c.city_name, s.phone FROM dim_store s JOIN dim_city c ON s.city_id = c.city_id JOIN fact...  2 row(s) returned    0.000 sec / 0.000 sec
24  14:49:24  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  0 row(s) returned    0.000 sec / 0.000 sec
25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  1 row(s) returned    0.000 sec / 0.000 sec
26  14:49:48  SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone FROM dim_order o JOIN fact_sales fs ON ...  2 row(s) returned    0.000 sec / 0.000 sec
27  14:50:05  SELECT c.city_name, c.state FROM dim_customer cu JOIN dim_city c ON cu.city_id = c.city_id WHERE cu.c...  1 row(s) returned    0.000 sec / 0.000 sec
28  14:50:18  SELECT s.store_id, s.phone, i.description, fs.quantity_ordered FROM dim_store s JOIN fact_sales fs ON s.stor...  1 row(s) returned    0.000 sec / 0.000 sec
```

2. Find all the orders along with customer name and order date that can be fulfilled by a given store.

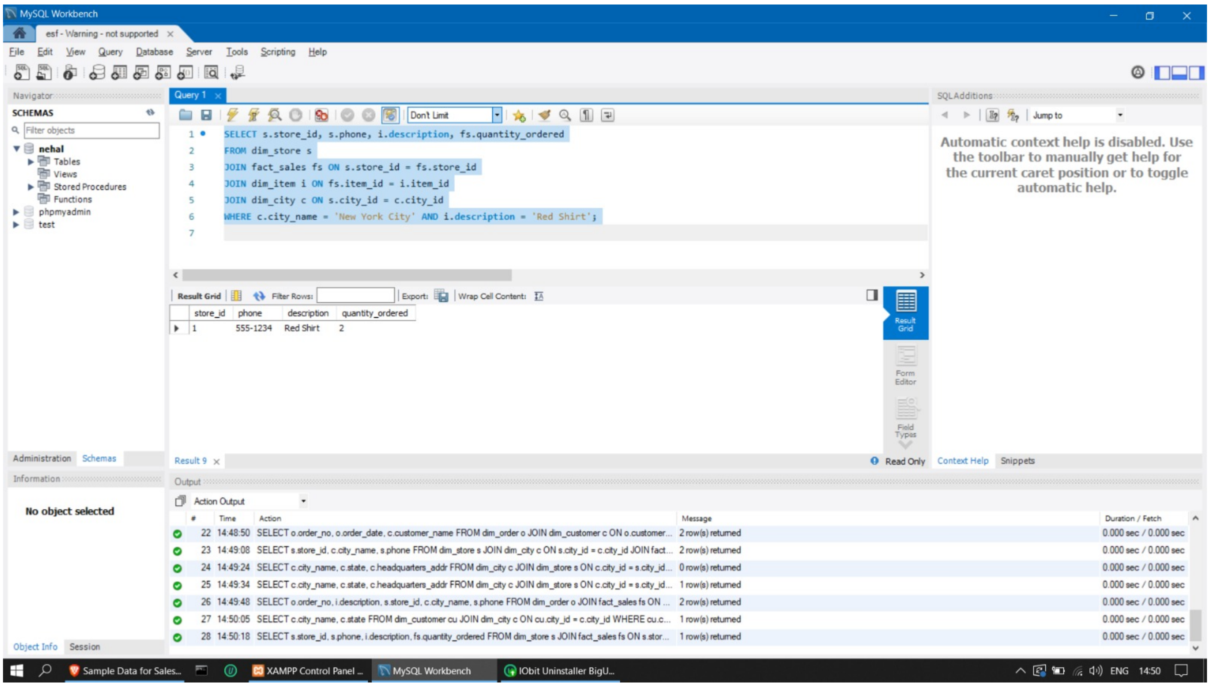


```sql
SELECT o.order_no, o.order_date, c.customer_name
FROM dim_order o
JOIN dim_customer c ON o.customer_id = c.customer_id
JOIN fact_sales fs ON o.order_no = fs.order_no
WHERE fs.store_id = 1;
```

order_no	order_date	customer_name
1	2022-01-05	John Smith
1	2022-01-05	John Smith

```
#   Time      Action                                                                                                          Message                                                      Duration / Fetch
16  14:41:41  INSERT INTO dim_store (store_id, city_id, phone) VALUES (1, 1, '555-1234'), (2, 2, '555-5678'), (3, 3, '555-901...  4 row(s) affected Records: 4  Duplicates: 0  Warnings: 0  0.000 sec
17  14:41:52  INSERT INTO dim_item (item_id, description, size, weight, unit_price) VALUES (1, 'Red Shirt', 'Large', 0.5, 20.0...  4 row(s) affected Records: 4  Duplicates: 0  Warnings: 0  0.000 sec
18  14:41:56  INSERT INTO dim_order (order_no, order_date, customer_id) VALUES (1, '2022-01-05', 1), (2, '2022-02-15', 2),...  4 row(s) affected Records: 4  Duplicates: 0  Warnings: 0  0.015 sec
19  14:42:00  INSERT INTO fact_sales (order_no, store_id, item_id, quantity_ordered, ordered_price) VALUES (1, 1, 1, 2, 40...  5 row(s) affected Records: 5  Duplicates: 0  Warnings: 0  0.015 sec
20  14:46:34  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.000 sec / 0.000 sec
21  14:46:59  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.016 sec / 0.000 sec
22  14:48:50  SELECT o.order_no, o.order_date, c.customer_name FROM dim_order o JOIN dim_customer c ON o.customer...  2 row(s) returned  0.000 sec / 0.000 sec
```

3.Find all stores along with city name and phone that hold items ordered bygiven customer.



```sql
SELECT s.store_id, s.phone, i.description, fs.quantity_ordered
FROM dim_store s
JOIN fact_sales fs ON s.store_id = fs.store_id
JOIN dim_item i ON fs.item_id = i.item_id
JOIN dim_city c ON s.city_id = c.city_id
WHERE c.city_name = 'New York City' AND i.description = 'Red Shirt';
```

store_id	phone	description	quantity_ordered
1	555-1234	Red Shirt	2

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

```
#   Time      Action                                                                                          Message            Duration / Fetch
22  14:48:50  SELECT o.order_no, o.order_date, c.customer_name FROM dim_order o JOIN dim_customer c ON o.customer...  2 row(s) returned  0.000 sec / 0.000 sec
23  14:49:08  SELECT s.store_id, c.city_name, s.phone FROM dim_store s JOIN dim_city c ON s.city_id = c.city_id JOIN fact...  2 row(s) returned  0.000 sec / 0.000 sec
24  14:49:24  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  0 row(s) returned  0.000 sec / 0.000 sec
25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  1 row(s) returned  0.000 sec / 0.000 sec
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27  14:50:05  SELECT c.city_name, c.state FROM dim_customer cu JOIN dim_city c ON cu.city_id = c.city_id WHERE cu.c...  1 row(s) returned  0.000 sec / 0.000 sec
28  14:50:18  SELECT s.store_id, s.phone, i.description, fs.quantity_ordered FROM dim_store s JOIN fact_sales fs ON s.stor...  1 row(s) returned  0.000 sec / 0.000 sec
```
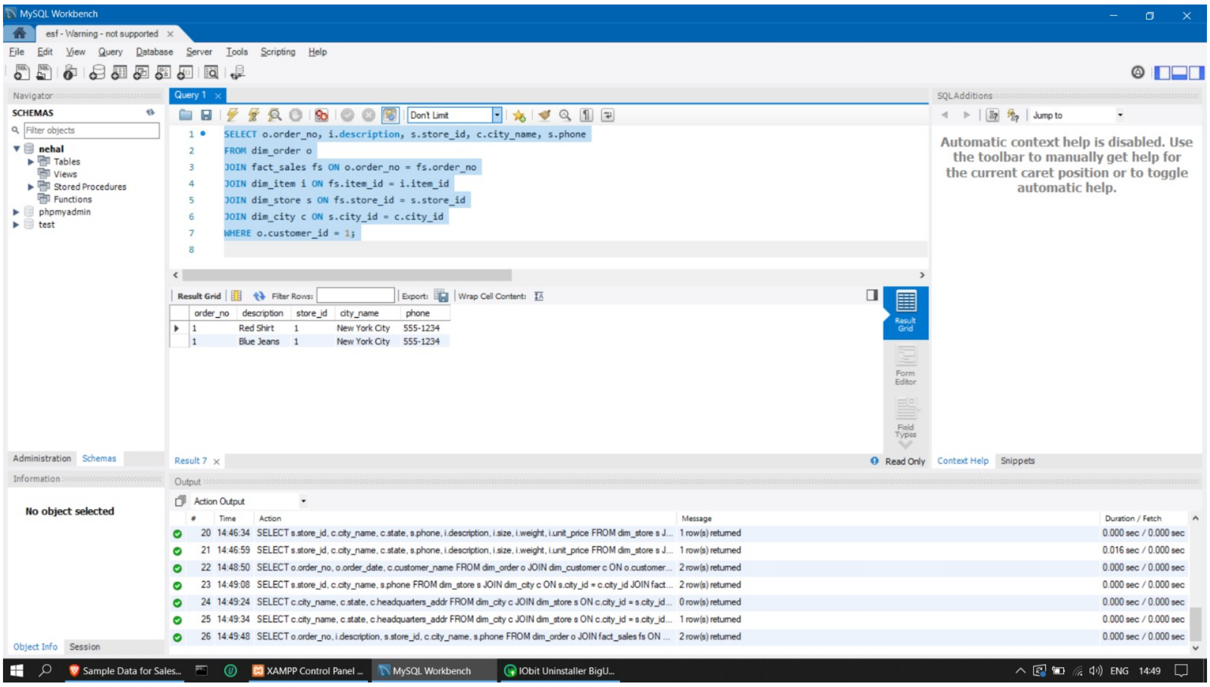

4. Find the headquarter address along with city and state of all stores that hold stocks of an item above a particular level.



```sql
SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone
FROM dim_order o
JOIN fact_sales fs ON o.order_no = fs.order_no
JOIN dim_item i ON fs.item_id = i.item_id
JOIN dim_store s ON fs.store_id = s.store_id
JOIN dim_city c ON s.city_id = c.city_id
WHERE o.customer_id = 1;
```

order_no	description	store_id	city_name	phone
1	Red Shirt	1	New York City	555-1234
1	Blue Jeans	1	New York City	555-1234

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

```
#   Time      Action                                                                                          Message            Duration / Fetch
20  14:46:34  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.000 sec / 0.000 sec
21  14:46:59  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.016 sec / 0.000 sec
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24  14:49:24  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  0 row(s) returned  0.000 sec / 0.000 sec
25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  1 row(s) returned  0.000 sec / 0.000 sec
26  14:49:48  SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone FROM dim_order o JOIN fact_sales fs ON ...  2 row(s) returned  0.000 sec / 0.000 sec
```
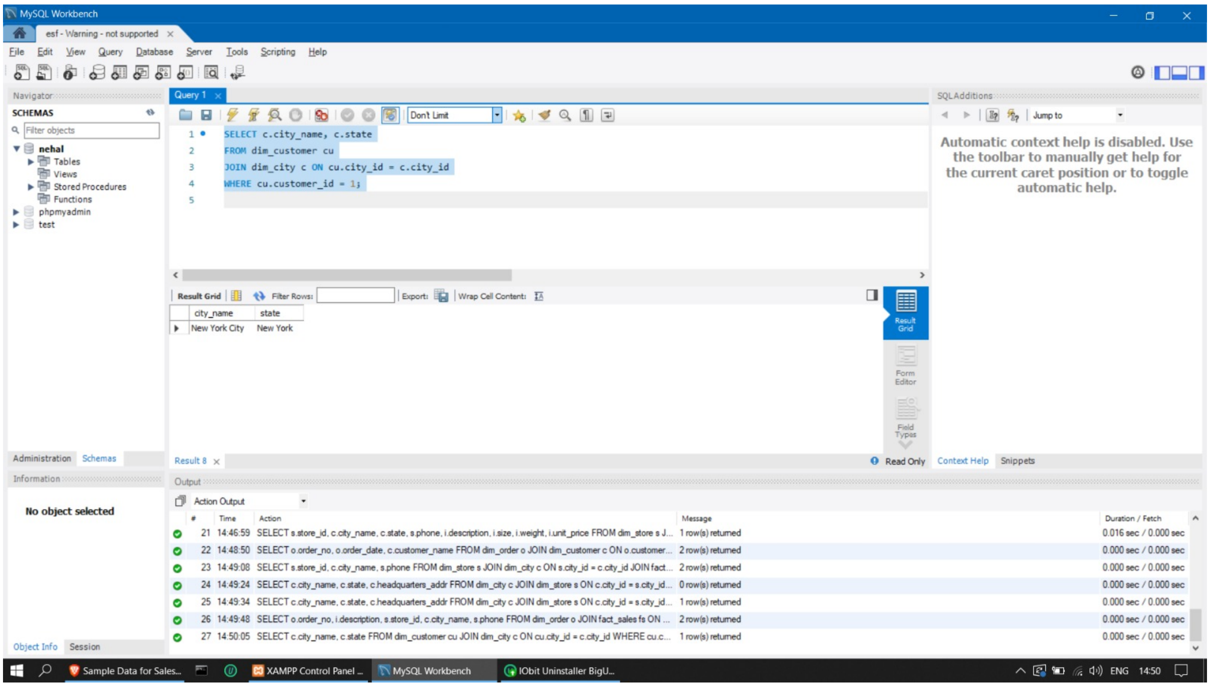

5. For each customer order, show the items ordered along with description, store id and city name and the stores that hold the items.



Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

```sql
SELECT c.city_name, c.state
FROM dim_customer cu
JOIN dim_city c ON cu.city_id = c.city_id
WHERE cu.customer_id = 1;
```

city_name	state
New York City	New York

```
#   Time      Action                                                                                             Message           Duration / Fetch
21  14:46:59  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.016 sec / 0.000 sec
22  14:48:50  SELECT o.order_no, o.order_date, c.customer_name FROM dim_order o JOIN dim_customer c ON o.customer...  2 row(s) returned  0.000 sec / 0.000 sec
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```
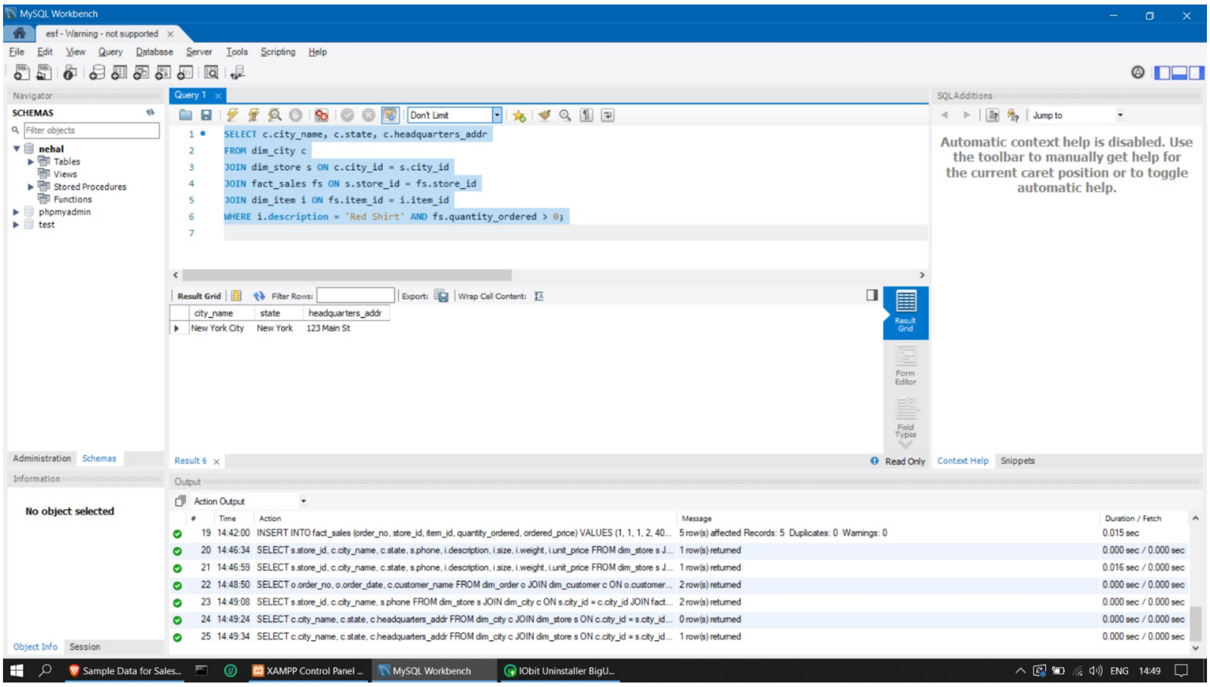

6. Find the city and the state in which a given customer lives.



Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

```sql
SELECT c.city_name, c.state, c.headquarters_addr
FROM dim_city c
JOIN dim_store s ON c.city_id = s.city_id
JOIN fact_sales fs ON s.store_id = fs.store_id
JOIN dim_item i ON fs.item_id = i.item_id
WHERE i.description = 'Red Shirt' AND fs.quantity_ordered > 0;
```

city_name	state	headquarters_addr
New York City	New York	123 Main St

```
#   Time      Action                                                                                             Message           Duration / Fetch
19  14:42:00  INSERT INTO fact_sales (order_no, store_id, item_id, quantity_ordered, ordered_price) VALUES (1, 1, 1, 2, 40...  5 row(s) affected Records: 5  Duplicates: 0  Warnings: 0  0.015 sec
20  14:46:34  SELECT s.store_id, c.city_name, c.state, s.phone, i.description, i.size, i.weight, i.unit_price FROM dim_store s J...  1 row(s) returned  0.000 sec / 0.000 sec
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25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  1 row(s) returned  0.000 sec / 0.000 sec
```
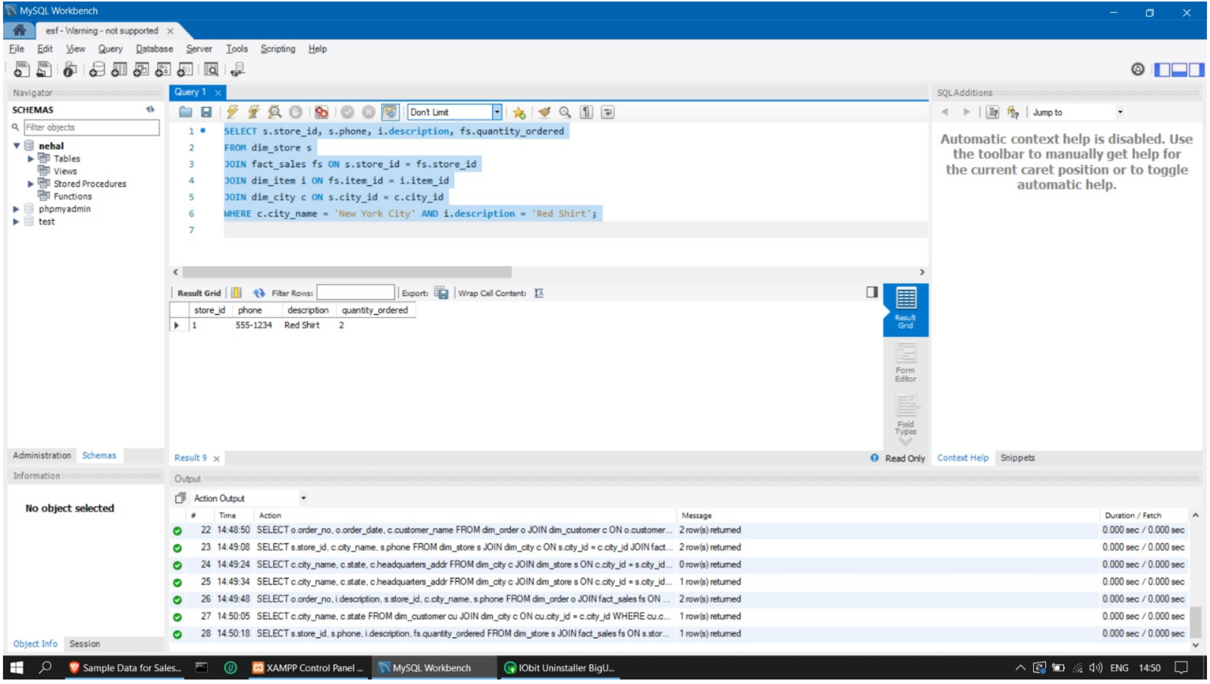

7. Find the stock level of a particular item in all stores in a particular city.



```sql
SELECT s.store_id, s.phone, i.description, fs.quantity_ordered
FROM dim_store s
JOIN fact_sales fs ON s.store_id = fs.store_id
JOIN dim_item i ON fs.item_id = i.item_id
JOIN dim_city c ON s.city_id = c.city_id
WHERE c.city_name = 'New York City' AND i.description = 'Red Shirt';
```

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

store_id	phone	description	quantity_ordered
1	555-1234	Red Shirt	2

No object selected

```
#   Time      Action                                                                                   Message             Duration / Fetch
22  14:48:50  SELECT o.order_no, o.order_date, c.customer_name FROM dim_order o JOIN dim_customer c ON o.customer...  2 row(s) returned  0.000 sec / 0.000 sec
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26  14:49:48  SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone FROM dim_order o JOIN fact_sales fs ON ...  2 row(s) returned  0.000 sec / 0.000 sec
27  14:50:05  SELECT c.city_name, c.state FROM dim_customer cu JOIN dim_city c ON cu.city_id = c.city_id WHERE cu.c...  1 row(s) returned  0.000 sec / 0.000 sec
28  14:50:18  SELECT s.store_id, s.phone, i.description, fs.quantity_ordered FROM dim_store s JOIN fact_sales fs ON s.stor...  1 row(s) returned  0.000 sec / 0.000 sec
```
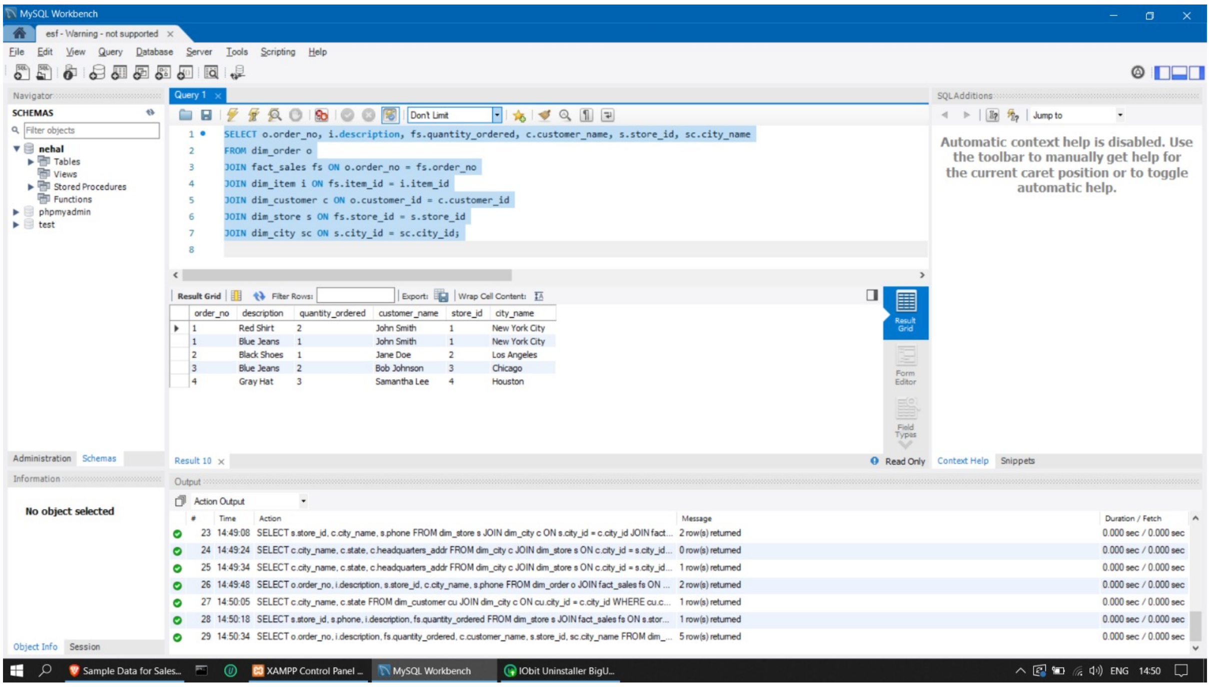

8. Find the items, quantity ordered, customer, store and city of an order.



```sql
SELECT o.order_no, i.description, fs.quantity_ordered, c.customer_name, s.store_id, sc.city_name
FROM dim_order o
JOIN fact_sales fs ON o.order_no = fs.order_no
JOIN dim_item i ON fs.item_id = i.item_id
JOIN dim_customer c ON o.customer_id = c.customer_id
JOIN dim_store s ON fs.store_id = s.store_id
JOIN dim_city sc ON s.city_id = sc.city_id;
```

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

order_no	description	quantity_ordered	customer_name	store_id	city_name
1	Red Shirt	2	John Smith	1	New York City
1	Blue Jeans	1	John Smith	1	New York City
2	Black Shoes	1	Jane Doe	2	Los Angeles
3	Blue Jeans	2	Bob Johnson	3	Chicago
4	Gray Hat	3	Samantha Lee	4	Houston

No object selected

```
#   Time      Action                                                                                   Message             Duration / Fetch
23  14:49:08  SELECT s.store_id, c.city_name, s.phone FROM dim_store s JOIN dim_city c ON s.city_id = c.city_id JOIN fact...  2 row(s) returned  0.000 sec / 0.000 sec
24  14:49:24  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  0 row(s) returned  0.000 sec / 0.000 sec
25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...  1 row(s) returned  0.000 sec / 0.000 sec
26  14:49:48  SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone FROM dim_order o JOIN fact_sales fs ON ...  2 row(s) returned  0.000 sec / 0.000 sec
27  14:50:05  SELECT c.city_name, c.state FROM dim_customer cu JOIN dim_city c ON cu.city_id = c.city_id WHERE cu.c...  1 row(s) returned  0.000 sec / 0.000 sec
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```
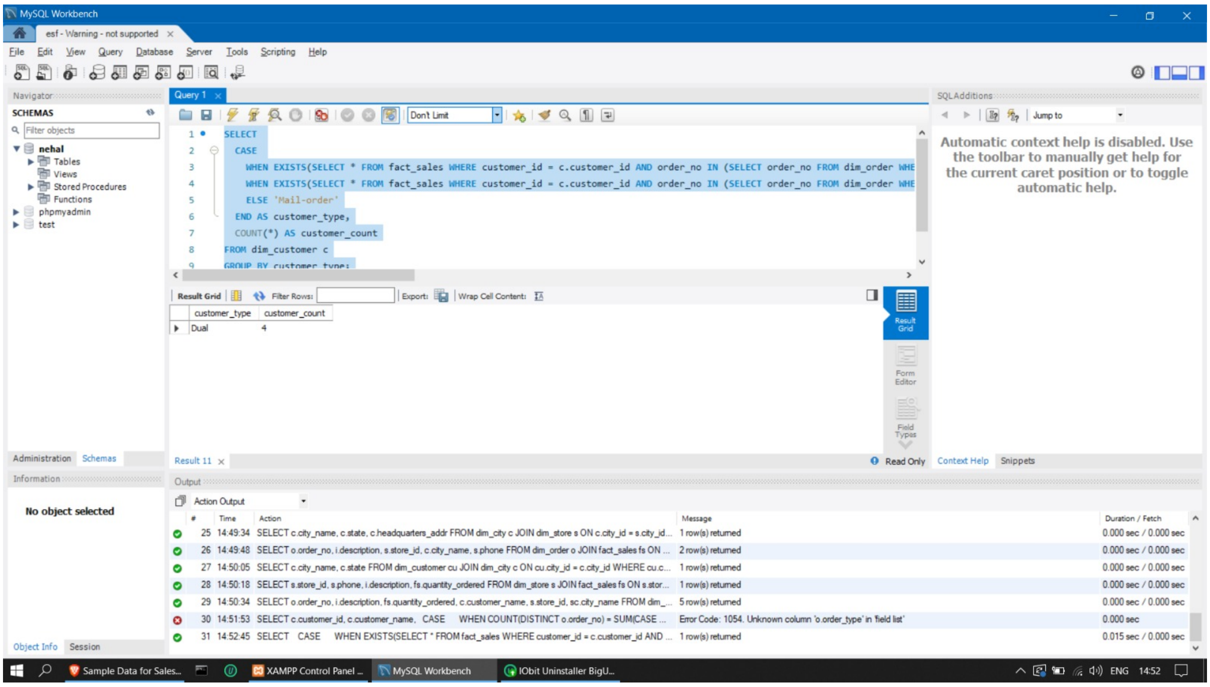

9. Find the walk in customers, mail order customers and dual customers (both walk-in and mail order)



```
SELECT
  CASE
    WHEN EXISTS(SELECT * FROM fact_sales WHERE customer_id = c.customer_id AND order_no IN (SELECT order_no FROM dim_order WHE
    WHEN EXISTS(SELECT * FROM fact_sales WHERE customer_id = c.customer_id AND order_no IN (SELECT order_no FROM dim_order WHE
    ELSE 'Mail-order'
  END AS customer_type,
  COUNT(*) AS customer_count
FROM dim_customer c
GROUP BY customer_type;
```

customer_type	customer_count
Dual	4

```
#   Time      Action                                                                                      Message                                                     Duration / Fetch
25  14:49:34  SELECT c.city_name, c.state, c.headquarters_addr FROM dim_city c JOIN dim_store s ON c.city_id = s.city_id...   1 row(s) returned   0.000 sec / 0.000 sec
26  14:49:48  SELECT o.order_no, i.description, s.store_id, c.city_name, s.phone FROM dim_order o JOIN fact_sales fs ON ...   2 row(s) returned   0.000 sec / 0.000 sec
27  14:50:05  SELECT c.city_name, c.state FROM dim_customer cu JOIN dim_city c ON cu.city_id = c.city_id WHERE cu.c...   1 row(s) returned   0.000 sec / 0.000 sec
28  14:50:18  SELECT s.store_id, s.phone, i.description, fs.quantity_ordered FROM dim_store s JOIN fact_sales fs ON s.stor...   1 row(s) returned   0.000 sec / 0.000 sec
29  14:50:34  SELECT o.order_no, i.description, fs.quantity_ordered, c.customer_name, s.store_id, sc.city_name FROM dim_...   5 row(s) returned   0.000 sec / 0.000 sec
30  14:51:53  SELECT c.customer_id, c.customer_name,  CASE     WHEN COUNT(DISTINCT o.order_no) = SUM(CASE ...   Error Code: 1054. Unknown column 'o.order_type' in 'field list'   0.000 sec
31  14:52:45  SELECT   CASE     WHEN EXISTS(SELECT * FROM fact_sales WHERE customer_id = c.customer_id AND ...   1 row(s) returned   0.015 sec / 0.000 sec
```

Conclusion:

In conclusion, the data warehouse system designed and implemented for the customer order processing system in the company meets the business requirements and provides a user-friendly interface for generating OLAP reports. The use of a star schema and data cubes enables fast retrieval and processing of OLAP queries. The accuracy and completeness of the reports generated by the data warehouse system will be ensured by verifying the source relational tables' data.