Experiment - 5

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Branch: BE-CSE **Section/Group:** KRG_3B
Semester: 5th **Date of Performance:** 19/9/25
Subject Name: Advanced Database and Management System **Subject Code:** 23CSP-333

Aim:

Medium-Problem Title: Generate 1 million records per ID in 'transaction_data' using generate_series() and random() ,create a normal view and a materialized view 'sales_summary' with aggregated metrics (total_quantity_sold , total_sales, total_orders) , and compare their performance and execution time.

Procedure (Step-by-Step):

1. Create a large dataset:
   - Create a table names transaction_data (id , value) with 1 million records.
   - take id 1 and 2, and for each id, generate 1 million records in value column
   - Use Generate_series () and random() to populate the data.
2. Create a normal view and materialized view to for sales_summary, which includes total_quantity_sold, total_sales, and total_orders with aggregation.
3. Compare the performance and execution time of both.

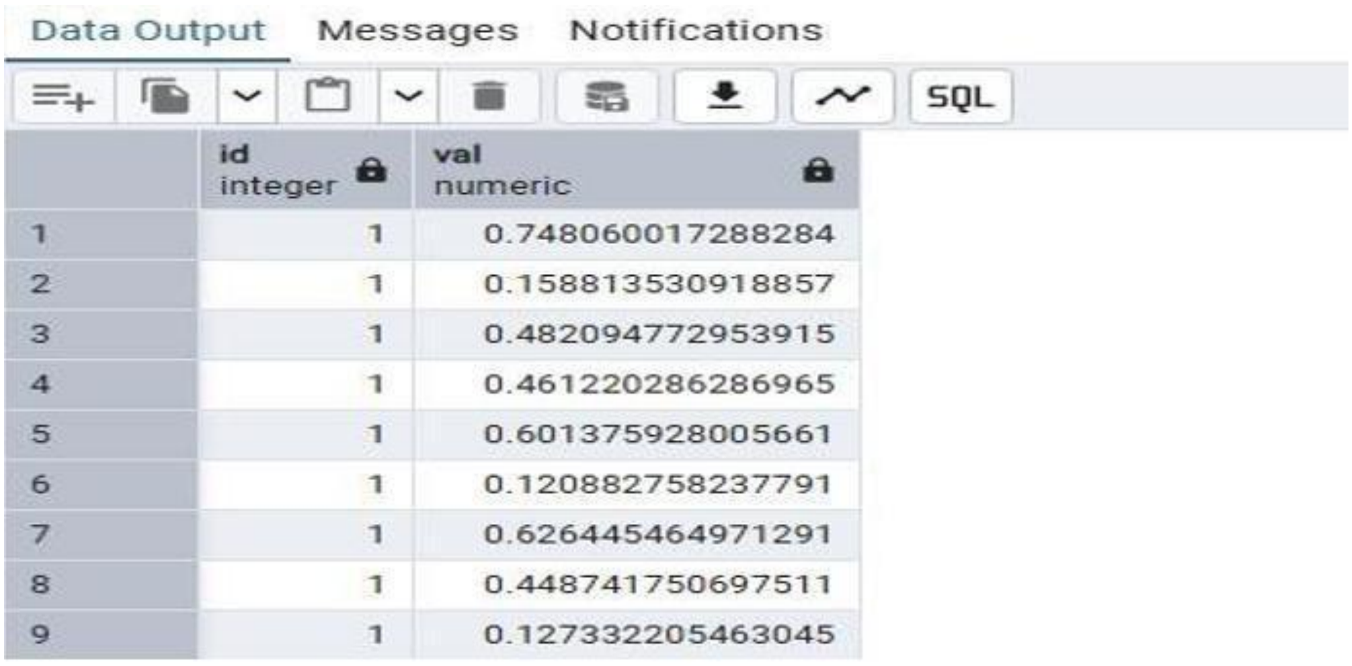
Sample Output Description:

The transaction_data table has 2 million rows (1 million per ID) with random values. The normal view sales_summary computes aggregates on the fly, while the materialized view sales_summary_mv stores precomputed results. Queries on the materialized view are much faster, but it needs refreshing when data changes, whereas the normal view always shows uptodate results.

Source Code

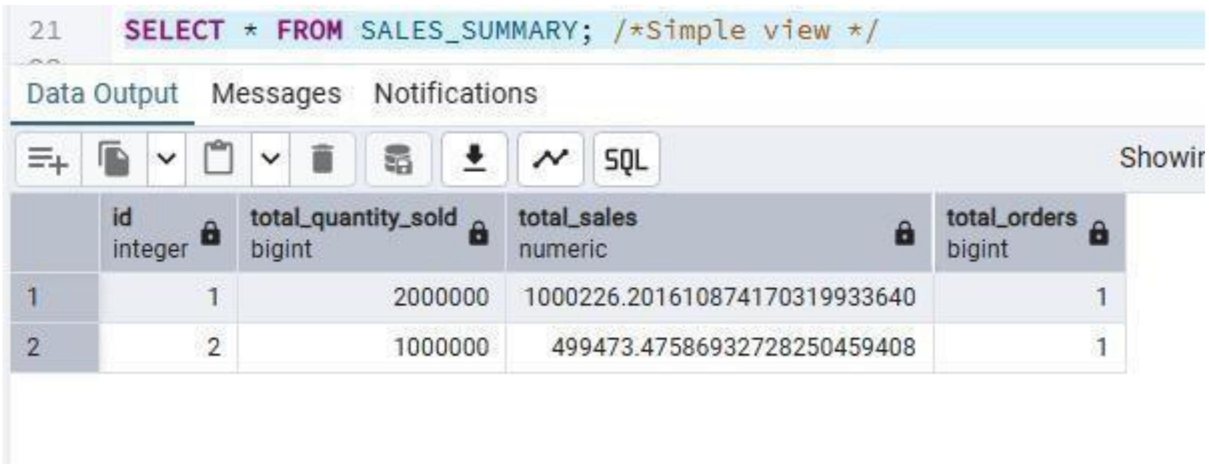
```
Create table TRANSACTION_DATA(id int,val decimal);
INSERT INTO TRANSACTION_DATA(ID,VAL) SELECT
1,RANDOM()
FROM GENERATE_SERIES(1,1000000);
```

```
INSERT INTO TRANSACTION_DATA(ID,VAL) SELECT
2,RANDOM()
FROM GENERATE_SERIES(1,1000000);


SELECT * FROM TRANSACTION_DATA;

CREATE or REPLACE VIEW SALES_SUMMARY AS
SELECT
ID,
COUNT(*) AS total_quantity_sold,
sum(val) AS total_sales, count(distinct id)
AS total_orders FROM
TRANSACTION_DATA GROUP BY
ID;

EXPLAIN ANALYZE
SELECT * FROM SALES_SUMMARY;
CREATE MATERIALIZED VIEW SALES_SUMM AS
SELECT
ID,
COUNT(*) AS total_quantity_sold, sum(val) AS total_sales, count(distinct id) AS total_orders FROM
TRANSACTION_DATA GROUP BY ID;

EXPLAIN ANALYZE
SELECT * FROM SALES_SUMM;
```



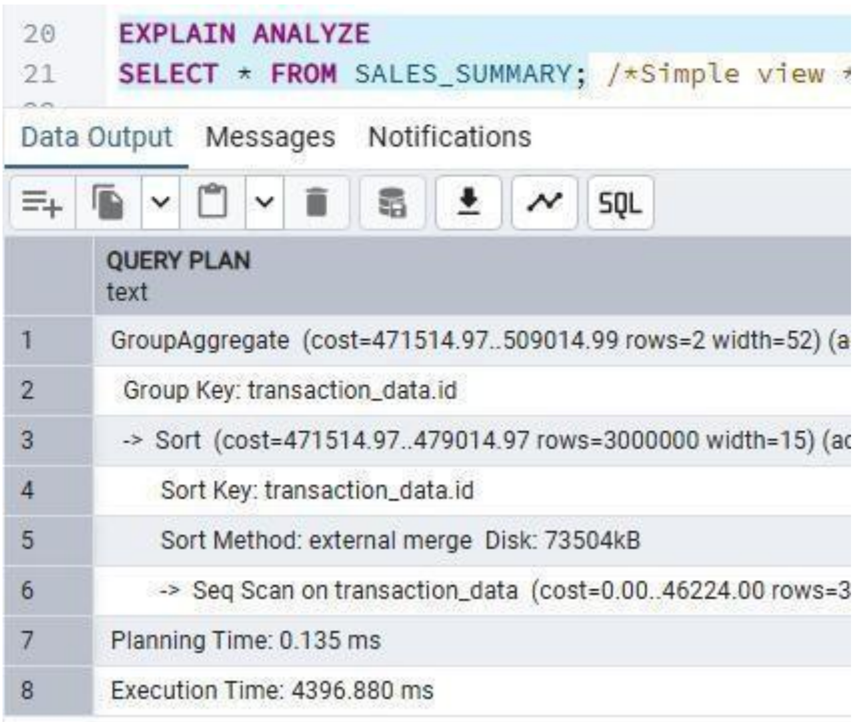
	id integer	val numeric
1	1	0.748060017288284
2	1	0.158813530918857
3	1	0.482094772953915
4	1	0.461220286286965
5	1	0.601375928005661
6	1	0.120882758237791
7	1	0.626445464971291
8	1	0.448741750697511
9	1	0.127332205463045

Investigate



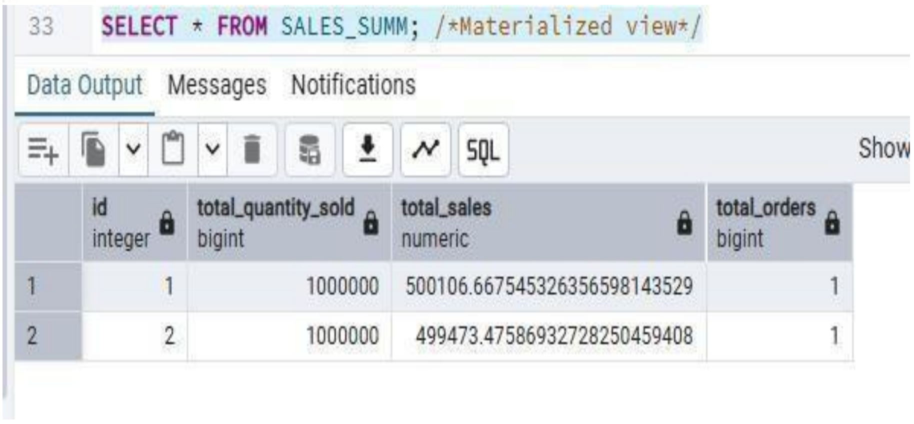
```sql
SELECT * FROM SALES_SUMMARY; /*Simple view */
```

	id integer	total_quantity_sold bigint	total_sales numeric	total_orders bigint
1	1	2000000	1000226.20161087417031993364	1
2	2	1000000	499473.47586932728250459408	1



```sql
EXPLAIN ANALYZE
SELECT * FROM SALES_SUMMARY; /*Simple view *
```

	QUERY PLAN text
1	GroupAggregate (cost=471514.97..509014.99 rows=2 width=52) (a
2	Group Key: transaction_data.id
3	-> Sort (cost=471514.97..479014.97 rows=3000000 width=15) (ac
4	Sort Key: transaction_data.id
5	Sort Method: external merge Disk: 73504kB
6	-> Seq Scan on transaction_data (cost=0.00..46224.00 rows=3
7	Planning Time: 0.135 ms
8	Execution Time: 4396.880 ms



```sql
SELECT * FROM SALES_SUMM; /*Materialized view*/
```

	id integer	total_quantity_sold bigint	total_sales numeric	total_orders bigint
1	1	1000000	500106.667545326356598143529	1
2	2	1000000	499473.47586932728250459408	1

Hard-Problem Title: Create restricted views in the sales database to provide summarized, non-sensitive data to the reporting team, and control access using DCL commands(GRANT and REVOKE).

Procedure (Step-by-Step):

1. Create restricted views-
   Define views that show only **aggregated sales data** (e.g., total_sales, total_orders) without exposing sensitive columns like customer details or payment info.
2. Assign access to reporting team(or client)-
   Use "GRANT SELECT ON view_name TO reporting_user; " to give access.
   Revoke access if needed.
   Use "REVOKE SELECT ON view_name FROM reporting_user;" to remove access.
   Verify access
   Reporting users can query the view but cannot access base tables directly, ensuring security

Sample Output Description:

The result shows the restricted view providing summarized sales data only like
- Columns shown are - product_id,total_quantity_sold, total_sales, total_orders
- Columns hidden are - Customer names, addresses, payment details

A reporting user querying the view sees something like :
- Product 101 - 5000 units sold, total sales Rs. 12,50,000,500 orders.
- Product 102 - 3200 units sold, total sales Rs. 8,60,000,320 orders.

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A reporting user querying the view sees something like :
- Product 101 - 5000 units sold, total sales Rs. 12,50,000,500 orders.
- Product 102 - 3200 units sold, total sales Rs. 8,60,000,320 orders.

When the user tries to query the base "sales_transactions" table directly, access is denied, enforcing security.

2. Objective: To design and implement secure, efficient data access mechanisms by creating large-scale transaction datasets, summarizing them through normal and materialized views for performance comparison, and enforcing restricted access to sensitive data using views and DCL commands.

Source Code

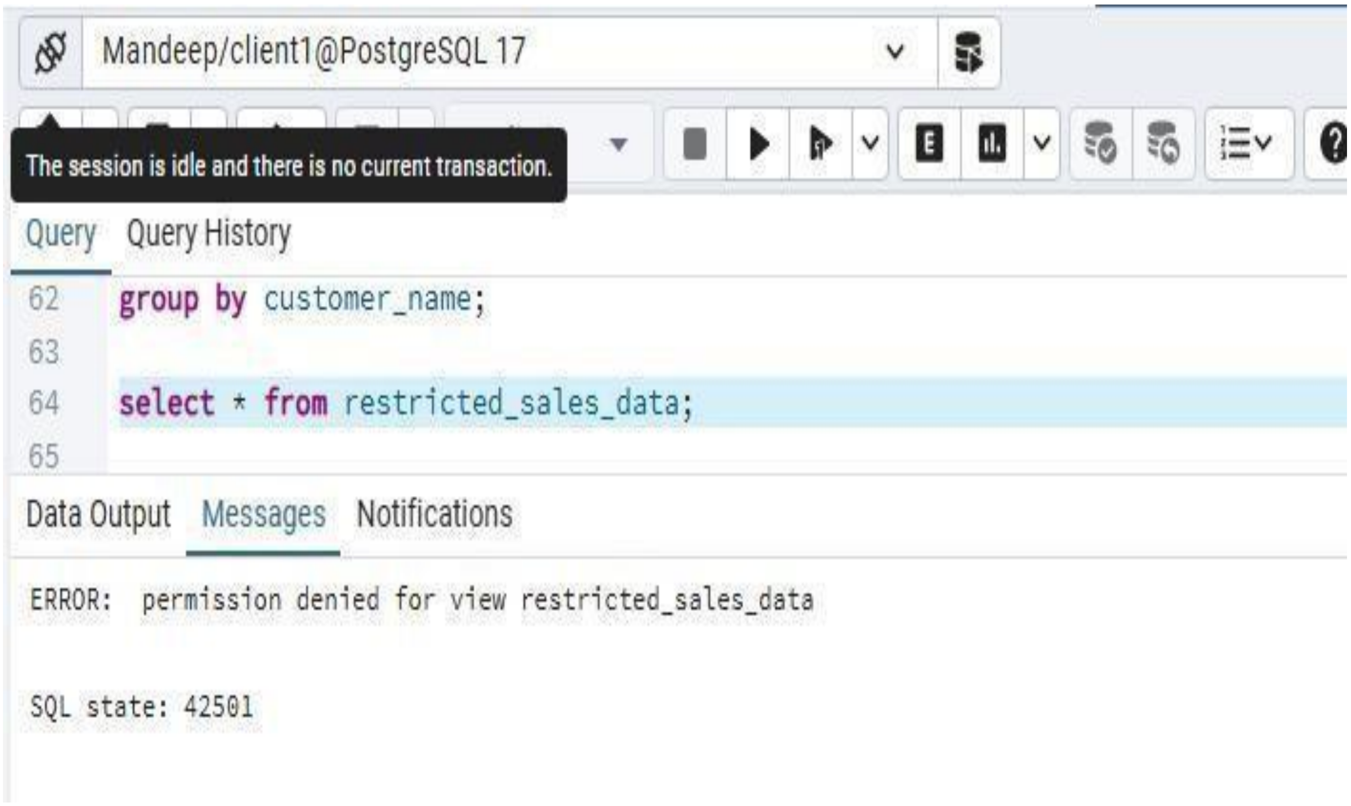
```
CREATE TABLE customer_data ( transaction_id SERIAL
        PRIMARY    KEY,  customer_name
   VARCHAR(100), email VARCHAR(100), phone
   VARCHAR(15), payment_info VARCHAR(50), -
   sensitive   order_value   DECIMAL,   order_date
   DATE DEFAULT CURRENT_DATE
);

-- Insert sample data
INSERT INTO customer_data (customer_name, email, phone, payment_info, order_value)
VALUES
('Mandeep Kaur', 'mandeep@example.com', '9040122324', '1234-5678-9012-3456', 500),
('Mandeep Kaur', 'mandeep@example.com', '9040122324', '1234-5678-9012-3456', 1000),
('Jaskaran Singh', 'jaskaran@example.com', '9876543210', '9876-5432-1098-7654', 700),
('Jaskaran Singh', 'jaskaran@example.com', '9876543210', '9876-5432-1098-7654', 300);
CREATE OR REPLACE VIEW RESTRICTED_SALES_DATA AS
```

```
SELECT
CUSTOMER_NAME,
COUNT(*)    AS      total_orders,
SUM(order_value) as total_sales
from customer_data group by
customer_name;

select * from restricted_sales_data;

CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';
GRANT SELECT ON RESTRICTED_SALES_DATA TO CLIENT1;
REVOKE SELECT ON RESTRICTED_SALES_DATA FROM CLIENT1;
```

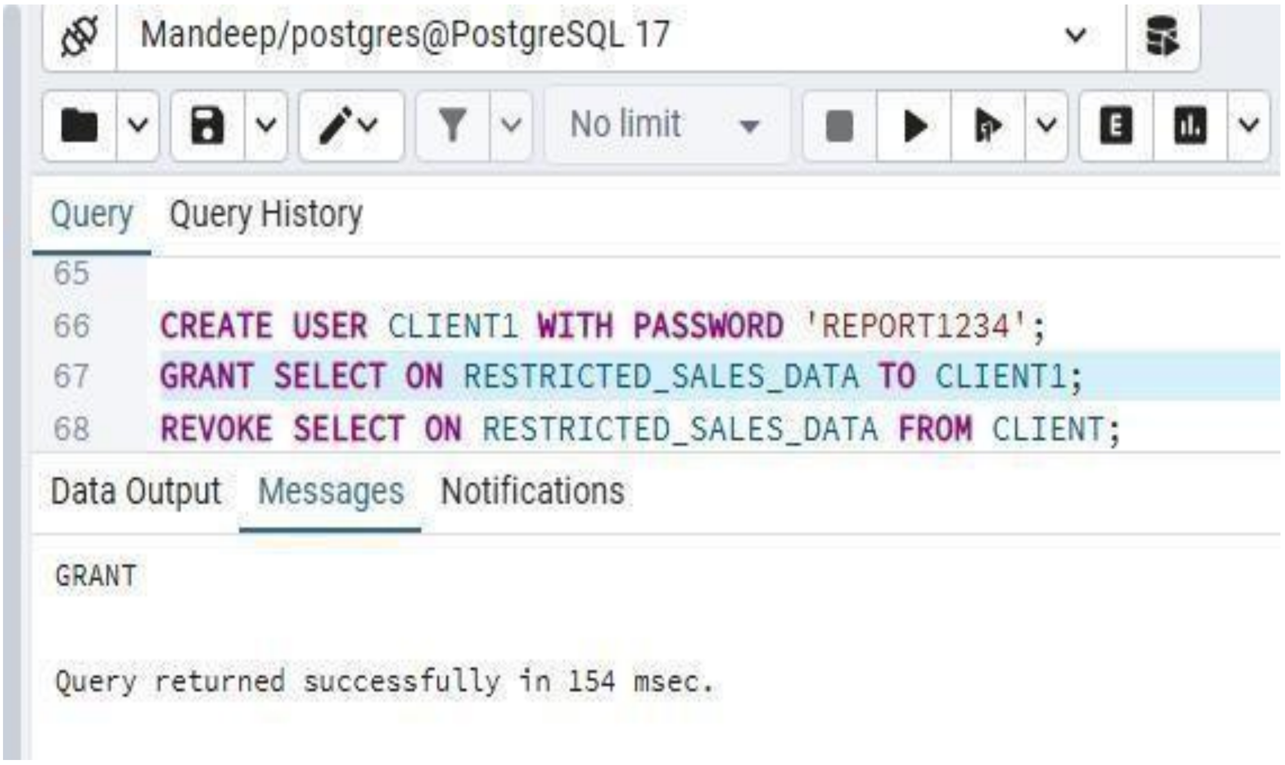

Mandeep/client1@PostgreSQL 17
The session is idle and there is no current transaction.
Query
Query History
Data Output
Messages
Notifications

```
group by customer_name;

select * from restricted_sales_data;
```

```
ERROR:  permission denied for view restricted_sales_data

SQL state: 42501
```

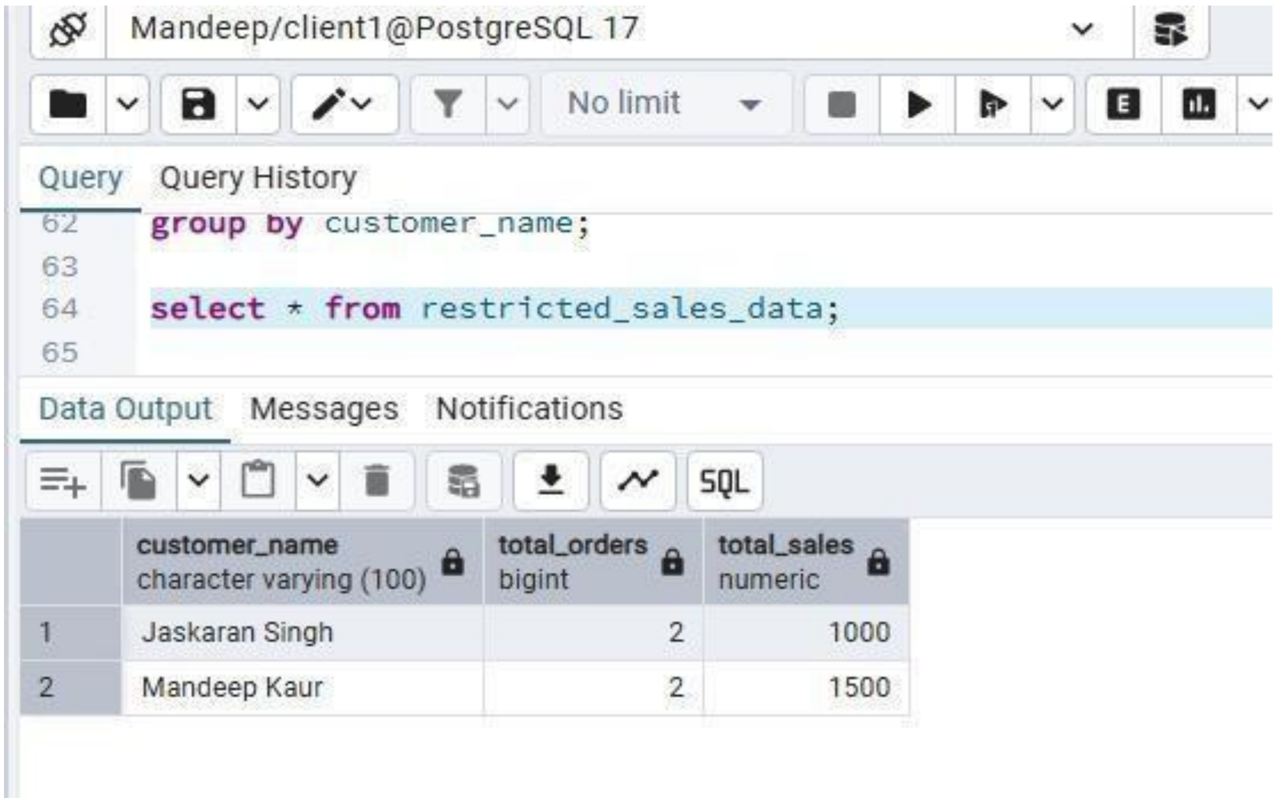


Mandeep/postgres@PostgreSQL 17

```
CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';
GRANT SELECT ON RESTRICTED_SALES_DATA TO CLIENT1;
REVOKE SELECT ON RESTRICTED_SALES_DATA FROM CLIENT;
```

```
GRANT

Query returned successfully in 154 msec.
```

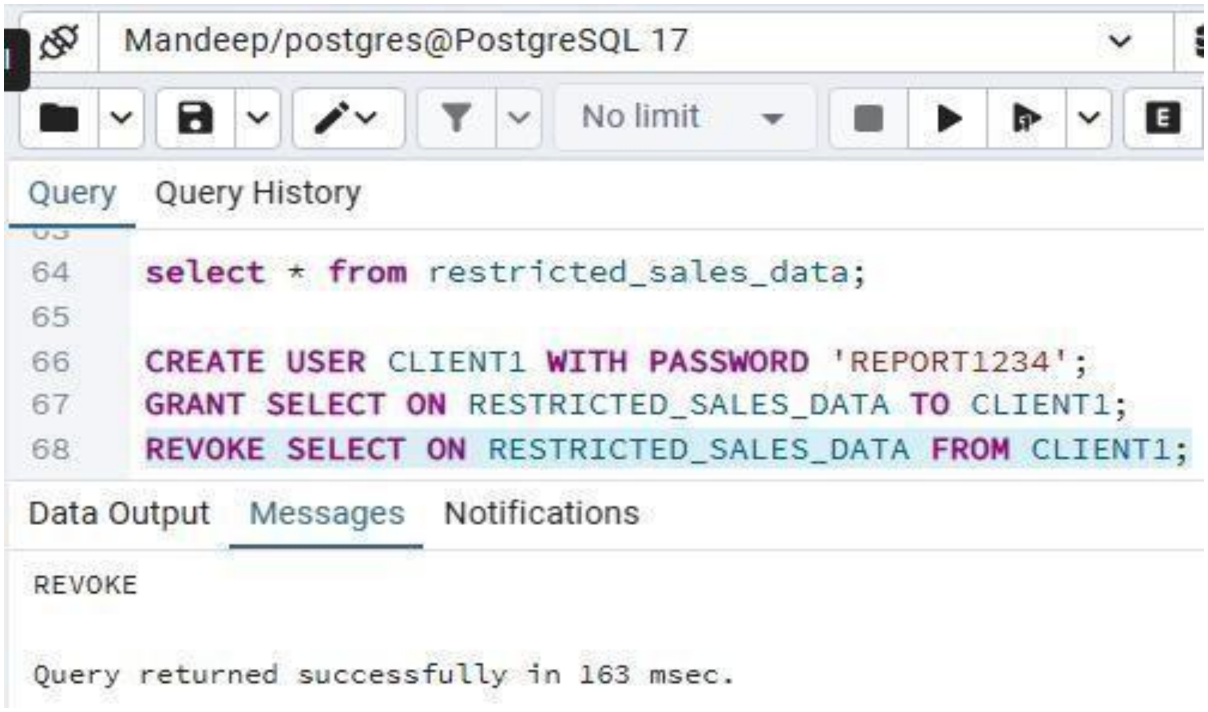


Mandeep/client1@PostgreSQL 17

```
group by customer_name;

select * from restricted_sales_data;
```

	customer_name character varying (100)	total_orders bigint	total_sales numeric
1	Jaskaran Singh	2	1000
2	Mandeep Kaur	2	1500



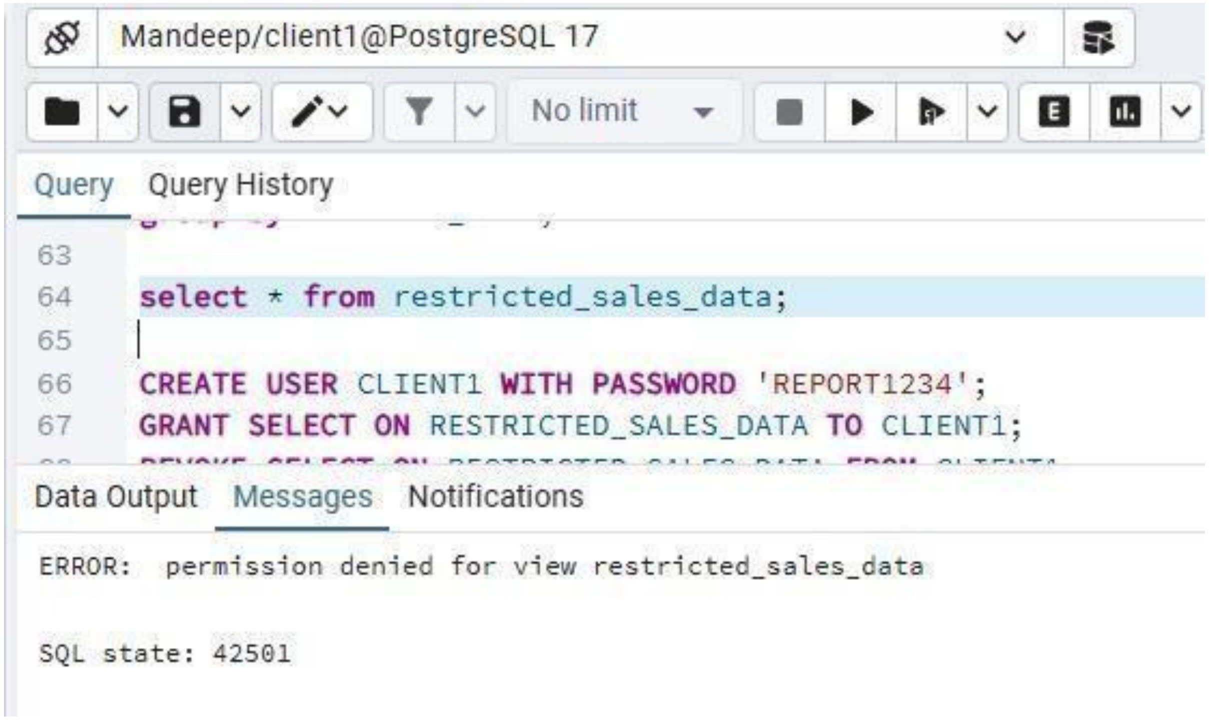
Mandeep/postgres@PostgreSQL 17

```
select * from restricted_sales_data;

CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';
GRANT SELECT ON RESTRICTED_SALES_DATA TO CLIENT1;
REVOKE SELECT ON RESTRICTED_SALES_DATA FROM CLIENT1;
```

```
REVOKE

Query returned successfully in 163 msec.
```



Mandeep/client1@PostgreSQL 17

```
select * from restricted_sales_data;

CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';
GRANT SELECT ON RESTRICTED_SALES_DATA TO CLIENT1;
```

```
ERROR:  permission denied for view restricted_sales_data

SQL state: 42501
```