Experiment 5

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Branch: CSE **Section/Group:** KRG_2B
Semester: 5th **Date of Performance:** 22/09/25
Subject Name: ADBMS **Subject Code:** 23CSP-333

1. Aim:

Part A – Medium Level:
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.

Part B – Hard Level:
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)

2. Objective:

Medium-Level Problem:

- **Data Generation:** Generate 1 million transaction records per ID in the transaction_data table using PostgreSQL functions generate_series() and random() to simulate realistic sales data.
- **View Creation:** Create a **normal view** to summarize sales metrics such as total_quantity_sold, total_sales, and total_orders.
- **Performance Comparison:** Compare the **execution time** and **query performance** between the normal view and the materialized view to demonstrate the benefits of materialized views in large datasets.
- **Query Optimization:** Understand how pre-aggregation in materialized views can optimize reporting queries on large datasets.

Hard-Level Problem:

- **Restricted Views:** Create **restricted or filtered views** in the sales database that provide only **non-sensitive aggregated data** to the reporting team.
- **Audit & Compliance:** Demonstrate how database security features can enforce organizational **data privacy and compliance policies**.

- **Access Control:** Implement **Data Control Language (DCL)** commands such as GRANT and REVOKE to manage **user permissions** and restrict access to sensitive transactional data.

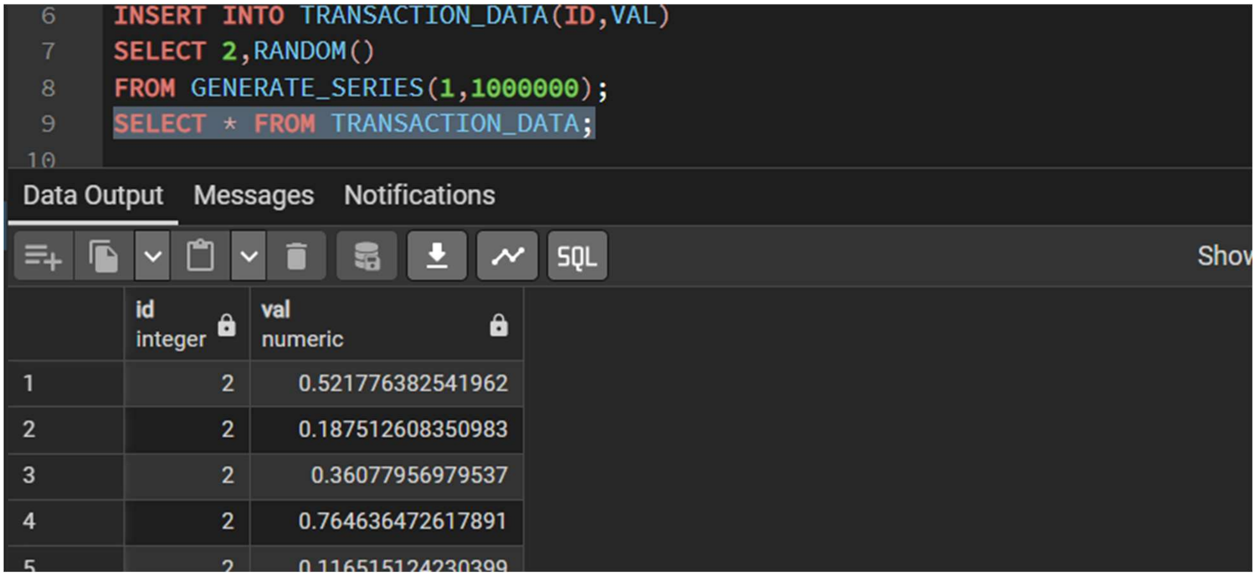
3. ADBMS script and output:

<u>MEDIUM-LEVEL PROBLEM</u>

```
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; /*Simple view */

CREATE MATERIALIZED VIEW SALES_SUMM_MV AS

SELECT
```

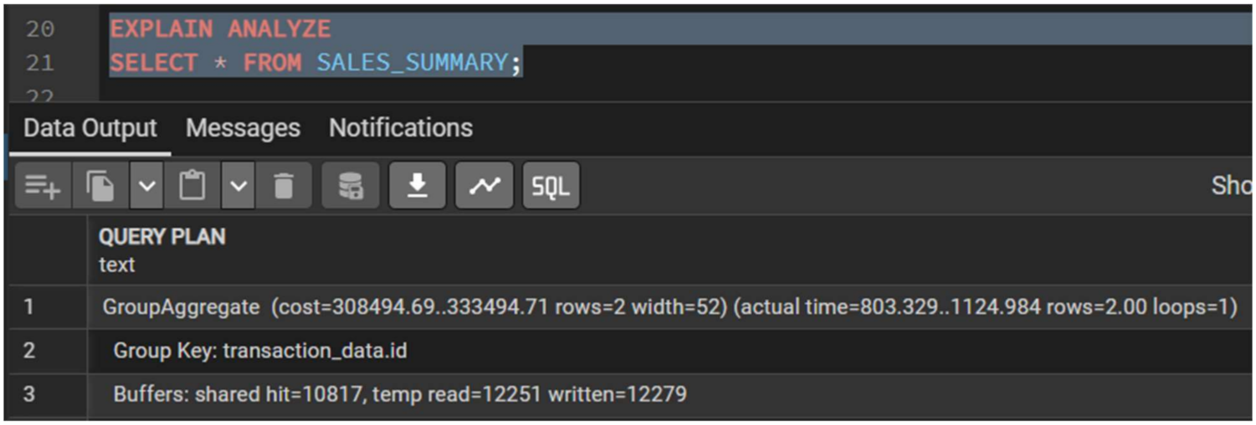
```
ID,

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_MV;
```

OUTPUT:-



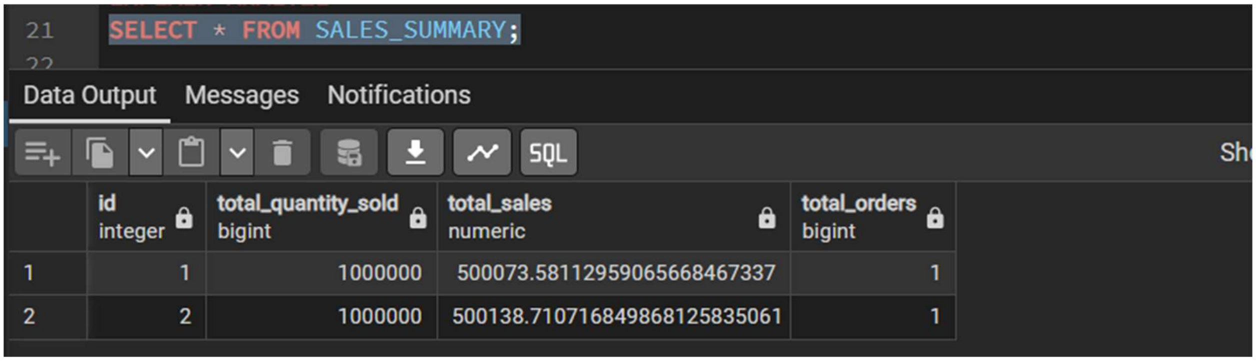
```
INSERT INTO TRANSACTION_DATA(ID,VAL)
SELECT 2,RANDOM()
FROM GENERATE_SERIES(1,1000000);
SELECT * FROM TRANSACTION_DATA;
```

	id integer	val numeric
1	2	0.521776382541962
2	2	0.187512608350983
3	2	0.36077956979537
4	2	0.764636472617891
5	2	0.116515124230399



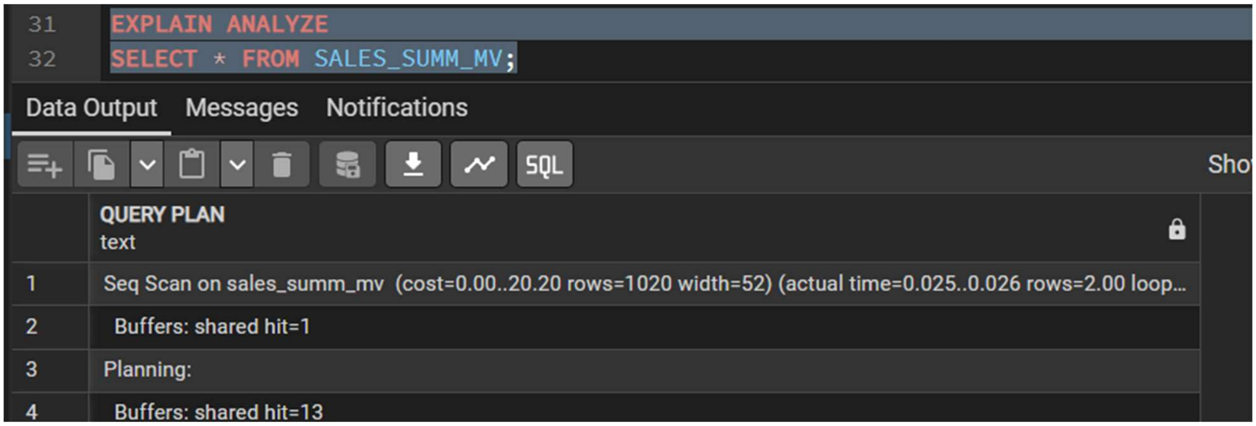
```
EXPLAIN ANALYZE
SELECT * FROM SALES_SUMMARY;
```

	QUERY PLAN text
1	GroupAggregate (cost=308494.69..333494.71 rows=2 width=52) (actual time=803.329..1124.984 rows=2.00 loops=1)
2	Group Key: transaction_data.id
3	Buffers: shared hit=10817, temp read=12251 written=12279



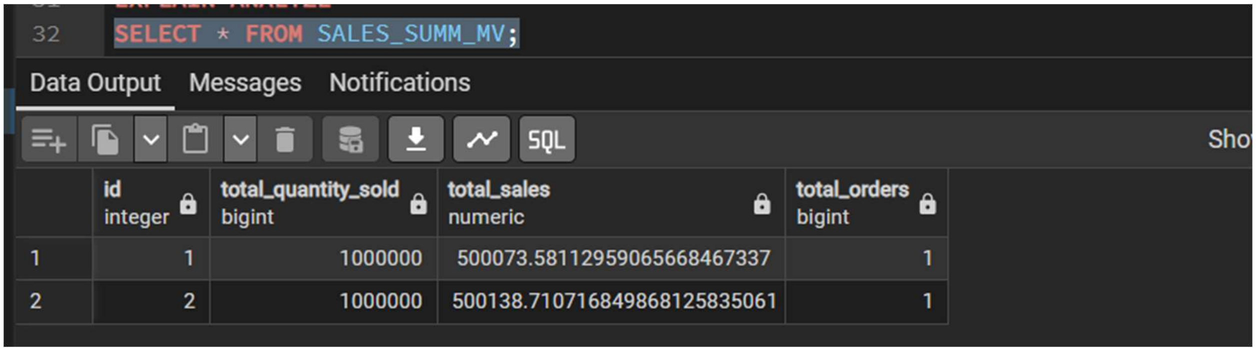
```
SELECT * FROM SALES_SUMMARY;
```

	id integer	total_quantity_sold bigint	total_sales numeric	total_orders bigint
1	1	1000000	500073.58112959065668467337	1
2	2	1000000	500138.710716849868125835061	1



```
EXPLAIN ANALYZE
SELECT * FROM SALES_SUMM_MV;
```

	QUERY PLAN text
1	Seq Scan on sales_summ_mv (cost=0.00..20.20 rows=1020 width=52) (actual time=0.025..0.026 rows=2.00 loop...
2	Buffers: shared hit=1
3	Planning:
4	Buffers: shared hit=13



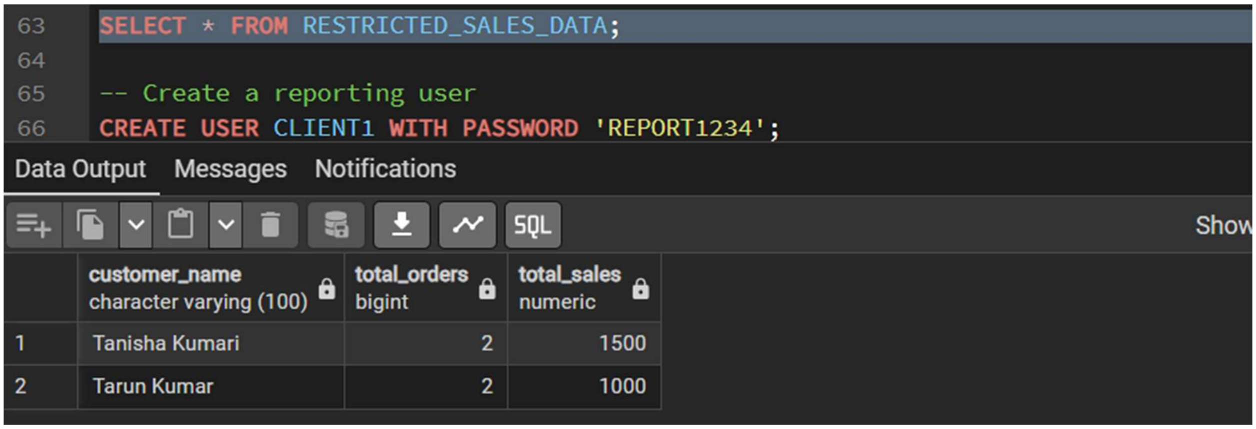
```
SELECT * FROM SALES_SUMM_MV;
```

	id integer	total_quantity_sold bigint	total_sales numeric	total_orders bigint
1	1	1000000	500073.58112959065668467337	1
2	2	1000000	500138.710716849868125835061	1

HARD LEVEL PROBLEM:

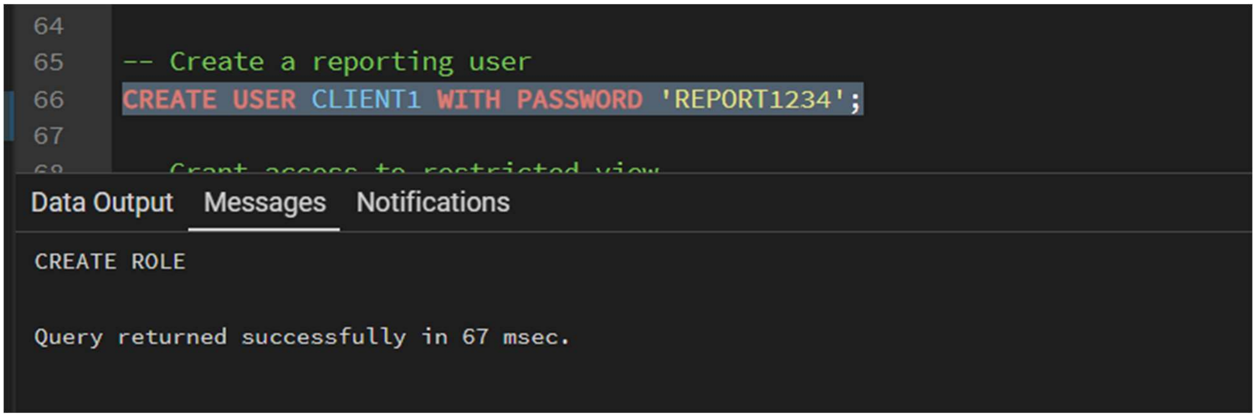
```
CREATE TABLE customer_data (
    transaction_id SERIAL PRIMARY KEY,
    customer_name VARCHAR(100),
    email VARCHAR(100),
    phone VARCHAR(15),
    payment_info VARCHAR(50),
    order_value DECIMAL,
    order_date DATE DEFAULT CURRENT_DATE
);
-- Insert sample data
INSERT INTO customer_data (customer_name, email, phone, payment_info, order_value)
VALUES
('Tanisha Kumari', 'tanisha.pankajj@gmail.com', '987654321', '1234-5678-9012-3456', 500),
('Tanisha Kumari', 'tanisha.pankajj@gmail.com', '987654321', '1234-5678-9012-3456', 1000),
('Tarun Kumar', 'tarun3008@gmail.com', '123456789', '9876-5432-1098-7654', 700),
('Tarun Kumar', 'tarun3008@gmail.com', '123456789', '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;
```

OUTPUTS:



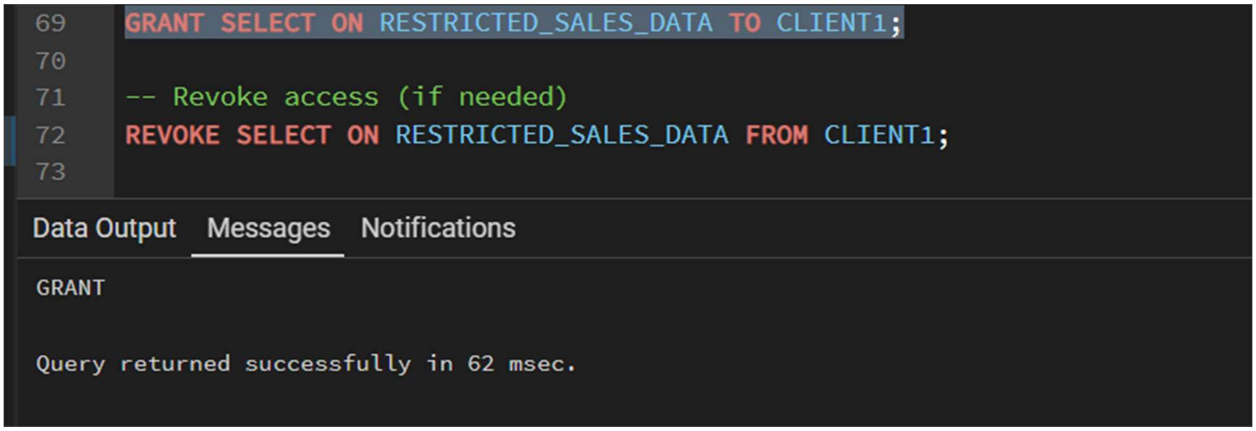
```
SELECT * FROM RESTRICTED_SALES_DATA;

-- Create a reporting user
CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';
```

	customer_name character varying (100)	total_orders bigint	total_sales numeric
1	Tanisha Kumari	2	1500
2	Tarun Kumar	2	1000



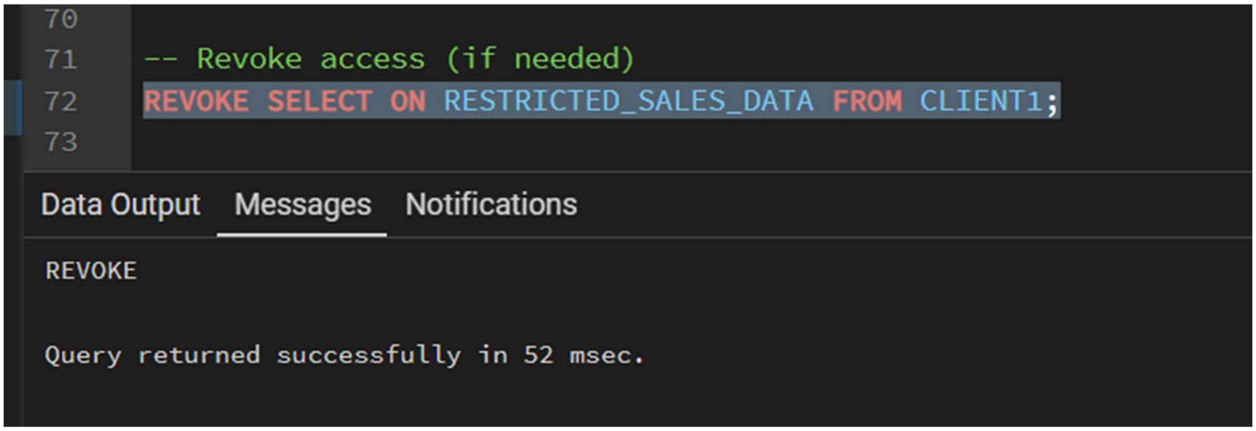
```

-- Create a reporting user
CREATE USER CLIENT1 WITH PASSWORD 'REPORT1234';

-- Grant access to restricted view
```

```
CREATE ROLE

Query returned successfully in 67 msec.
```



```
GRANT SELECT ON RESTRICTED_SALES_DATA TO CLIENT1;

-- Revoke access (if needed)
REVOKE SELECT ON RESTRICTED_SALES_DATA FROM CLIENT1;

```

```
GRANT

Query returned successfully in 62 msec.
```



```sql

-- Revoke access (if needed)
REVOKE SELECT ON RESTRICTED_SALES_DATA FROM CLIENT1;

```

```
REVOKE


Query returned successfully in 52 msec.
```