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Title:	Implementation of Dimension and Fact tables and perform OLAP operations.
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Marks:	
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Aim: Implementation of Dimension and Fact tables and perform OLAP operations.

Objective: OLAP stands for Online Analytical Processing. The objective of OLAP is to analyze information from multiple database systems at the same time. It is based on multidimensional data model and allows the user to query on multi-dimensional data.

Theory:

- Online Analytical Processing Server (OLAP) is based on the multidimensional data model.
- The main aim of OLAP is to provide multidimensional analysis to the underlying data.

  Following is the list of OLAP operations:

  1. Roll-up
  2. Drill-down
  3. Slice
  4. Dice
  5. Pivot (rotate)

Roll-up:

- The roll-up operation (also called the drill-up operation) performs aggregation on a data cube, either by climbing up a concept hierarchy for a dimension or by dimension reduction.
- Figure 2.1 shows the result of a roll-up operation performed on the central cube by climbing up the concept hierarchy for location.
- This hierarchy was defined as the total order "street < city < province or state < country."
- The roll-up operation aggregates the data by ascending the location hierarchy from the level of city to the level of country.
- In other words, rather than grouping the data by city, the resulting cube groups the data by country.

Drill-down:

- Drill-down is the reverse of roll-up. It navigates from less detailed data to more detailed data.
- Drill-down can be realized by either stepping down a concept hierarchy for a dimension or introducing additional dimensions.
- Figure 2.1 shows the result of a drill-down operation performed on the central cube by stepping down a concept hierarchy for time defined as "day < month < quarter < year."
- Drill-down occurs by descending the time hierarchy from the level of quarter to the more detailed level of month.
- The resulting data cube details the total sales per month rather than summarizing them by

quarter.

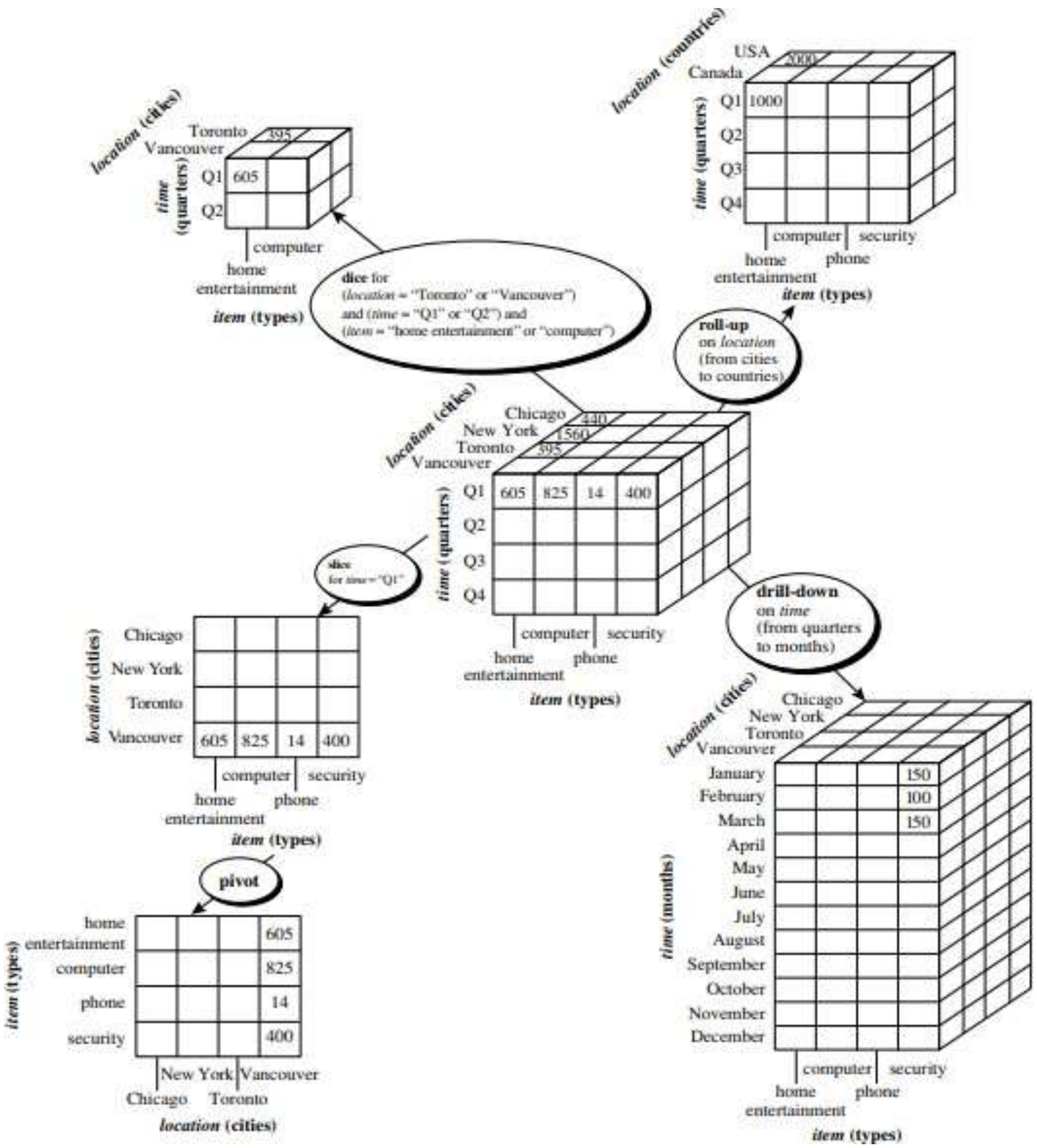


Figure 2.1: Examples of typical OLAP operations on multidimensional data.

Slice:

- The slice operation performs a selection on one dimension of the given cube, resulting in a subcube.
- Figure 2.1 below shows a slice operation where the sales data are selected from the central cube for the dimension time using the criterion time = "Q1."

Dice:

- The dice operation defines a subcube by performing a selection on two or more dimensions.
- Figure 2.1 shows a dice operation on the central cube based on the following selection criteria that involve three dimensions: (location = "Toronto" or "Vancouver") and (time = "Q1" or "Q2") and (item = "home entertainment" or "computer").

Pivot:

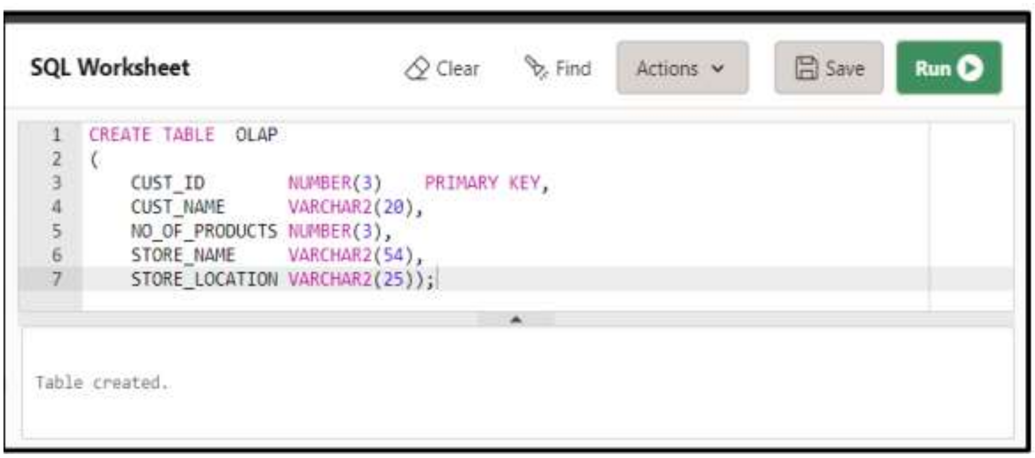
- Pivot (also called rotate) is a visualization operation that rotates the data axes in view to provide an alternative data presentation.
- Figure 2.1 shows a pivot operation where the item and location axes in a 2-D slice are rotated.

Problem Statement:

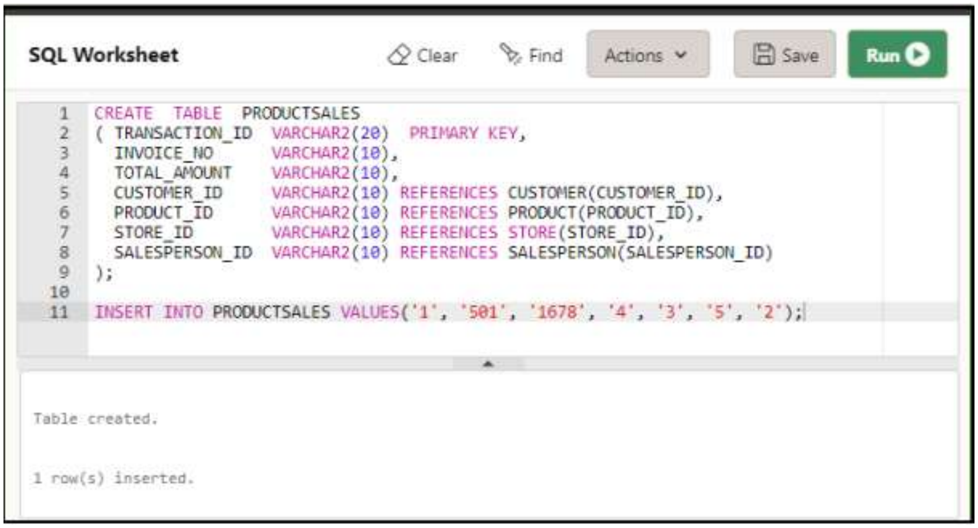
We are tasked with designing and implementing a data warehousing solution for an E-commerce company. Our objective is to create Dimension and Fact tables and perform OLAP (Online Analytical Processing) operations for data analysis.

Output:

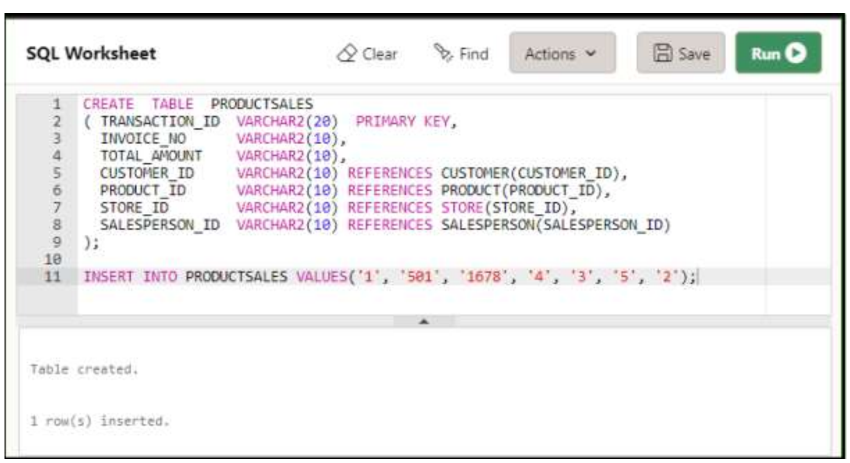
1. Creating the Dimension Tables



2. Creating the Fact Table



3. Inserting values in both dimension and fact tables



4. Displaying the tables

SQL Worksheet

```
SELECT * FROM OLAP;
```

CUST_ID	CUST_NAME	NO_OF_PRODUCTS	STORE_NAME	STORE_LOCATION
1	ARCHIT KONDE	2	Star Bazzar	THANE
2	SAAKSHI DEOKAR	1	DMart	GOREGAON
3	HASAN RIZVI	4	DMart	THANE
4	MEGA MODHA	3	Big Bazaar	GHATKOPAR
5	MAYURESH PHANSIKAR	2	DMart	SEAWOODS
6	INJILA HUSSAIN	1	Big Bazaar	KURLA
7	SAURABH KILLEKAR	2	Hyper City	THANE
8	SAKSHI KHARE	1	Star Bazzar	GHATKOPAR

Download CSV
8 rows selected.

- Roll UP :

SQL Worksheet

```
SELECT STORE_NAME, SUM(NO_OF_PRODUCTS) AS TOTALPRODUCT FROM OLAP GROUP BY STORE_NAME;
```

STORE_NAME	TOTALPRODUCT
Star Bazzar	3
Big Bazaar	4
DMart	7
Hyper City	2

Download CSV
4 rows selected.

- Drill Down :

SQL Worksheet

```sql
SELECT CUST_ID,CUST_NAME,NO_OF_PRODUCTS, STORE_LOCATION FROM OLAP;
```

CUST_ID	CUST_NAME	NO_OF_PRODUCTS	STORE_LOCATION
1	ARCHIT KONDE	2	THANE
2	SAAKSHI DEOKAR	1	GOREGAON
3	HASAN RIZVI	4	THANE
4	MEGA MODHA	3	GHATKOPAR
5	MAYURESH PHANSIKAR	2	SEAWOODS
6	INJILA HUSSAIN	1	KURLA
7	SAURABH KILLEKAR	2	THANE
8	SAKSHI KHARE	1	GHATKOPAR

Download CSV
8 rows selected.

- Slice

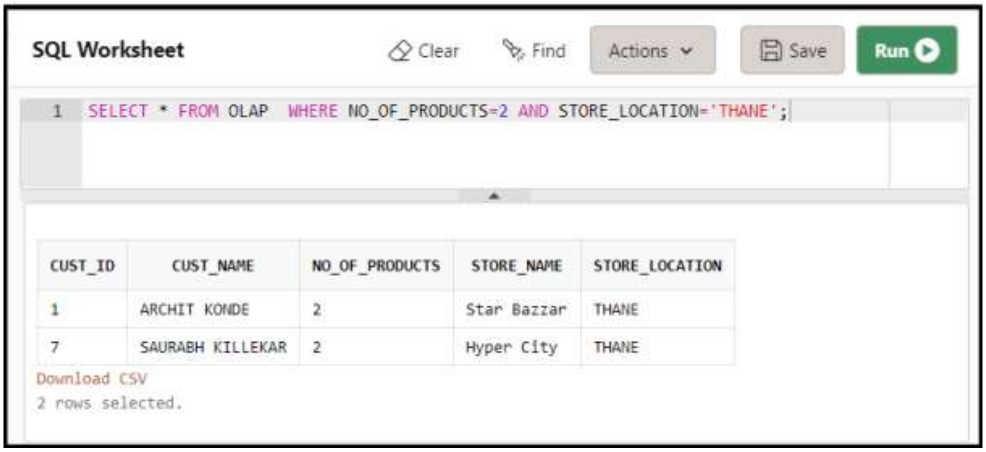
SQL Worksheet

```sql
SELECT * FROM OLAP WHERE STORE_LOCATION='THANE';
```

CUST_ID	CUST_NAME	NO_OF_PRODUCTS	STORE_NAME	STORE_LOCATION
1	ARCHIT KONDE	2	Star Bazzar	THANE
3	HASAN RIZVI	4	DMart	THANE
7	SAURABH KILLEKAR	2	Hyper City	THANE

Download CSV
3 rows selected.

- Dice :



5. Write SQL Queries for all the above OLAP operations.
    1. Roll up

SELECT STORE_NAME, SUM(NO_OF_PRODUCTS) AS TOTALPRODUCT FROM OLAP GROUP BY STORE_NAME;

    2. Drill Down

SELECT CUST_ID,CUST_NAME,NO_OF_PRODUCTS, STORE_LOCATION FROM OLAP;

    3. Slice

SELECT * FROM OLAP WHERE STORE_LOCATION='THANE';

    4. Dice

SELECT * FROM OLAP WHERE NO_OF_PRODUCTS=2 AND STORE_LOCATION='THANE';

Conclusion:
In summary, OLAP operations are essential for exploring data, controlling granularity, and enabling flexible, efficient, and informed decision-making. They empower organizations to analyze historical data, forecast trends, and integrate with BI tools. Continuous learning and adaptation to emerging best practices are key to maximizing the benefits of OLAP in data analysis and decision-making.