EXPERIMENT NO.3

Aim: To implement OLAP operations Slice, Dice, Roll up. Drill down based on experiment no.1 case study.

Theory:

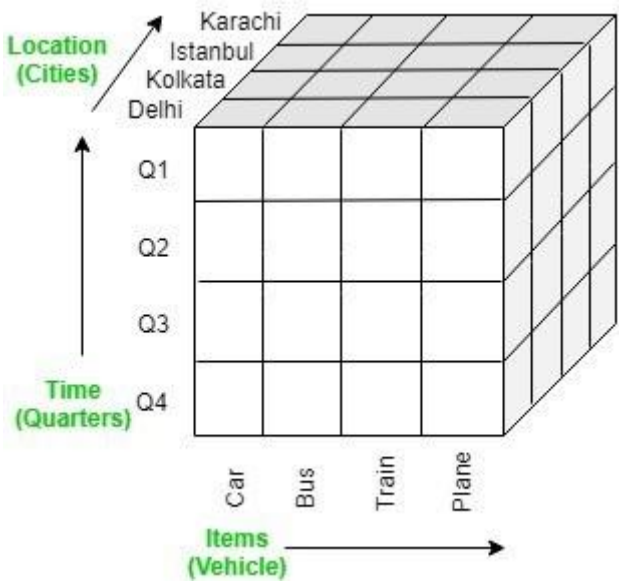
- Difference between OLTP & OLAP

OLTP and OLAP: The two terms look similar but refer to different kinds of systems. Online transaction processing (OLTP) captures, stores, and processes data fromtransactions in real time. Online analytical processing (OLAP) uses complex queries to analyse aggregated historical data from OLTP systems.

An OLTP system captures and maintains transaction data in a database. Each transaction involves individual database records made up of multiple fields or columns. Examples include banking and credit card activity or retail checkout scanning. In OLTP, the emphasis is on fast processing, because OLTP databases are read, written, and updated frequently. If a transaction fails, built-in system logic ensures data integrity.

OLAP applies complex queries to large amounts of historical data, aggregated from OLTP databases and other sources, for data mining, analytics, and business intelligence projects. In OLAP, the emphasis is on response time to these complex queries. Each query involves one or more columns of data aggregated from many rows. Examples include year-over- year financial performance or marketing lead generation trends. OLAP databases and data warehouses give analysts and decision-makers the ability to use custom reporting tools to turn data into information. Query failure in OLAP does not interrupt or delay transaction processing for customers, but it can delay or impact the accuracy of business intelligence insights.

- OLAP Operations(Explain all operations with example) Consider this example:-

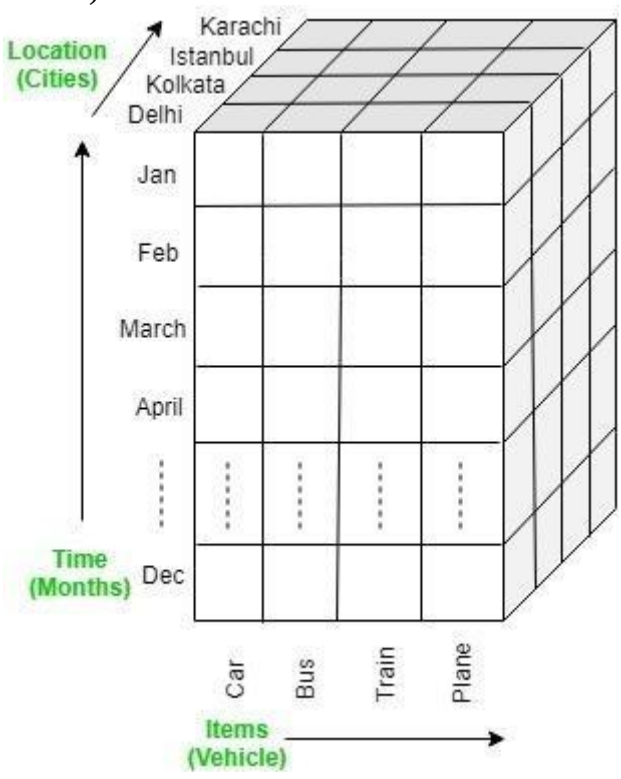


There are five basic analytical operations that can be performed on an OLAP cube:

Drill down: In drill-down operation, the less detailed data is converted into highly detailed data. It can be done by:

- Moving down in the concept hierarchy
- Adding a new dimension

In the cube given in overview section, the drill down operation is performed by moving down in the concept hierarchy of *Time* dimension (Quarter -> Month).

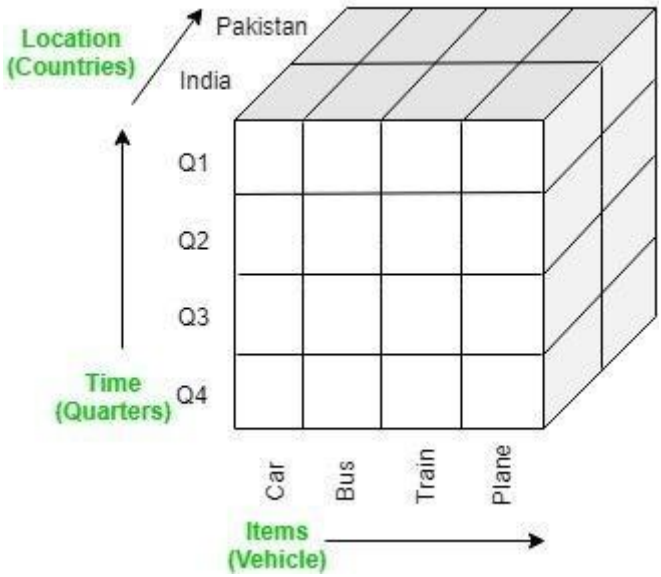


Roll up: It is just opposite of the drill-down operation. It performs aggregation on the OLAP cube. It can be done by:

- Climbing up in the concept hierarchy

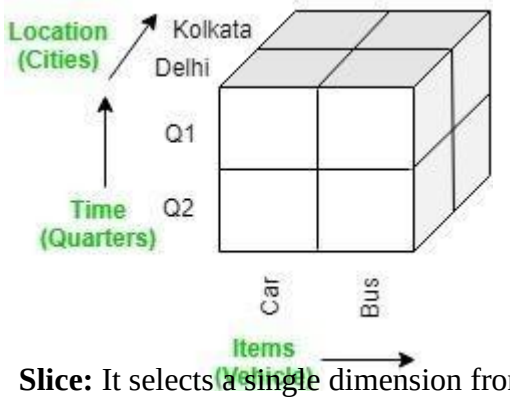
- Reducing the dimensions

In the cube given in the overview section, the roll-up operation is performed by climbing up in the concept hierarchy of *Location* dimension (City -> Country).



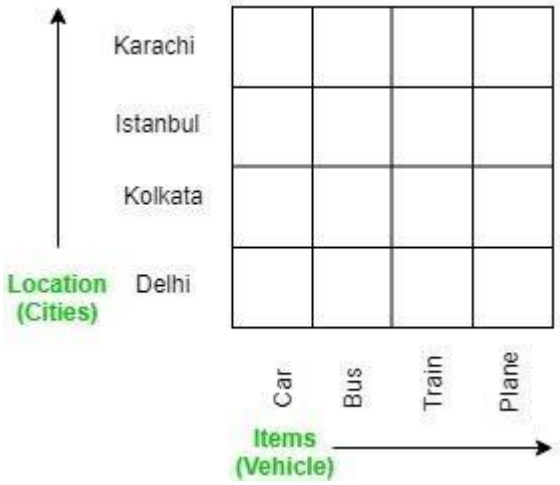
Dice: It selects a sub-cube from the OLAP cube by selecting two or more dimensions. In the cube given in the overview section, a sub-cube is selected by selecting following dimensions with criteria:

- Location = “Delhi” or “Kolkata”
- Time = “Q1” or “Q2”
- Item = “Car” or “Bus”

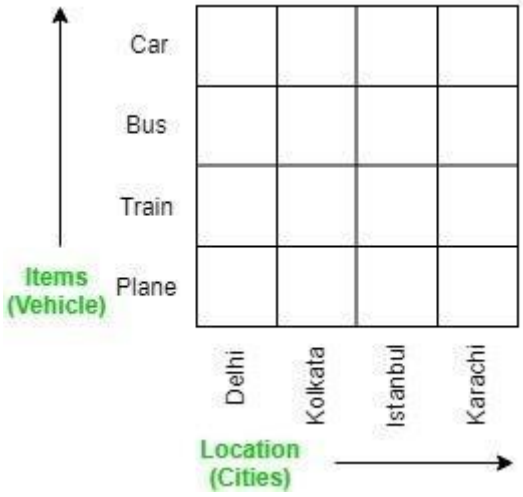


Slice: It selects a single dimension from the OLAP cube which results in a new sub- cube creation. In the cube given in the overview section, Slice is performed on the

dimension Time = “Q1”.



Pivot: It is also known as *rotation* operation as it rotates the current view to get a new view of the representation. In the sub-cube obtained after the slice operation, performing pivot operation gives a new view of it.



Problem Statement/Case Study

Suppose that a data warehouse for DB-University consists of the four dimensions: student, course, semester, and instructor, and two measures count and avg-grade. At the lowest conceptual level (e.g., for a given student, course, semester, and instructor combination), the avg-grade measure stores the actual course grade of the student. At higher conceptual levels, avg grade stores the average grade for the given combination.

- **Query for Roll up:**

Messages | Query Editor | Query History

```
1  select semester.semester_year,count(course_id)
2  from fact_table
3  Natural join course2
4  join semester
5  on fact_table.semester_id=semester.semester_id
6  where course_id='101'
7  Group by semester.semester_year
```

Data Output | Explain | Messages | Notifications

	semester_year character varying (45)	count bigint
1	2020	4
2	2021	1

- **Query for Drill down :**

Messages | Query Editor | Query History

```
1  select fact_table.course_id,count(student_id)
2  from fact_table
3  Natural join Student1
4  join course2
5  on fact_table.course_id=course2.course_id
6  where student_id='ST01'
7  Group by fact_table.course_id
```

Data Output | Explain | Messages | Notifications

	course_id character varying (50)	count bigint
1	CS01	1
2	CS02	1
3	CS03	3

- **Query for Slice :**

Messages | Query Editor | Query History

```
1  select fact_table.student_id,avg_grade
2  from fact_table
3  Inner Join Student1
4  On fact_table.student_id=Student1.student_id
5  where fact_table.student_id='ST01';
```

Data Output | Explain | Messages | Notifications

	student_id character varying (50)	avg_grade character varying (10)
1	ST01	A
2	ST01	B
3	ST01	A
4	ST01	B
5	ST01	B

- **Query for Dice:**

Messages | Query Editor | Query History

```
1  select fact_table.student_id,avg_grade
2  from fact_table
3  Inner Join Student1
4  On fact_table.student_id=Student1.student_id
5  Join course2
6  on fact_table.course_id=course2.course_id
7  where avg_grade='A' and course2.couse_time='6 months';
```

Data Output | Explain | Messages | Notifications

	student_id character varying (50)	avg_grade character varying (10)
1	ST01	A
2	ST04	A
3	ST03	A
4	ST02	A
5	ST03	A
6	ST05	A

Conclusion:

Thus, OLAP (Online Analytical Processing) is powerful technology behind many Business Intelligence (BI) applications that discovers data, report viewing capabilities, complex analytical calculations, and predictive scenario, budget planning, forecast planning.It works as it first collected the data from multiple data sources (like a spreadsheet, video, XML, etc.) and is stored in data warehouses, which are then cleansed and organized into data cubes on which can run the user's queries.The five types of analytical operations against the multidimensional databases that can perform are Roll-up, Drill-down, Slice, Dice, and Pivot.