Experiment 3

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Date: 14-08-2021

Aim: Implementation of OLAP operations: Slice, Dice, Rollup, Drill down based on the case study from Experiment 1

Theory:

Online Analytical Processing Server (OLAP):

- It is a software technology that allows users 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 multidimensional data (e.g. Delhi -> 2018 -> Sales data).
- OLAP databases are divided into one or more cubes and these cubes are known as Hypercubes.
- These cubes are designed in a way that creating, viewing reports becomes easy. It is a data structure optimized for very quick data analysis.
- For OLAP applications response time is an effective measure. It is widely used by Data Mining Techniques.
- In the OLAP database there is aggregated, historical data, stored in multidimensional schemas (usually a star schema).
- Example: A bank storing years of historical records of cheque deposits could use OLAP database to provide reporting to business users.

Strengths of OLAP:

- It is a powerful visualization paradigm
- It provides fast, interactive response times
- It is good for analyzing time series
- It can be useful to find some clusters and outliers
- Many vendors offer OLAP tools such as brio.com, cognus.com, microstrategy.com etc.
- It is possible to access an OLAP database from the web.

OLAP Operations:

Drill Down:

- In drill-down operation, the less detailed data is converted into highly detailed data.
- It is also called reverse operation of roll-up. It acts as if zooming in on the data cube.
- It can be done by either stepping down a concept hierarchy or adding additional dimensions.
- **Example:** The figure shows a drill-down operation performed on dimension time by stepping down a concept hierarchy which is defined as day, month, quarter and year. Drilldown appears by descending the time hierarchy from the level of the quarter to a more detailed level of month.

Roll-up:

- It is just the opposite of the drill-down operation. It performs aggregation on the OLAP cube.
- It can be done either by climbing up in the concept hierarchy for a dimension or by 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).

Slice:

- It selects a single dimension from the OLAP cube which results in a new sub-cube creation.
- It is a subset of the cubes corresponding to a single value for one or more members of the dimension.
- Example: A slice operation is executed when a customer wants a selection on one dimension of a three-dimensional cube resulting in a two-dimensional site.
- Slice is performed on the dimension Time = “Q1”.

Dice:

- It selects a sub-cube from the OLAP cube by selecting two or more dimensions.
- Example: Implement the selection (time = day 3 OR time = day 4) AND (temperature = cool OR temperature = hot) to the original cubes we get the following subcube (still two dimensional)
- A sub-cube is selected by selecting following dimensions with criteria:
    - Location = “Delhi” or “Kolkata”
    - Time = “Q1” or “Q2”
    - Item = “Car” or “Bus”

Pivot:

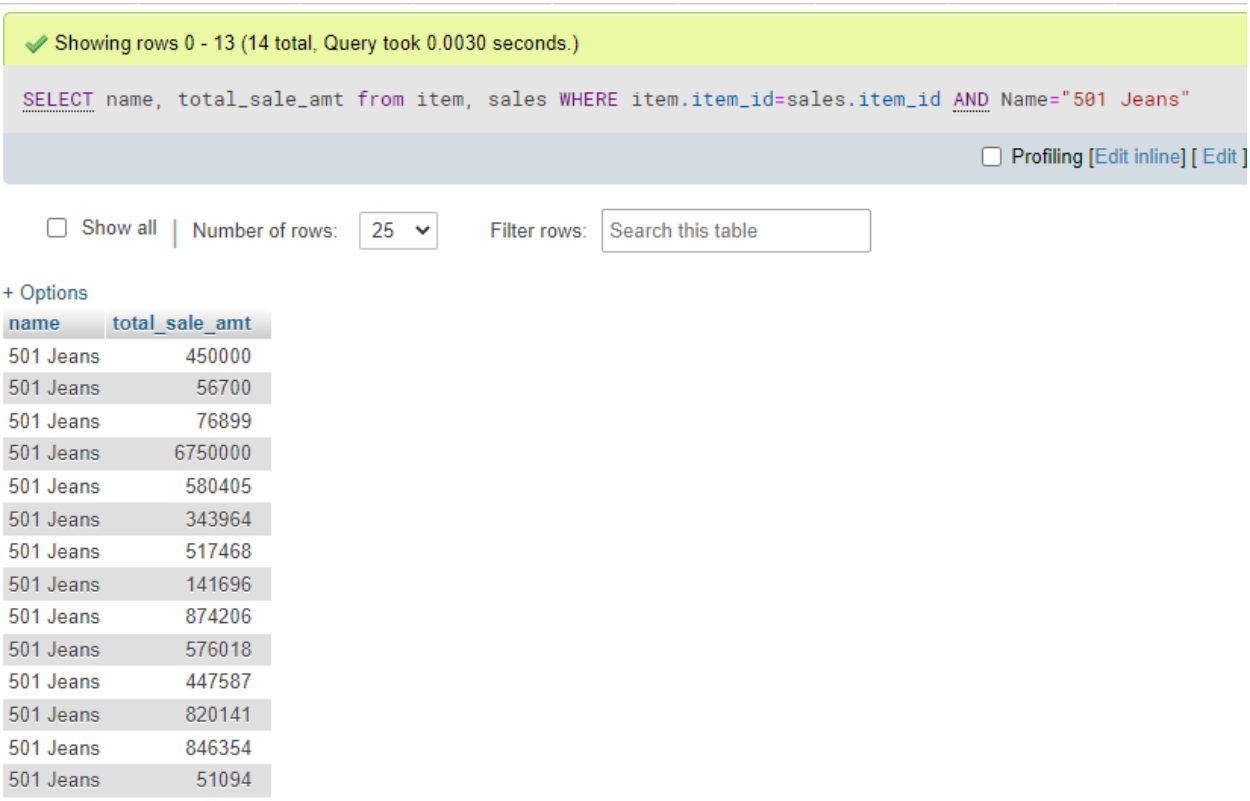
- It is also known as rotation operation as it rotates the current view to get a new view of the representation.
- Pivot is a visualization operation which rotates the data axes in view to provide an alternative presentation of the data.
- It may contain swapping the rows and columns or moving one of the row-dimension into
- column dimensions.
- In the sub-cube obtained after the slice operation, performing pivot operation gives a new view of it.

Implementation:

1) Slice:

```
SELECT name, total_sale_amt from item, sales
WHERE item.item_id=sales.item_id
AND Name="501 Jeans";
```

Result:

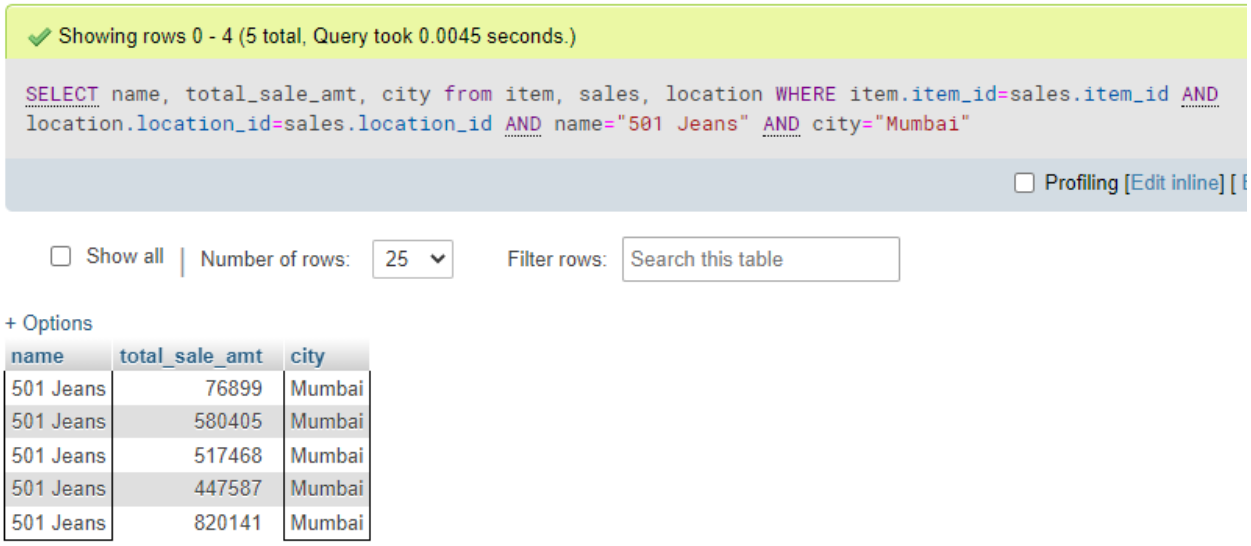


name	total_sale_amt
501 Jeans	450000
501 Jeans	56700
501 Jeans	76899
501 Jeans	6750000
501 Jeans	580405
501 Jeans	343964
501 Jeans	517468
501 Jeans	141696
501 Jeans	874206
501 Jeans	576018
501 Jeans	447587
501 Jeans	820141
501 Jeans	846354
501 Jeans	51094

2) Dice:

```
SELECT name, total_sale_amt, city from item, sales, location
WHERE item.item_id=sales.item_id
AND location.location_id=sales.location_id
AND name="501 Jeans"
AND city="Mumbai";
```

Result:



Showing rows 0 - 4 (5 total, Query took 0.0045 seconds.)

```
SELECT name, total_sale_amt, city from item, sales, location WHERE item.item_id=sales.item_id AND
location.location_id=sales.location_id AND name="501 Jeans" AND city="Mumbai"
```

Profiling [Edit inline] [

Show all | Number of rows: 25 Filter rows: Search this table

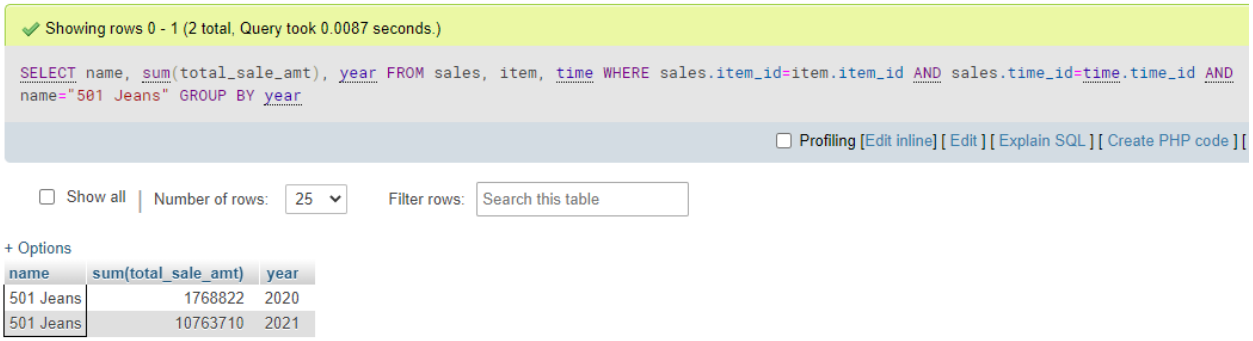
+ Options

name	total_sale_amt	city
501 Jeans	76899	Mumbai
501 Jeans	580405	Mumbai
501 Jeans	517468	Mumbai
501 Jeans	447587	Mumbai
501 Jeans	820141	Mumbai

3) Roll Up:

```
SELECT name, sum(total_sale_amt), year
FROM sales, item, time
WHERE sales.item_id=item.item_id
AND sales.time_id=time.time_id
AND name="501 Jeans"
GROUP BY year;
```

Result:



Showing rows 0 - 1 (2 total, Query took 0.0087 seconds.)

```
SELECT name, sum(total_sale_amt), year FROM sales, item, time WHERE sales.item_id=item.item_id AND sales.time_id=time.time_id AND
name="501 Jeans" GROUP BY year
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [

Show all | Number of rows: 25 Filter rows: Search this table

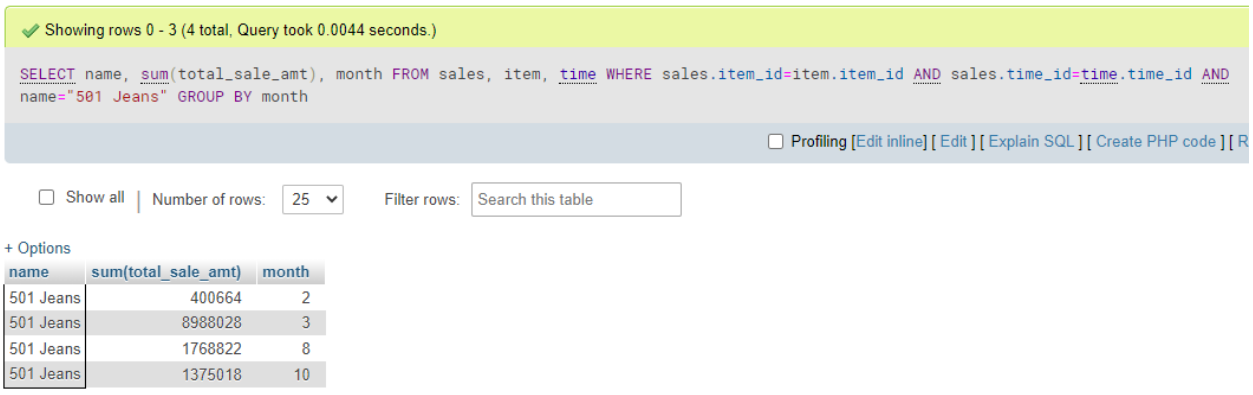
+ Options

name	sum(total_sale_amt)	year
501 Jeans	1768822	2020
501 Jeans	10763710	2021

4) Drill Down:

```
SELECT name, sum(total_sale_amt), month
FROM sales, item, time
WHERE sales.item_id=item.item_id
AND sales.time_id=time.time_id
AND name="501 Jeans"
GROUP BY month;
```

Result:



Showing rows 0 - 3 (4 total, Query took 0.0044 seconds.)

```
SELECT name, sum(total_sale_amt), month FROM sales, item, time WHERE sales.item_id=item.item_id AND sales.time_id=time.time_id AND
name="501 Jeans" GROUP BY month
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [R

Show all | Number of rows: 25 Filter rows: Search this table

+ Options

name	sum(total_sale_amt)	month
501 Jeans	400664	2
501 Jeans	8988028	3
501 Jeans	1768822	8
501 Jeans	1375018	10

Conclusion: Hence we successfully studied the concept of OLAP operations and implementation of the same based on the case study done in Experiment 1.