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## Data Warehouse – queries

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A.A. 2023-2024

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## The data cube in SQL

- It expresses all the possible tuple aggregations of a table
- It uses the new polymorphic value **ALL**

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## Data cube in SQL (Relational OLAP)

Consider only the red cars of Fiat and Ford models in years 1994 and 1995, find the total sales for each model, year and color of the car. Include in the answer also the aggregations computed using only one or two of the three attributes.

```
select Model, Year,  
       Color, sum(Sales)  
from Sales  
where Model in {'Fiat', 'Ford'}  
       and Color = 'Red'  
       and Year between 1994 and 1995  
group by Cube(Model, Year, Color)
```

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## Relevant Facts

model	year	color	sales
fiat	1994	red	50
fiat	1995	red	85
ford	1994	red	80

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## All the data in the cube

model	year	color	sum (sales)
fiat	1994	red	50
fiat	1995	red	85
fiat	1994	ALL	50
fiat	1995	ALL	85
fiat	ALL	red	135
fiat	ALL	ALL	135
ford	1994	red	80
ford	1994	ALL	80
ford	ALL	red	80
ford	ALL	ALL	80
ALL	1994	red	130
ALL	1995	red	85
ALL	ALL	red	215
ALL	1994	ALL	130
ALL	1995	ALL	85
ALL	ALL	ALL	215

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## Roll up

ROLLUP enables a SELECT statement to calculate multiple levels of subtotals across an ordered set of dimensions.

Using the ROLLUP operator instead of the CUBE operator eliminates the results that contain ALL only in one column (except for the last), thus the aggregations only by model or only by year are not computed.

```
select Model, Year,
       Color, sum(Sales)
from Sales
where Model in {'Fiat','Ford'}
   and Color = 'Red'
   and Year between 1994 and 1995
group by Rollup (Model, Year, Color)
```

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## The data after roll-up

model	year	color	sum(sales)
fiat	1994	red	50
fiat	1995	red	85
ford	1994	red	80
fiat	1994	ALL	50
fiat	1995	ALL	85
ford	1994	ALL	80
fiat	ALL	ALL	135
ford	ALL	ALL	80
ALL	ALL	ALL	215

→ It is a kind of “progressive aggregation”

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WAREHOUSE	PRODUCT	SUM(QUANTITY)
San Francisco	Samsung	300
San Francisco	iPhone	260
San Jose	Samsung	350
San Jose	iPhone	300

SELECT warehouse, product,  
SUM(quantity) FROM inventory  
GROUP BY CUBE(warehouse,product)  
ORDER BY warehouse, product;

WAREHOUSE	PRODUCT	SUM(QUANTITY)
San Francisco	Samsung	300
San Francisco	iPhone	260
San Francisco	(null)	560
San Jose	Samsung	350
San Jose	iPhone	300
San Jose	(null)	650
(null)	Samsung	650
(null)	iPhone	560
(null)	(null)	1210

SELECT warehouse, product,  
SUM(quantity) FROM inventory  
GROUP BY ROLLUP (warehouse ,  
product);

warehouse	product	SUM(quantity)
San Francisco	iPhone	260
San Francisco	Samsung	300
San Francisco	NULL	560
San Jose	iPhone	300
San Jose	Samsung	350
San Jose	NULL	650
NULL	NULL	1210

<https://www.sqltutorial.org/sql-rollup/>

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# Rollup

- Difference between Cube and rollup:

CUBE evaluates aggregate expression with all possible combinations of columns specified in group by clause, whereas the Rollup evaluates aggregate expressions only relative to the order of columns specified in group by clause.

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