



Business School
UNIVERSITY OF COLORADO DENVER

Information Systems Program

Module 2

SQL Subtotal Operators

Lesson 1: GROUP BY Clause Review



Lesson Objectives

- Review GROUP BY clause
- Compare GROUP BY results with pivot table
- Understand the importance of the subtotal operators



GROUP BY Clause Review

- **Row summary**
 - **One row per combination of grouping values**
- **Grouping columns, summary values**
- **Aggregate function**
 - **One value per set of rows**
- **MIN, MAX, COUNT, SUM, AVG, ...**



GROUP BY Rules

SELECT/GROUP BY consistency

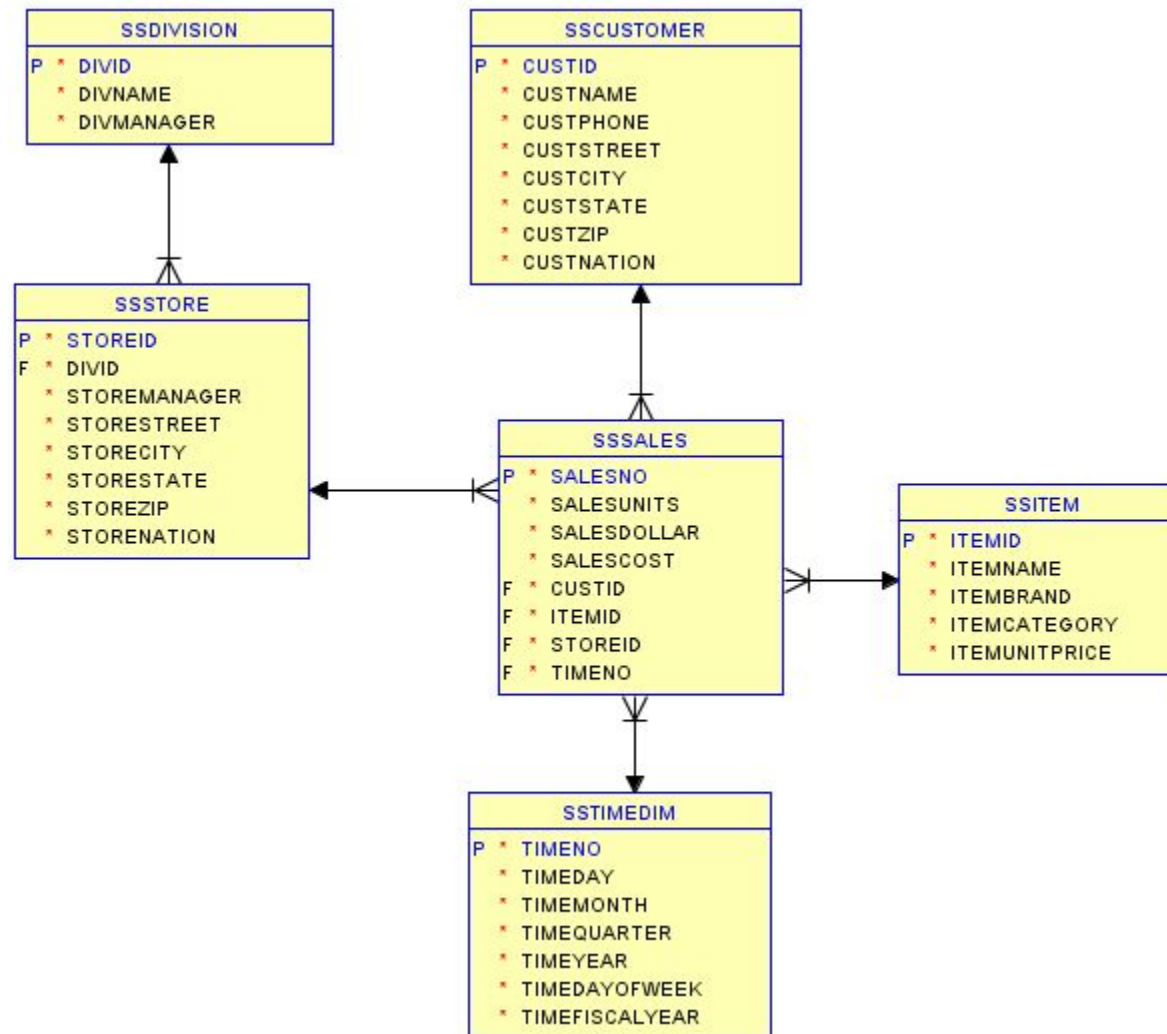
- **SELECT** Col₁, Col₂, ..., Col_n, COUNT(*)
- **GROUP BY** Col₁, Col₂, ..., Col_n

Condition placement

- **Row conditions** (no aggregate function) in **WHERE**
- **Group conditions** (aggregate function) in **HAVING**



Oracle Diagram for the Store Sales Tables



GROUP BY Example

- Summarize (sum, min, and count) store sales for USA and Canada in 2016 by store zip and month
- Only include groups with more than one row

```
SELECT StoreZip, TimeMonth,  
       SUM(SalesDollar) AS SumSales,  
       MIN(SalesDollar) AS MinSales, COUNT(*) AS RowCount  
FROM SSSales, SSStore, SSTimeDim  
WHERE SSSales.StoreId = SSStore.StoreId  
      AND SSSales.TimeNo = SSTimeDim.TimeNo  
      AND (StoreNation = 'USA' OR StoreNation = 'Canada')  
      AND TimeYear = 2016  
GROUP BY StoreZip, TimeMonth  
HAVING COUNT(*) > 1  
ORDER BY StoreZip, TimeMonth;
```



Query Clause Evaluation Order

- Rows
 - **FROM**
 - **WHERE**
- Groups
 - **GROUP BY**
 - **HAVING**
- Result
 - **ORDER BY**
 - **SELECT**



Lessons about the Evaluation Order

- Row operations before group operations
 - FROM and WHERE before GROUP BY and HAVING
 - Check row operations first
- Grouping occurs only one time



Motivation for Subtotal Extensions

- Lack of subtotals in GROUP BY result
- Show subtotals in a data cube
- Provide control over subtotals in GROUP BY result
- Provide a bridge between relational database representation and data cubes



GROUP BY / Pivot Table Comparison

GROUP BY result

State	Month	SUM(Sales)
CA	Dec	100
CA	Feb	75
CO	Dec	150
CO	Jan	100
CO	Feb	200
CN	Dec	50
CN	Jan	75

```
SELECT State, Month, SUM(Sales)
GROUP BY State, Month
```

Sales Pivot
Table

State	Month			
	Dec	Jan	Feb	Total
CA	100	-	75	175
CO	150	100	200	450
CN	50	75	-	125
Total	300	175	275	750



Summary

- GROUP BY clause to calculate summary data for decision making
- Extend GROUP BY with subtotal operators
- Differences between GROUP BY results and pivot tables

