Course code : **CSE2007**
Course title : **Database Management System**
Module : **3**
Topic : **2**

Relational Operations - Joins

Objectives

This session will give the knowledge about

- Relational Algebra - Joins

- Rename

What is Join?

Join is a binary operation which allows you to combine join product and selection in one single statement.

The JOIN operation, denoted by ⋈, is used to combine related tuples from two relations into single "longer" tuples.

The goal of creating a join condition is that it helps you to combine the data from multiple join tables. SQL Joins allows you to retrieve data from two or more DBMS tables.

The tables in DBMS are associated using the primary key and foreign keys.

What is Join?

To illustrate JOIN, suppose that we want to retrieve the name of the manager of each department.

To get the manager's name, we need to combine each department tuple with the employee tuple whose Ssn value matches the Mgr_ssn value in the department tuple.

We do this by using the JOIN operation and then projecting the result over the necessary attributes, as follows:

$$DEPT\_MGR \leftarrow DEPARTMENT \bowtie_{Mgr_{ssn}=Ssn} EMPLOYEE$$

$$RESULT \leftarrow \pi_{(Dname,Lname,Fname)}(DEPT\_MGR)$$

Types of Join

DEPT_MGR

Dname	Dnumber	Mgr_ssn	· · ·	Fname	Minit	Lname	Ssn	· · ·
Research	5	333445555	· · ·	Franklin	T	Wong	333445555	· · ·
Administration	4	987654321	· · ·	Jennifer	S	Wallace	987654321	· · ·
Headquarters	1	888665555	· · ·	James	E	Borg	888665555	· · ·

Here are mainly two types of joins in DBMS:

• Inner Joins

• Outer Join

Inner Join

An inner join is the widely used join operation and can be considered as a default join-type. The inner JOIN is used to return rows from both tables which satisfy the given condition.

An Inner join or equijoin is a comparator-based join which uses equality comparisons in the join-predicate.

Inner Join further divided into three subtypes:

- Theta join
- Natural join
- EQUI join

Theta Join

Theta Join allows you to merge two tables based on the condition represented by theta. Theta joins work for all comparison operators.

The general case of JOIN operation is called a Theta join. It is denoted by symbol θ

Syntax:

$A \bowtie_\theta B$

Theta join can use any conditions in the selection criteria.

Theta Join

Consider two relations

Car

CName	CPrice
Swift	20000
City	30000
Verna	50000

Bike

BName	BPrice
Apache	10000
Shine	40000
Xtreme	60000

Car ⋈$_{(Car.CPrice>Bike.BPrice)}$ Bike

CName	CPrice	BName	BPrice
Swift	20000	Apache	10000
City	30000	Shine	40000
Verna	50000	Shine	40000
Verna	50000	Xtreme	60000

Equi Join

When Theta join uses only equality comparison operator, it is said to be equijoin. The above example corresponds to equijoin.

Syntax:

A ⋈ B

Student		
SID	Name	Std
101	Alex	10
102	Maria	11

Subjects	
Class	Subject
10	Math
10	English
11	Music
11	Sports

Equi Join

STUDENT ⋈ $_{(Student.Std = Subject.Class)}$ SUBJECT

Student_detail				
SID	Name	Std	Class	Subject
101	Alex	10	10	Math
101	Alex	10	10	English
102	Maria	11	11	Music
102	Maria	11	11	Sports

Natural Join

Natural join does not utilize any of the comparison operators.

In this type of join, the attributes should have the same name and domain.

In this type of join, there should be at least one common attribute between two relations.

It performs selection forming equality on those attributes which appear in both relations and eliminates the duplicate attributes.

Natural Join

C	
Num	Square
2	4
3	9

D	
Num	Cube
2	8
3	18

C ⋈ D		
Num	Square	Cube
2	4	8
3	9	18

Outer Join

An outer join doesn't require each record in the two join tables to have a matching record.

In this type of join, the table retains each record even if no other matching record exists.

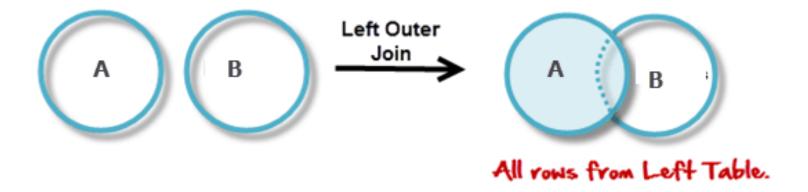Three types of Outer Joins are:

- Left Outer Join

- Right Outer Join

- Full Outer Join

Left Outer Join (A ⋈ B)

The LEFT JOIN returns all the rows from the table on the left even if no matching rows have been found in the table on the right.

Where no matching record found in the table on the right, NULL is returned.

Left Outer Join

All rows from Left Table.

Left Outer Join (A ⋈ B)

Course	
A	B
100	Database
101	Mechanics
102	Electronics

Chair	
A	B
100	Alex
102	Maya
104	Mira

Course ⋈ Chair

Courses ⋈ Chair			
A	B	C	D
100	Database	100	Alex
101	Mechanics	---	---
102	Electronics	102	Maya

Right Outer Join (A ⋈ B)

RIGHT outer JOIN is the opposite of LEFT JOIN. The RIGHT JOIN returns all the columns from the table on the right even if no matching rows have been found in the table on the left.

Where no matches have been found in the table on the left, NULL is returned.

Right Outer Join

All rows from Right Table.

Right Outer Join (A ⋈ B)

Course	
A	B
100	Database
101	Mechanics
102	Electronics

Chair	
A	B
100	Alex
102	Maya
104	Mira

Left ⋈ Right

Courses ⋈ Chair			
A	B	C	D
100	Database	100	Alex
101	Mechanics	---	---
102	Electronics	102	Maya

Full Outer Join (A ⋈ B)

All the tuples from both participating relations are included in the resulting relation.

If there are no matching tuples for both relations, their respective unmatched attributes are made NULL.

Courses ⋈ Chair			
A	B	C	D
100	Database	100	Alex
101	Mechanics	---	---
102	Electronics	102	Maya
---	---	104	Mira

Rename Operation

The rename operation is used to rename the output relation. It is denoted by rho (ρ).

Example: We can use the rename operator to rename STUDENT relation to STUDENT1.

ρ(STUDENT1, STUDENT)

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Summary

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- Relational Algebra - Joins

- Rename