

Join Operations

Cross Product (or Cartesian Product)

EMP

Name	Dno
John	1
David	2
Bob	2
Jim	3

DEPT

Dname	Dnumber
Sales	1
Service	2
Research	3

EMP X DEPT

Name	DNo	DName	DNumber
John	1	Sales	1
John	1	Service	2
John	1	Research	3
David	2	Sales	1
David	2	Service	2
David	2	Research	3
Bob	2	Sales	1
Bob	2	Service	2
Bob	2	Research	3
Jim	3	Sales	1
Jim	3	Service	2
Jim	3	Research	3

Join

EMP X DEPT

Name	DNo	DName	DNumber
John	1	Sales	1
John	1	Service	2
John	1	Research	3
David	2	Sales	1
David	2	Service	2
David	2	Research	3
Bob	2	Sales	1
Bob	2	Service	2
Bob	2	Research	3
Jim	3	Sales	1
Jim	3	Service	2
Jim	3	Research	3

```
SELECT *  
FROM EMP, DEPT  
WHERE DNo = DNumber
```

Name	Dno	DName	DNumber
John	1	Sales	1
David	2	Service	2
Bob	2	Service	2
Jim	3	Research	3

Natural Join

- NATURAL JOIN on two tables R and S
 - No join condition specified
 - Implicit EQUIJOIN condition for each pair of attributes with same name from R and S
- Example

```
SELECT *  
FROM DEPARTMENT natural join DEPT_LOCATIONS
```

Outer Joins

DEPT

Dname	City
HR	Boston
Research	LA
Production	LA
Sales	NY

PROJECT

Pname	Location
Moon	Boston
Mercury	NY
Mars	Dallas
Saturn	NY

INNER JOIN:

```
SELECT *  
FROM DEPT JOIN PROJECT  
on City = Location
```

or

```
SELECT *  
FROM DEPT, PROJECT  
WHERE City = Location
```

Dname	City	Pname	Location
HR	Boston	Moon	Boston
Sales	NY	Mercury	NY
Sales	NY	Saturn	NY

Outer Joins

DEPT

Dname	City
HR	Boston
Research	LA
Production	LA
Sales	NY

PROJECT

Pname	Location
Moon	Boston
Mercury	NY
Mars	Dallas
Saturn	NY

LEFT OUTER JOIN:

```
SELECT *  
FROM DEPT LEFT OUTER JOIN PROJECT  
on City = Location
```

Dname	City	Pname	Location
HR	Boston	Moon	Boston
Research	LA	NULL	NULL
Production	LA	NULL	NULL
Sales	NY	Mercury	NY
Sales	NY	Saturn	NY

Outer Joins

DEPT

Dname	City
HR	Boston
Research	LA
Production	LA
Sales	NY

PROJECT

Pname	Location
Moon	Boston
Mercury	NY
Mars	Dallas
Saturn	NY

RIGHT OUTER JOIN:

```
SELECT *  
FROM DEPT RIGHT OUTER JOIN PROJECT  
on City = Location
```

Dname	City	Pname	Location
HR	Boston	Moon	Boston
Sales	NY	Mercury	NY
NULL	NULL	Mars	Dallas
Sales	NY	Saturn	NY

Outer Joins

DEPT

Dname	City
HR	Boston
Research	LA
Production	LA
Sales	NY

PROJECT

Pname	Location
Moon	Boston
Mercury	NY
Mars	Dallas
Saturn	NY

FULL OUTER JOIN:

```
SELECT *  
FROM DEPT FULL OUTER JOIN PROJECT  
on City = Location
```

Dname	City	Pname	Location
HR	Boston	Moon	Boston
Research	LA	NULL	NULL
Production	LA	NULL	NULL
Sales	NY	Mercury	NY
Sales	NY	Saturn	NY
NULL	NULL	Mars	Dallas