SQL Joins

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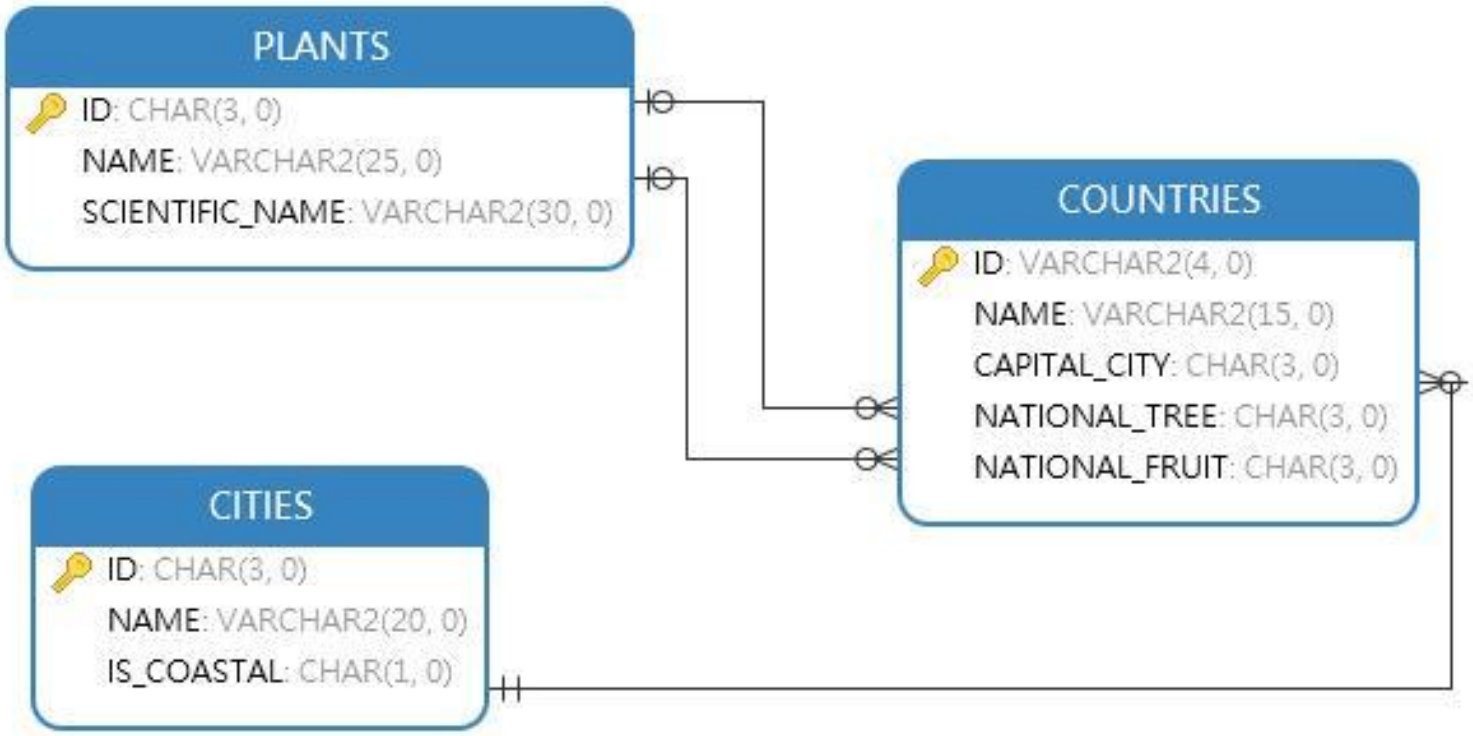
Introduction

Sometimes the information we need to retrieve is stored in multiple tables.

We need to JOIN the tables appropriately for the query to execute.



A Sample Schema For Demonstration

COUNTRIES

ID	NAME	CAPITAL_CITY	NATIONAL_TREE	NATIONAL_FRUIT
BD	BANGLADESH	DHA	MNG	JCF
GRC	GREECE	ATH	OLV	(Null)
PHP	PHILIPPINES	MAN	(Null)	MNG
IND	INDIA	DEL	BAN	MNG
AUS	AUSTRALIA	CAN	(Null)	PCH

CITIES

ID	NAME	IS_COASTAL
DHA	DHAKA	N
COX	COX'S BAZAR	Y
ATH	ATHENS	Y
CAN	CANBERRA	N
MAN	MANILA	Y
DEL	DELHI	N

PLANTS

ID	NAME	SCIENTIFIC_NAME
MNG	MANGO	Mangifera indica
PCH	PEACH	Prunus persica
OLV	OLIVE	Olea europaea
BAN	BANYANA	Ficus benghalensis
HIB	HIBISCUS	Hibiscus rosa-sinensis
JCF	JACKFRUIT	Artocarpus heterophyllus

Cartesian Product

When no conditions are specified, SQL merges each row of the first table with all rows of the second table.

Cartesian Product

```
-- CARTESIAN PRODUCT

SELECT COUNTRIES.NAME AS COUNTRY_NAME,
CITIES.NAME AS CITY_NAME
FROM COUNTRIES, CITIES;
```

Cartesian Product

Matches each of the 5 rows of COUNTRIES table with each of the 6 rows of CITIES table

Outputs 5X6 = 30 rows

But we need to qualify for fruitful data retrieval.

Query

-- Retrieve all the names of the countries along with the names of the capital cities

```
SELECT COUNTRIES.NAME AS COUNTRY_NAME,
CITIES.NAME AS CITY_NAME
FROM COUNTRIES, CITIES
WHERE COUNTRIES.CAPITAL_CITY = CITIES.ID;
```

Message | Result 1

COUNTRY_NAME	CITY_NAME
GREECE	ATHENS
AUSTRALIA	CANBERRA
INDIA	DELHI
BANGLADESH	DHAKA
PHILIPPINES	MANILA

Result

Inner Join

Inner join merges two tables comparing two columns. Only rows having the same value for the columns in the tables are reported.

There is a dedicated and equally efficient INNER JOIN command in SQL.

Query (rewritten)

-- Retrieve all the names of the countries along with the names of the capital cities

```
SELECT COUNTRIES.NAME AS COUNTRY_NAME,
CITIES.NAME AS CITY_NAME
FROM COUNTRIES INNER JOIN CITIES
    ON COUNTRIES.CAPITAL_CITY = CITIES.ID;
```

Joining Multiple Tables

A query may need to connect more than two tables.

In that case, we need (n-1) join conditions to join n tables.

Query

-- Find the national trees of the countries having a coastal city as capital

-- Output the names of the trees, the countries, and their coastal capitals

Query

```
SELECT PLANTS.NAME AS PLANT_NAME,
COUNTRIES.NAME AS COUNTRY_NAME, CITIES.NAME
AS CITY_NAME
FROM (COUNTRIES INNER JOIN CITIES
    ON COUNTRIES.CAPITAL_CITY = CITIES.ID) INNER
JOIN PLANTS
    ON COUNTRIES.NATIONAL_TREE = PLANTS.ID
WHERE CITIES.IS_COASTAL = 'Y';
```

Query (rewritten)

```
SELECT PLANTS.NAME AS PLANT_NAME,
COUNTRIES.NAME AS COUNTRY_NAME, CITIES.NAME
AS CITY_NAME
FROM COUNTRIES, CITIES, PLANTS
WHERE CITIES.IS_COASTAL = 'Y'
AND COUNTRIES.CAPITAL_CITY = CITIES.ID
AND COUNTRIES.NATIONAL_TREE = PLANTS.ID;
```

Message | Result 1

PLANT_NAME	COUNTRY_NAME	CITY_NAME
OLIVE	GREECE	ATHENS

Result

Joining Multiple Tables

DBMS (Oracle) will find the best way to join the tables. So, the order in which join conditions are mentioned is immaterial.

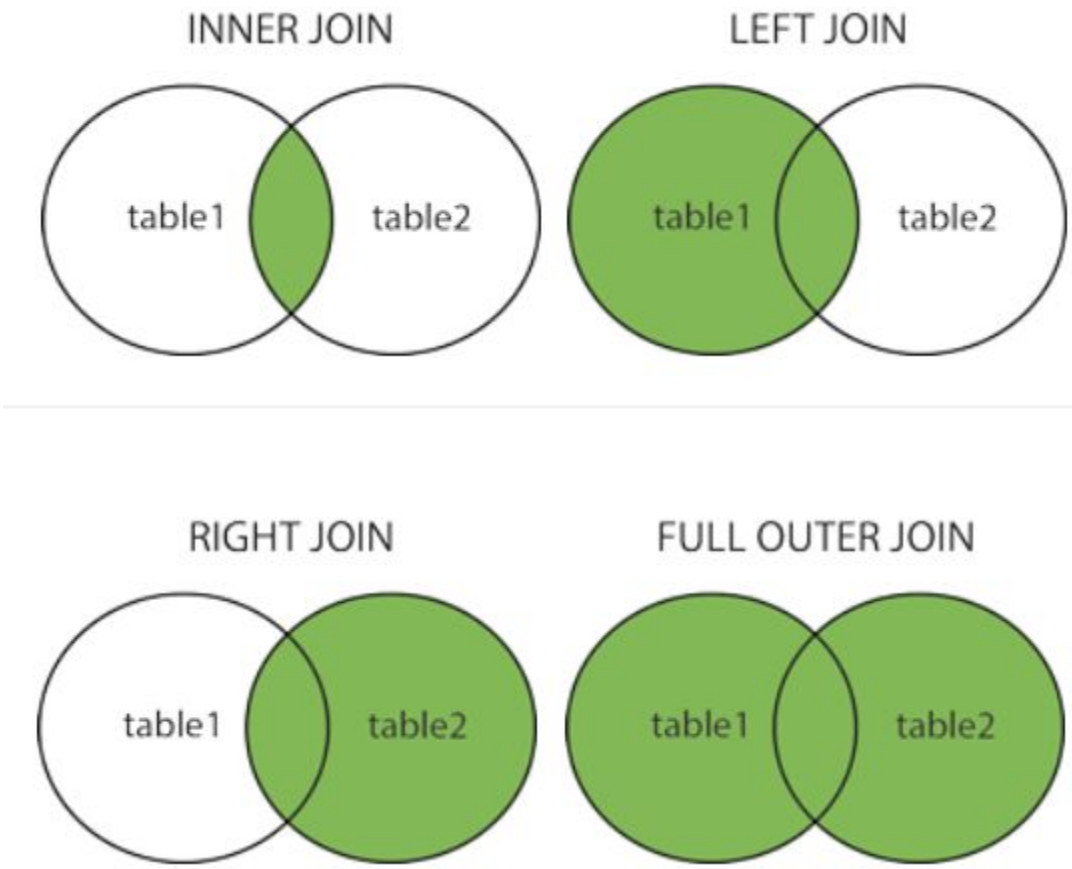
Leaving a join condition can have drastic impact on correctness and performance.

Outer JOIN

Outer joins are useful when we may have to join on a column that may have null values.

Outer joins are of three types.

JOINS

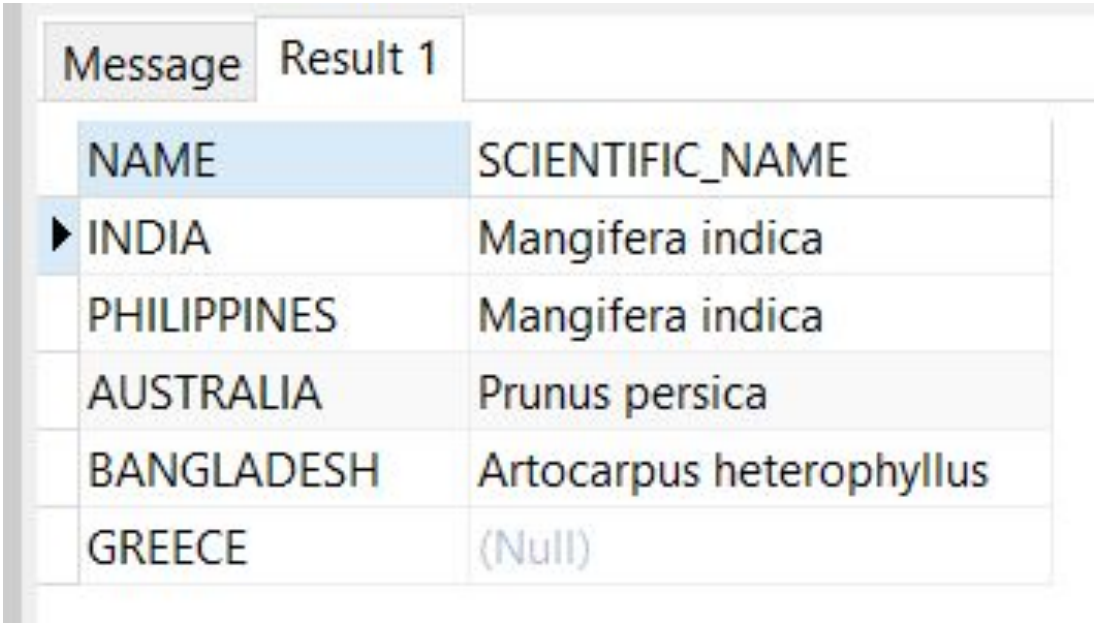

INNER JOIN
table1
table2
LEFT JOIN
table1
table2
RIGHT JOIN
table1
table2
FULL OUTER JOIN
table1
table2

Left Join

-- Report all the countries and scientific names of their national fruits (or null)

```
SELECT COUNTRIES.NAME, PLANTS.SCIENTIFIC_NAME
FROM COUNTRIES LEFT JOIN PLANTS
    ON COUNTRIES.NATIONAL_FRUIT = PLANTS.ID;
```

Left Join



Message | Result 1

NAME	SCIENTIFIC_NAME
INDIA	Mangifera indica
PHILIPPINES	Mangifera indica
AUSTRALIA	Prunus persica
BANGLADESH	Artocarpus heterophyllus
GREECE	(Null)

Right Join

-- Report all the plants in the database and mention the country they are national fruits of (or null)

```
SELECT COUNTRIES.NAME, PLANTS.SCIENTIFIC_NAME
FROM COUNTRIES RIGHT JOIN PLANTS
    ON COUNTRIES.NATIONAL_FRUIT = PLANTS.ID;
```

Right Join

Message | Result 1

NAME	SCIENTIFIC_NAME
(Null)	Ficus benghalensis
(Null)	Hibiscus rosa-sinensis
BANGLADESH	Artocarpus heterophyllus
PHILIPPINES	Mangifera indica
INDIA	Mangifera indica
(Null)	Olea europaea
AUSTRALIA	Prunus persica

Full Outer Join

-- Report all the plants and all the countries in the database. Show if a plant is a national fruit of a country.

```
SELECT COUNTRIES.NAME, PLANTS.SCIENTIFIC_NAME
FROM COUNTRIES FULL JOIN PLANTS
    ON COUNTRIES.NATIONAL_FRUIT = PLANTS.ID;
```

Full Outer Join

Message | Result 1

NAME	SCIENTIFIC_NAME
AUSTRALIA	Prunus persica
BANGLADESH	Artocarpus heterophyllus
GREECE	(Null)
INDIA	Mangifera indica
PHILIPPINES	Mangifera indica
(Null)	Ficus benghalensis
(Null)	Hibiscus rosa-sinensis
(Null)	Olea europaea

Self Join

Joining a table with itself

Non-Equi Joins

Join tables based on inequalities

Thanks

Just in case you need it:

https://github.com/EthanITargaryen/SQL_Joins

References

1. 2016. Oracle Database SQL Language Reference, 11G Release 2 (11.2). Oracle.
2. W3schools.com. 2020. SQL Joins. [online] Available at: <https://www.w3schools.com/sql/sql_join.asp> [Accessed 10 September 2020].
3. Mishra, S. and Beaulieu, A., 2009. Mastering Oracle SQL. 1st ed. Sebastopol: O'Reilly Media, Inc.