11 Oct 2007

A Visual Explanation of SQL Joins

I thought Ligaya Turmelle's post on SQL joins was a great primer for novice developers. Since SQL joins *appear* to be set-based, the use of Venn diagrams to explain them seems, at first blush, to be a natural fit. However, like the commenters to her post, I found that the Venn diagrams didn't quite match the SQL join syntax reality in my testing.

I love the concept, though, so let's see if we can make it work. Assume we have the following two tables. **Table A** is on the left, and **Table B** is on the right. We'll populate them with four records each.

```
id  name        id  name
--  ----        --  ----
1   Pirate      1   Rutabaga
2   Monkey      2   Pirate
3   Ninja       3   Darth Vader
4   Spaghetti   4   Ninja
```

Let's join these tables by the name field in a few different ways and see if we can get a

conceptual match to those nifty Venn diagrams.

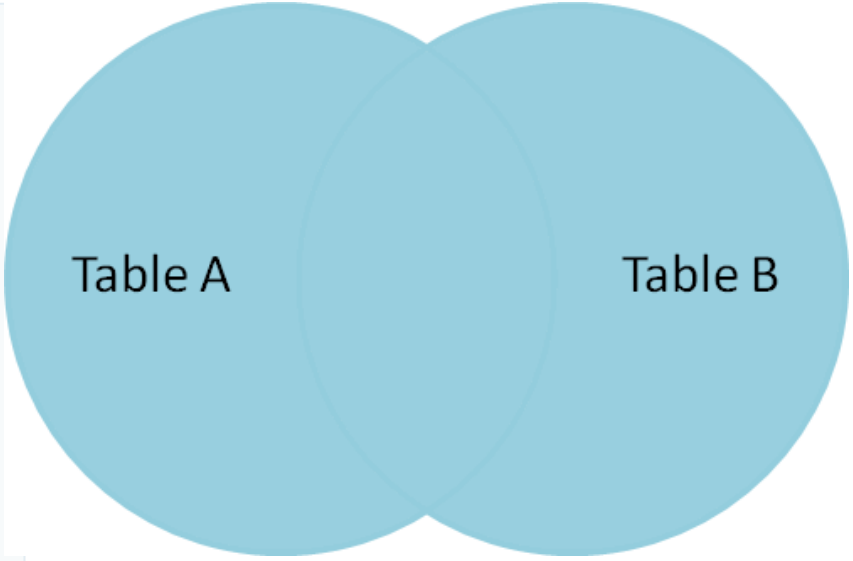
```
SELECT * FROM TableA
INNER JOIN TableB
ON TableA.name = TableB.name
```

```
id  name       id   name
--  ----       --   ----
1   Pirate     2    Pirate
3   Ninja      4    Ninja
```

Inner join produces only the set of records that match in both Table A and Table B.

```
SELECT * FROM TableA
FULL OUTER JOIN TableB
ON TableA.name = TableB.name

id    name       id    name
--    ----       --    ----
1     Pirate     2     Pirate
2     Monkey     null  null
3     Ninja      4     Ninja
4     Spaghetti  null  null
null  null       1     Rutabaga
null  null       3     Darth Vader
```

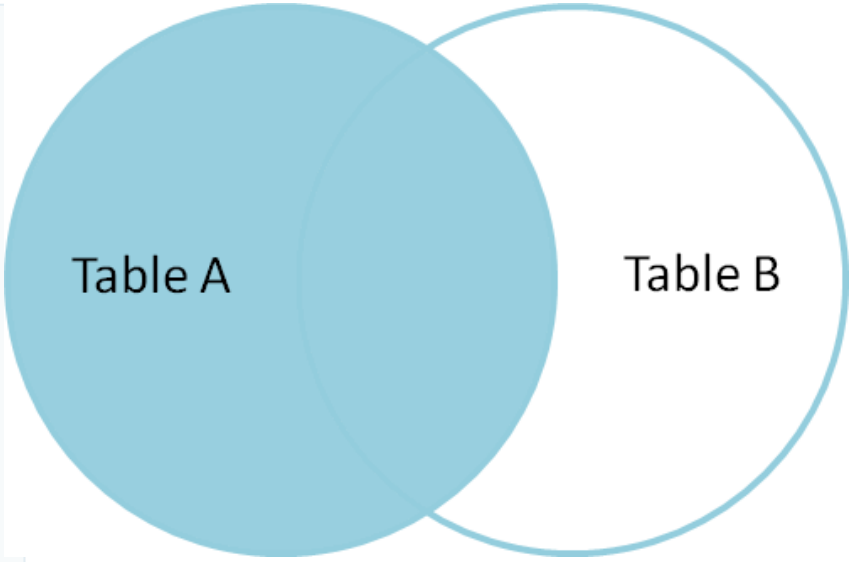


Full outer join produces the set of all records in Table A and Table B, with matching records from both sides where available. If there is no match, the missing side will contain

null.

```
SELECT * FROM TableA
LEFT OUTER JOIN TableB
ON TableA.name = TableB.name

id  name       id    name
--  ----       --    ----
1   Pirate     2     Pirate
2   Monkey     null  null
3   Ninja      4     Ninja
4   Spaghetti  null  null
```



Left outer join produces a complete set of records from Table A, with the matching records (where available) in Table B. If there is no match, the right side will contain null.

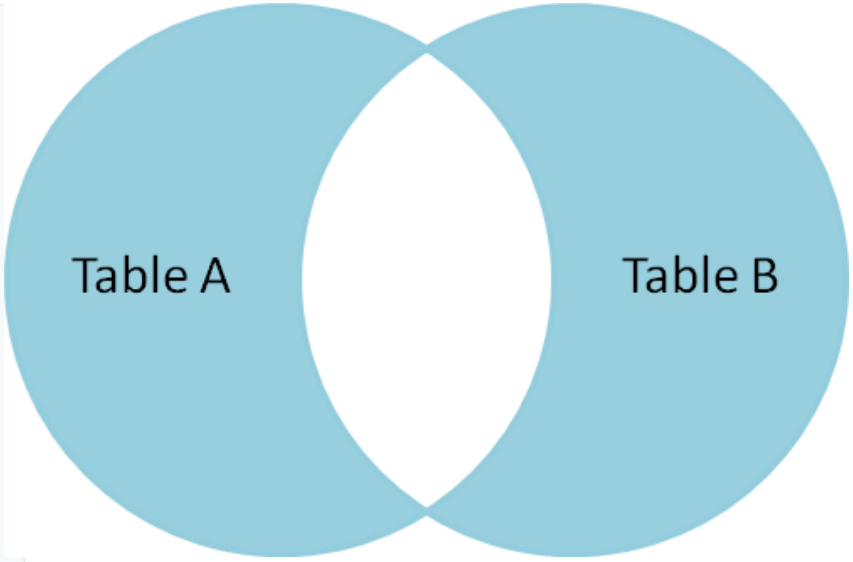
```
SELECT * FROM TableA
LEFT OUTER JOIN TableB
ON TableA.name = TableB.name
WHERE TableB.id IS null
```

```
id  name       id     name
--  ----       --     ----
2   Monkey     null   null
4   Spaghetti  null   null
```

To produce the set of records only in Table A, but not in Table B, we perform the same left outer join, then **exclude the records we don't want from the right side via a where clause**.

```
SELECT * FROM TableA
FULL OUTER JOIN TableB
ON TableA.name = TableB.name
WHERE TableA.id IS null
OR TableB.id IS null

id    name       id    name
--    ----       --    ----
2     Monkey     null  null
4     Spaghetti  null  null
null  null       1     Rutabaga
null  null       3     Darth Vader
```



To produce the set of records unique to Table A and Table B,

we perform the same full outer join, then **exclude the records we don't want from both sides via a where clause**.

There's also a cartesian product or **cross join**, which as far as I can tell, can't be expressed as a Venn diagram:

```
SELECT * FROM TableA
CROSS JOIN TableB
```

This joins "everything to everything", resulting in 4 x 4 = 16 rows, far more than we had in the original sets. If you do the math, you can see why this is a *very* dangerous join to run against large tables.

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PREVIOUS
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Written by Jeff Atwood

Indoor enthusiast. Co-founder of Stack Exchange and Discourse. Disclaimer: I have no idea what I'm talking about. Find me here: http://twitter.com/codinghorror

S

ShawnW

Funny, I just explained this to a co-worker in the same manner earlier in the week. I guess it never dav others may have never thought about joins in terms of these diagrams. Good post, Jeff!

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