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A Visual Explanation of SQL Joins

Jeff Atwood

4 minutes

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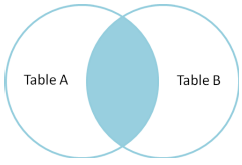
I thought Ligaya Turmelle's post on SQL joins was a great primer for novice developers. Since SQL joins *appear* to be set-based, the use of Venn diagrams to explain them seems, at first blush, to be a natural fit. However, like the commenters to her post, I found that the Venn diagrams didn't quite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

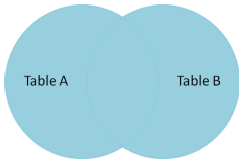
```
id name      id  name
-- ----      --  ----
1  Pirate    1   Rutabaga
2  Monkey    2   Pirate
3  Ninja     3   Darth Vader
4  Spaghetti 4   Ninja
```

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

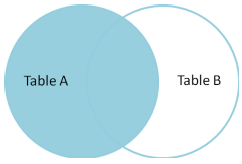
4 Spaghetti null null

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.

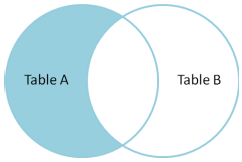
SELECT * FROM TableA
LEFT OUTER JOIN TableB
ON TableA.name = TableB.name



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

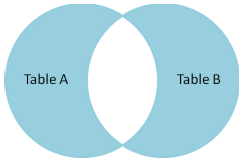
---

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.