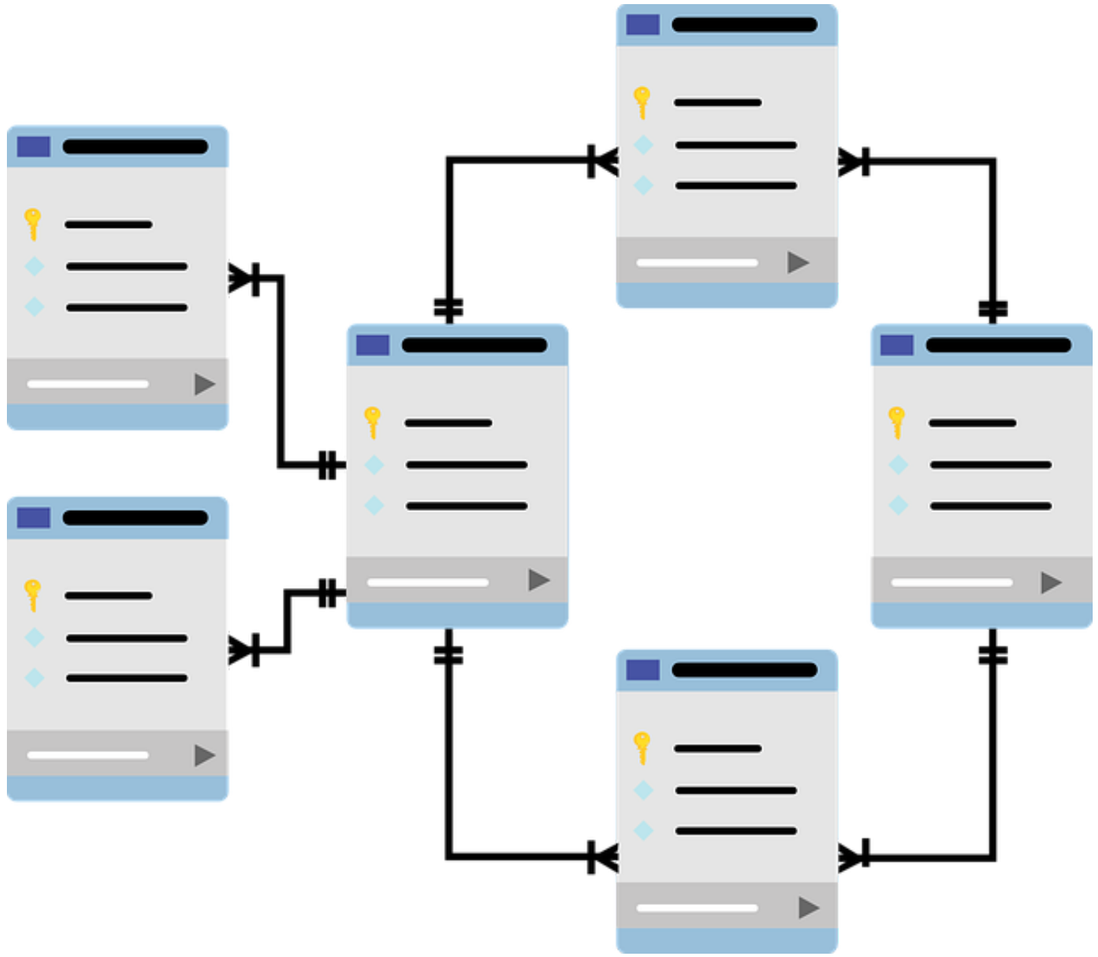
Joining tables

INTRODUCTION TO SQL SERVER

John MacKintosh
Instructor

Relational Databases



Primary Keys

- Primary keys: Uniquely identify each row in a table

```
+-----------+--------------------+
| artist_id | name               |
|-----------+--------------------|
| 1         | AC/DC              |
| 2         | Accept             |
| 3         | Aerosmith          |
| 4         | Alanis Morissette  |
| 5         | Alice In Chains    |
+-----------+--------------------+
```

  - Primary key: `artist_id`

```
+----------+-------------------------+-----------+
| album_id | title                   | artist_id |
|----------+-------------------------+-----------|
| 1        | For Those About To Rock | 1         |
| 2        | Balls to the Wall       | 2         |
| 3        | Restless and Wild       | 2         |
| 4        | Let There Be Rock       | 1         |
| 5        | Big Ones                | 3         |
+----------+-------------------------+-----------+
```

- Primary key: `album_id`
- What about `artist_id` ?

Foreign keys

- `artist` table

```
+-----------+------------------+
| artist_id | name             |
|-----------+------------------|
| 1         | AC/DC            |
| 2         | Accept           |
| 3         | Aerosmith        |
| 4         | Alanis Morissette |
| 5         | Alice In Chains  |
+-----------+------------------+
```

- `album` table

```
+----------+-------------------------+----------
| album_id | title                   | artist_id
|----------+-------------------------+----------
| 1        | For Those About To Rock | 1
| 2        | Balls to the Wall       | 2
| 3        | Restless and Wild       | 2
| 4        | Let There Be Rock       | 1
| 5        | Big Ones                | 3
+----------+-------------------------+----------
```

  - `artist_id` : Foreign key to `artist`

Joining album and artist

- `artist` table

```
+-----------+------------------+
| artist_id | name             |
|-----------+------------------|
| 1         | AC/DC            |
| 2         | Accept           |
| 3         | Aerosmith        |
| 4         | Alanis Morissette |
| 5         | Alice In Chains  |
+-----------+------------------+
```

  - AC/DC has `artist_id` = 1

- `album` table

```
+----------+-------------------------+-----------+
| album_id | title                   | artist_id |
|----------+-------------------------+-----------|
| 1        | For Those About To Rock | 1         |
| 2        | Balls to the Wall       | 2         |
| 3        | Restless and Wild       | 2         |
| 4        | Let There Be Rock       | 1         |
| 5        | Big Ones                | 3         |
+----------+-------------------------+-----------+
```

  - Rows 1 and 4 have `artist_id` = 1

Joining album and artist

```
+----------+-------------------------+-----------+-------------+
| album_id | title                   | artist_id | artist_name |
|----------+-------------------------------------+-----------|
| 1        | For Those About To Rock | 1         | AC/DC       |
| 4        | Let There Be Rock       | 1         | AC/DC       |
+----------+-------------------------+-----------+-------------|
```

- Return album details from `album` table
- Return corresponding artist details from `artist` table
- Joined using `artist_id` column

INNER JOIN

```
SELECT
  album_id,
  title,
  album.artist_id,
  name AS artist_name
FROM album
INNER JOIN artist ON artist.artist_id = album.artist_id
WHERE album.artist_id = 1;
```

```
+----------+-------------------------+-----------+-------------+
| album_id | title                   | artist_id | artist_name |
|----------+-------------------------+-----------+-------------|
| 1        | For Those About To Rock | 1         | AC/DC       |
| 4        | Let There Be Rock       | 1         | AC/DC       |
+----------+-------------------------+-----------+-------------|
```

INNER JOIN syntax

```
SELECT
  table_A.columnX,
  table_A.columnY,
  table_B.columnZ
FROM table_A
INNER JOIN table_B ON table_B.foreign_key = table_A.primary_key;
```

```
SELECT
  album_id,
  title,
  album.artist_id,
  name AS artist_name
FROM album
INNER JOIN artist on artist.artist_id = album.artist_id;
```

```
+----------+--------------------------------------+-----------+
| album_id | title                    | artist_id | artist_name |
|----------+--------------------------------------+-----------|
| 1        | For Those About To Rock | 1         | AC/DC       |
| 4        | Let There Be Rock       | 1         | AC/DC       |
| 2        | Balls To The Wall       | 2         | Accept      |
| 3        | Restless and Wild       | 2         | Accept      |
+----------+--------------------------------------+-----------+
```

- Returns **all** combinations of **all** matches between `album` and `artist`

Multiple INNER JOINS

```
SELECT
  table_A.columnX,
  table_A.columnY,
  table_B.columnZ table_C columnW
FROM table_A
INNER JOIN table_B ON table_B.foreign_key = table_A.primary_key
INNER JOIN table_C ON table_C.foreign_key = table_B.primary_key;
```

Let's join some tables!

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Mix n match - LEFT & RIGHT joins

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The rationale for LEFT and RIGHT joins

- Why do we need `LEFT` and `RIGHT` joins?
- One table may not have an exact match in another:
  - Customer order history for marketing campaign
  - Product list and returns history
  - Patients admitted but not yet discharged

The rationale for LEFT and RIGHT joins

- Why do we need `LEFT` and `RIGHT` joins?
- One table may not have an exact match in another:
  - Customer order history for marketing campaign
  - Product list and returns history
  - **Patients admitted but not yet discharged**

Admissions table

Patient_ID	Admitted
1	1
2	1
3	1
4	1
5	1

Discharges table

Patient_ID	Admitted
1	1
3	1
4	1

INNER JOIN:

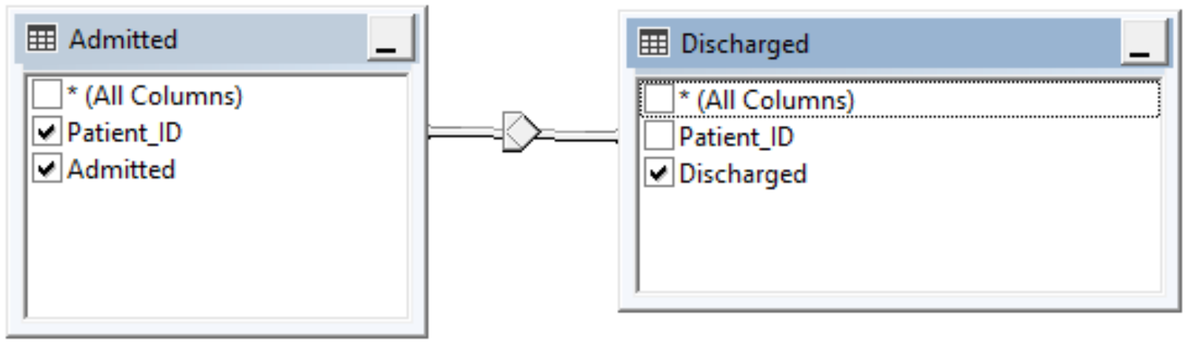
Patient_ID	Admitted	Discharged
1	1	1
3	1	1
4	1	1

LEFT JOIN:

Patient_ID	Admitted	Discharged
1	1	1
2	1	NULL
3	1	1
4	1	1
5	1	NULL

LEFT JOIN SYNTAX

```
SELECT
  Admitted.Patient_ID,
  Admitted,
  Discharged
FROM Admitted
LEFT JOIN Discharged ON Discharged.Patient_ID = Admitted.Patient_ID;
```

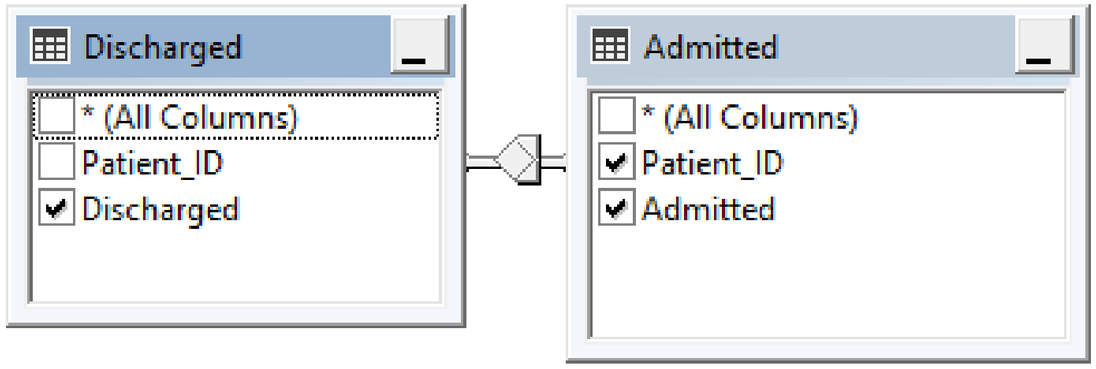


```
SELECT
  Admitted.Patient_ID,
  Admitted,
  Discharged
FROM Admitted
LEFT JOIN Discharged ON Discharged.Patient_ID = Admitted.Patient_ID;
```

```
+------------+----------+------------|
| Patient_ID | Admitted | Discharged |
|------------+----------|------------|
| 1          | 1        | 1          |
| 2          | 1        | NULL       |
| 3          | 1        | 1          |
| 4          | 1        | 1          |
| 5          | 1        | NULL       |
+------------+----------+------------+
```

RIGHT JOIN

```
SELECT
  Admitted.Patient_ID,
  Admitted,
  Discharged
FROM Discharged
RIGHT JOIN Admitted ON Admitted.Patient_ID = Discharged.Patient_ID;
```



RIGHT JOIN results

```
SELECT
  Admitted.Patient_ID,
  Admitted,
  Discharged
FROM Discharged
RIGHT JOIN Admitted ON Admitted.Patient_ID = Discharged.Patient_ID;
```

```
+------------+----------+------------|
| Patient_ID | Admitted | Discharged |
|------------+----------|------------|
| 1          | 1        | 1          |
| 2          | 1        | NULL       |
| 3          | 1        | 1          |
| 4          | 1        | 1          |
| 5          | 1        | NULL       |
+------------+----------+------------+
```

Summary

- `INNER JOIN` : Only returns matching rows
- `LEFT JOIN` (or `RIGHT JOIN`): All rows from the main table plus matches from the joining table
- `NULL` : Displayed if no match is found
- `LEFT JOIN` and `RIGHT JOIN` can be interchangeable

INNER JOIN

LEFT TABLE	RIGHT TABLE
MATCHES RETURNED, NON MATCHES DISCARDED	MATCHES RETURNED, NON MATCHES DISCARDED

LEFT JOIN

LEFT - MAIN TABLE	RIGHT - JOINING TABLE
ALL ROWS RETURNED	MATCHES RETURNED, NON MATCHES RETURN NULL

RIGHT JOIN

LEFT - JOINING TABLE	RIGHT - MAIN TABLE
MATCHES RETURNED, NON MATCHES RETURN NULL	ALL ROWS RETURNED

Let's Practice!

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UNION & UNION ALL

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```
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 3)
```

```
+------------+-------------------------+------------|
| album_id   | title                   | artist_id  |
|------------+-------------------------|------------|
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 5          | Big Ones                | 3          |
+------------+----------+--------------------------+
```

```
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 4, 5)
```

```
+------------+-------------------------+------------|
| album_id   | title                   | artist_id  |
|------------+-------------------------|------------|
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 6          | Jagged Little Pill      | 4          |
| 7          | Facelift                | 5          |
+------------+-------------------------+------------+
```

Combining results

```
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 3)
UNION
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 4, 5);
```

```
+------------+-------------------------+------------|
| album_id   | title                   | artist_id  |
|------------+-------------------------|------------|
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 5          | Big Ones                | 3          |
| 6          | Jagged Little Pill      | 4          |
| 7          | Facelift                | 5          |
+------------+-------------------------+------------+
```

- Duplicate rows are excluded

UNION ALL

```
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 3)
UNION ALL
SELECT
  album_id,
  title,
  artist_id
FROM album
WHERE artist_id IN (1, 4, 5);
```

```
+------------+-------------------------+------------+
| album_id   | title                   | artist_id  |
|------------+-------------------------|------------|
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 5          | Big Ones                | 3          |
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 6          | Jagged Little Pill      | 4          |
| 7          | Facelift                | 5          |
+------------+-------------------------+------------+
```

- Includes duplicate rows

Creating new column names for final results

```
SELECT
  album_id AS ALBUM_ID,
  title AS ALBUM_TITLE,
  artist_id AS ARTIST_ID
FROM album
WHERE artist_id IN(1, 3)
UNION ALL
SELECT
  album_id AS ALBUM_ID,
  title AS ALBUM_TITLE,
  artist_id AS ARTIST_ID
FROM album
WHERE artist_id IN(1, 4, 5)
```

```
+------------+-------------------------+------------|
| ALBUM_ID   | ALBUM_TITLE             | ARTIST_ID  |
|------------+-------------------------|------------|
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 5          | Big Ones                | 3          |
| 1          | For Those About To Rock | 1          |
| 4          | Let There Be Rock       | 1          |
| 6          | Jagged Little Pill      | 4          |
| 7          | Facelift                | 5          |
+------------+-------------------------+------------+
```

Summary

- `UNION` or `UNION ALL` : Combines queries from the same table or different tables

If combining data from different tables:

- Select the same number of columns in the same order
- Columns should have the same data types

If source tables have different column names

- Alias the column names

`UNION` : Discards duplicates (slower to run)

`UNION ALL` : Includes duplicates (faster to run)

Let's practice!

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