NULL

Databases - representing absence of a value

Database structure

In a database we store values in tables. A table has columns with names and types, and rows of data:

```
sqlite> .schema
CREATE TABLE book(title TEXT, author TEXT, isbn TEXT PRIMARY
KEY NOT NULL);
sqlite> SELECT * FROM book;
title                   author          isbn
----------------------  --------------  -------------
Java direkt med Swing   Jan Skansholm   9789144104317
Databasteknik           Thomas Padron   9789144044491
```

Inserting a book without title

Let’s insert a book without a title:

```
sqlite> INSERT INTO book (author, isbn)
...>    VALUES('Henrik and Rikard', '1234567');
```

What is stored for the above row in the column title?

Inserting a book without title

Let’s investigate what was stored:

```
sqlite> SELECT * FROM book WHERE isbn = '1234567';
title       author             isbn
----------  -----------------  ----------
            Henrik and Rikard  1234567
```

It’s empty? What does that mean? Empty string?

No, in this case there is no value at all, which is called NULL.

Making NULL values apparent (in SQLite3)

Let’s make NULL values more obvious:

```
sqlite> .nullvalue NULL
sqlite> SELECT * FROM book WHERE isbn = '1234567';
title       author              isbn
----------  ------------------  ----------
NULL        Henrik and Rikard   1234567
```

What about empty strings?

An empty string is still a string. We can prove that using the `is` operator:

```
sqlite> SELECT '' IS '';
'' IS ''
----------
1
sqlite> SELECT '' IS 'not empty';
'' IS 'not empty'
-----------------
0
sqlite> SELECT '' IS NULL;
'' IS NULL
----------
0
```

remember: 0 means false and 1 means true

So, how can we understand the meaning of NULL?

NULL simply means “absence of a value”. This is quite useful. It means that we can allow some columns to represent the lack of a value. We can use this to select rows where some column lacks a value:

```
sqlite> SELECT author, isbn FROM book WHERE title IS NULL;
author              isbn
-----------------   ----------
Henrik and Rikard   1234567
```

Checking for NULL is also useful when performing certain JOIN operations, e.g. when you want to check for the absence of references between tables, like “What publishers have no books in our book table”.

Adding publisher as a foreign key

```
sqlite> CREATE TABLE book(title TEXT, author TEXT,
...>    isbn TEXT PRIMARY KEY NOT NULL, publisher_id INTEGER);
sqlite> CREATE TABLE
...>    publisher(publisher_id INTEGER PRIMARY KEY NOT NULL,
...>              name TEXT UNIQUE NOT NULL);
```

In this new design, every book has a reference to the publisher table (the publisher_id).

Adding publisher as a foreign key - JOINing

```
sqlite> SELECT title, author, name AS publisher
          FROM book
  NATURAL JOIN publisher;

title                   author          publisher
----------------------  --------------  -----------------
Java direkt med Swing   Jan Skansholm   Studentlitteratur
Databasteknik           Thomas Padron   Studentlitteratur
Programming in Java     Henrik and Ri   Juneday
```

But, can we find out if there are publishers without books, and who these publishers are?

What if a publisher has no books?

```
sqlite>   SELECT title, name as publisher
            FROM publisher
 LEFT OUTER JOIN book ON book.publisher_id = publisher.publisher_id;
title           publisher
-------------   -----------------
Databasteknik   Studentlitteratur
Java direkt m   Studentlitteratur
Programming i   Juneday
NULL            Mayday! Mayday!
NULL            Oh Really
```

The publishers “Mayday! Mayday!” and “Oh Really” don’t have any titles, as shown when using LEFT OUTER JOIN (meaning “show columns from the left table, regardless!”).

Using the previous information

Since we saw that title became NULL for some publishers, we can use this fact:

```
sqlite> SELECT name as publisher
...>    FROM publisher LEFT OUTER JOIN book
...>     ON book.publisher_id = publisher.publisher_id
...>    WHERE title IS NULL;
publisher
---------------
Mayday! Mayday!
Oh Really
```

The above answers the question: “What publishers have no books”. That’s a use case for NULL!