BOOTCAMP II

Intermediate Software Development

SQL JOINS AND RELATIONSHIPS

SQL Strikes Back

"

The relational model of data permits the database designer to create a consistent, logical representation of information. Consistency is achieved by including declared constraints in the database design, which is usually referred to as the logical schema.

from the Relational Model (https://en.wikipedia.org/wiki/Relational_model)

SINGLE TABLE: THE STORY SO FAR

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Keven Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	http://meow.com	# chasing...	2013-07-18
4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
5	If It Fits	Meow Meow	http://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meows.com	# nyan...	2015-12-02

RELATIONAL DATA

➤ Complex data is better organized using more than one table.

➤ In our example, there is a lot of redundant data.

➤ This redundancy is also very error prone.

➤ The problem will grow if we store more data about each author (bio, favorite sandwich, etc.).

SINGLE TABLE: NOTICE ANY PROBLEMS?

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Keven Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	http://meow.com	# chasing...	2013-07-18
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5	If It Fits	Meow Meow	http://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meows.com	# nyan...	2015-12-02

SINGLE TABLE: AUTHOR NAMES MAY CONTAIN ERRORS

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Keven Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	http://meow.com	# chasing...	2013-07-18
4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
5	If It Fits	Meow Meow	http://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meows.com	# nyan...	2015-12-02

SINGLE TABLE: AUTHOR URLS MAY NEED UPDATES

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Keven Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	http://meow.com	# chasing...	2013-07-18
4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
5	If It Fits	Meow Meow	https://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meows.com	# nyan...	2015-12-02

SINGLE TABLE: PREVENTING ERRORS

➤ How can we prevent these errors and keep all author data in sync?

➤ Update authorUrl fields for each record for a given author every time something changes?

➤ What if both the authorUrl and author fields have errors?

INTERLUDE: MVC MODELS

➤ We are now thinking about *article* and *author* as separate **resources**.

➤ We'd therefore like to have different model objects in JavaScript, in different files.

➤ Yet we have just one table.

➤ Isn't that strange?

THERE MUST BE A BETTER WAY

NORMALIZATION

NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.
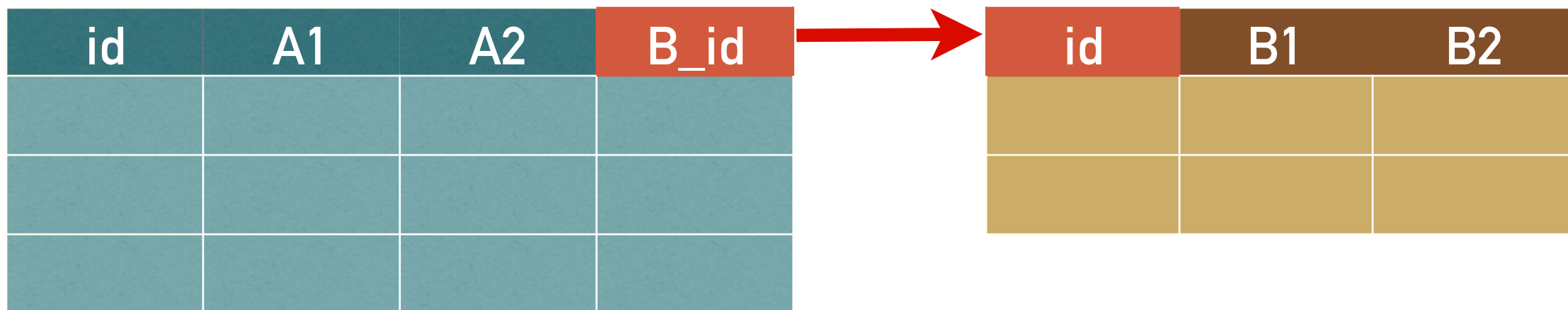
NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.

id	A1	A2	B1	B2

NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.

id	A1	A2	B1	B2

id	A1	A2	B_id

id	B1	B2

NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.

id	A1	A2	B_id

id	B1	B2

NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.

➤ Using foreign keys in the old table to reference the primary keys of new tables.

id	A1	A2	B_id

id	B1	B2

NORMALIZATION: WHAT

➤ Decomposing a table into smaller, less redundant tables without losing information.

➤ Using foreign keys in the old table to reference the primary keys of new tables.

id	A1	A2	B_id

id	B1	B2

NORMALIZATION: WHY

➤ Why does this help us?

  ➤ Reduce modification anomalies

  ➤ Minimize redesign when extending database structure

  ➤ Facilitate different types of queries

NORMALIZATION: HOW

➤ How is it used?

➤ Let's run through it step-by-step.

HERE'S WHERE WE ARE AT NOW

SINGLE TABLE: ARTICLES WITH AUTHORS

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Kevin Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	https://meow.com	# chasing...	2013-07-18
4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
5	If It Fits	Meow Meow	https://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meow.com	# nyan...	2015-12-02

SINGLE TABLE: ARTICLES WITH AUTHORS

id	title	author	authorUrl	markdown	publishedOn
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4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
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6	Why Grumpy?	Meow Meow	https://meow.com	# nyan...	2015-12-02

LET'S START FRESH

DROP OLD TABLE

DROP TABLE articles;

CREATE NEW AUTHORS TABLE

```
CREATE TABLE authors(
    id INTEGER PRIMARY KEY,
    name VARCHAR(50) UNIQUE NOT NULL,
    url VARCHAR(255),
);
```

The unique constraint is applied here because of the way the raw article data is imported into the blog system.

RESULT: NEW AUTHORS TABLE

id	name	url

NEW AUTHORS TABLE WITH RECORDS

id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
3	Zatarans	https://cajun.com

CREATE NEW ARTICLES TABLE

```sql
CREATE TABLE articles(
    id INTEGER PRIMARY KEY,
    title VARCHAR(50) NOT NULL,
    authorId INTEGER NOT NULL,
    markdown TEXT NOT NULL,
    publishedOn DATETIME
);
```

CREATE NEW ARTICLES TABLE WITH FOREIGN KEY

```
CREATE TABLE articles(
    id INTEGER PRIMARY KEY,
    title VARCHAR(50) NOT NULL,
    authorId INTEGER NOT NULL REFERENCES authors(id),
    markdown TEXT NOT NULL,
    publishedOn DATETIME
);
```

RESULT: NEW ARTICLES TABLE

id	title	authorId	markdown	publishedOn

id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
3	Zatarans	https://cajun.com

NEW ARTICLES TABLE WITH RECORDS

id	title	authorId	markdown	publishedOn
1	Bacon Ipsum	1	# Hickory...	2013-04-22
2	Six Degrees	1	# I know...	2013-12-13
3	Cat Ipsum	2	# chasing...	2013-07-18
4	Cajun Ipsum	3	# boudin...	2012-06-05
5	If It Fits	2	# I sits...	2014-08-01
6	Why Grumpy?	2	# nyan...	2015-12-02

id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
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NEW AUTHORS TABLE

id	title	authorId	markdown	publishedOn
1	Bacon Ipsum	1	# Hickory...	2013-04-22
2	Six Degrees	1	# I know...	2013-12-13
3	Cat Ipsum	2	# chasing...	2013-07-18
4	Cajun Ipsum	3	# boudin...	2012-06-05
5	If It Fits	2	# I sits...	2014-08-01
6	Why Grumpy?	2	# nyan...	2015-12-02

id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
3	Zatarans	https://cajun.com

MANY-TO-ONE RELATIONSHIP

id	title	authorId	markdown	publishedOn
1	Bacon Ipsum	1	# Hickory...	2013-04-22
2	Six Degrees	1	# I know...	2013-12-13
3	Cat Ipsum	2	# chasing...	2013-07-18
4	Cajun Ipsum	3	# boudin...	2012-06-05
5	If It Fits	2	# I sits...	2014-08-01
6	Why Grumpy?	2	# nyan...	2015-12-02

id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
3	Zatarans	https://cajun.com

NORMALIZED ARTICLES TABLE

id	title	authorId	markdown	publishedOn
1	Bacon Ipsum	1	# Hickory...	2013-04-22
2	Six Degrees	1	# I know...	2013-12-13
3	Cat Ipsum	2	# chasing...	2013-07-18
4	Cajun Ipsum	3	# boudin...	2012-06-05
5	If It Fits	2	# I sits...	2014-08-01
6	Why Grumpy?	2	# nyan...	2015-12-02

LOOKING TRIM THERE, MR ARTICLES TABLE!

HOLD ON!

HOW DO I COMBINE YOUR INFO WITH AUTHORS?

JOIN ME

INNER JOIN

SELECT QUERY WITH INNER JOIN

```sql
SELECT articles.id, title, authors.name AS author, authors.url AS
  authorUrl, markdown, publishedOn
FROM articles
INNER JOIN authors
  ON articles.authorId = authors.id
ORDER BY publishedOn DESC;
```

SELECT QUERY WITH INNER JOIN

SELECT articles.id, title, authors.name AS author, authors.url AS
authorUrl, markdown, publishedOn
FROM articles
INNER JOIN authors
  ON articles.authorId = authors.id
ORDER BY publishedOn DESC;

SELECT QUERY WITH INNER JOIN

```sql
SELECT articles.id, title, authors.name AS author, authors.url AS
    authorUrl, markdown, publishedOn
FROM articles
INNER JOIN authors
  ON articles.authorId = authors.id
ORDER BY publishedOn DESC;
```

SELECT QUERY WITH INNER JOIN

```
SELECT articles.id, title, authors.name AS author, authors.url AS
authorUrl, markdown, publishedOn
FROM articles
INNER JOIN authors
  ON articles.authorId = authors.id
ORDER BY publishedOn DESC;
```

SELECT QUERY WITH INNER JOIN

SELECT articles.id, title, authors.name AS author, authors.url AS authorUrl, markdown, publishedOn
FROM articles
INNER JOIN authors
  ON articles.authorId = authors.id
ORDER BY publishedOn DESC;

➤ The keys on the result object can remains the same!

RESULTS: JOINED TABLE

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id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Kevin Bacon	https://bacon.com	# I know...	2013-12-13
3	Cat Ipsum	Meow Meow	https://meow.com	# chasing...	2013-07-18
4	Cajun Ipsum	Zatarans	https://cajun.com	# boudin...	2012-06-05
5	If It Fits	Meow Meow	https://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meow.com	# nyan...	2015-12-02

BUT ISN'T THAT WHERE WE STARTED?

LOOKS LIKE IT! BUT IT'S MUCH BETTER.

NORMALIZED DATABASE: HOW IT'S STORED

| id	title	authorId	markdown	publishedOn
1	Bacon Ipsum	1	# Hickory...	2013-04-22
2	Six Degrees	1	# I know...	2013-12-13
3	Cat Ipsum	2	# chasing...	2013-07-18
4	Cajun Ipsum	3	# boudin...	2012-06-05
5	If It Fits	2	# I sits...	2014-08-01
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id	name	url
1	Kevin Bacon	https://bacon.com
2	Meow Meow	https://meow.com
3	Zatarans	https://cajun.com

QUERY WITH JOIN: OPTIONAL WAY TO VIEW DATA

id	title	author	authorUrl	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	https://bacon.com	# Hickory...	2013-04-22
2	Six Degrees	Kevin Bacon	https://bacon.com	# I know...	2013-12-13
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5	If It Fits	Meow Meow	https://meow.com	# I sits...	2014-08-01
6	Why Grumpy?	Meow Meow	https://meow.com	# nyan...	2015-12-02

SO WE CAN HAVE OUR CAKE AND EAT IT TOO!

OTHER JOINS
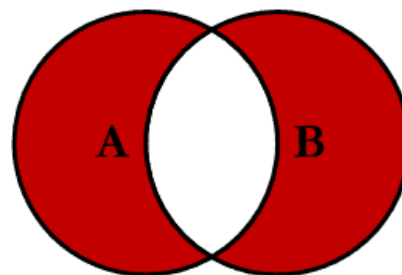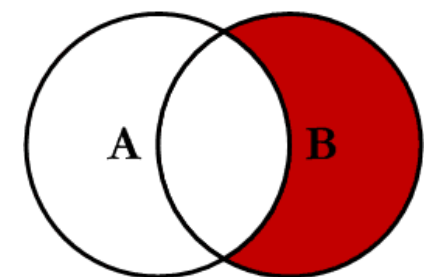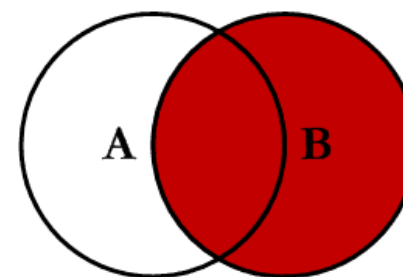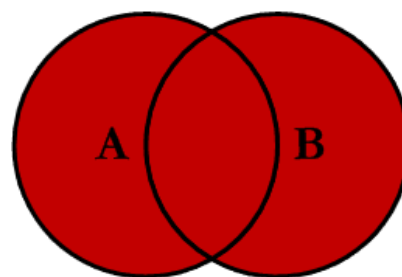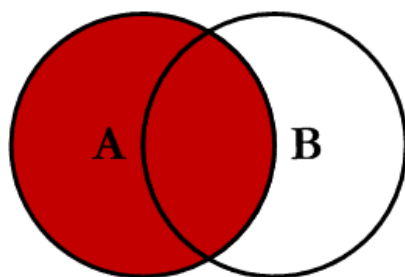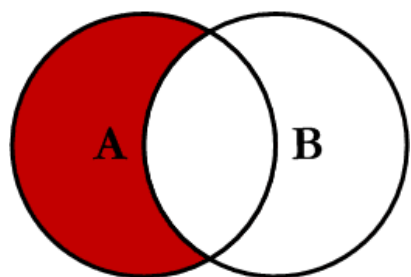
SO, SQL
WALKS INTO
A BAR...
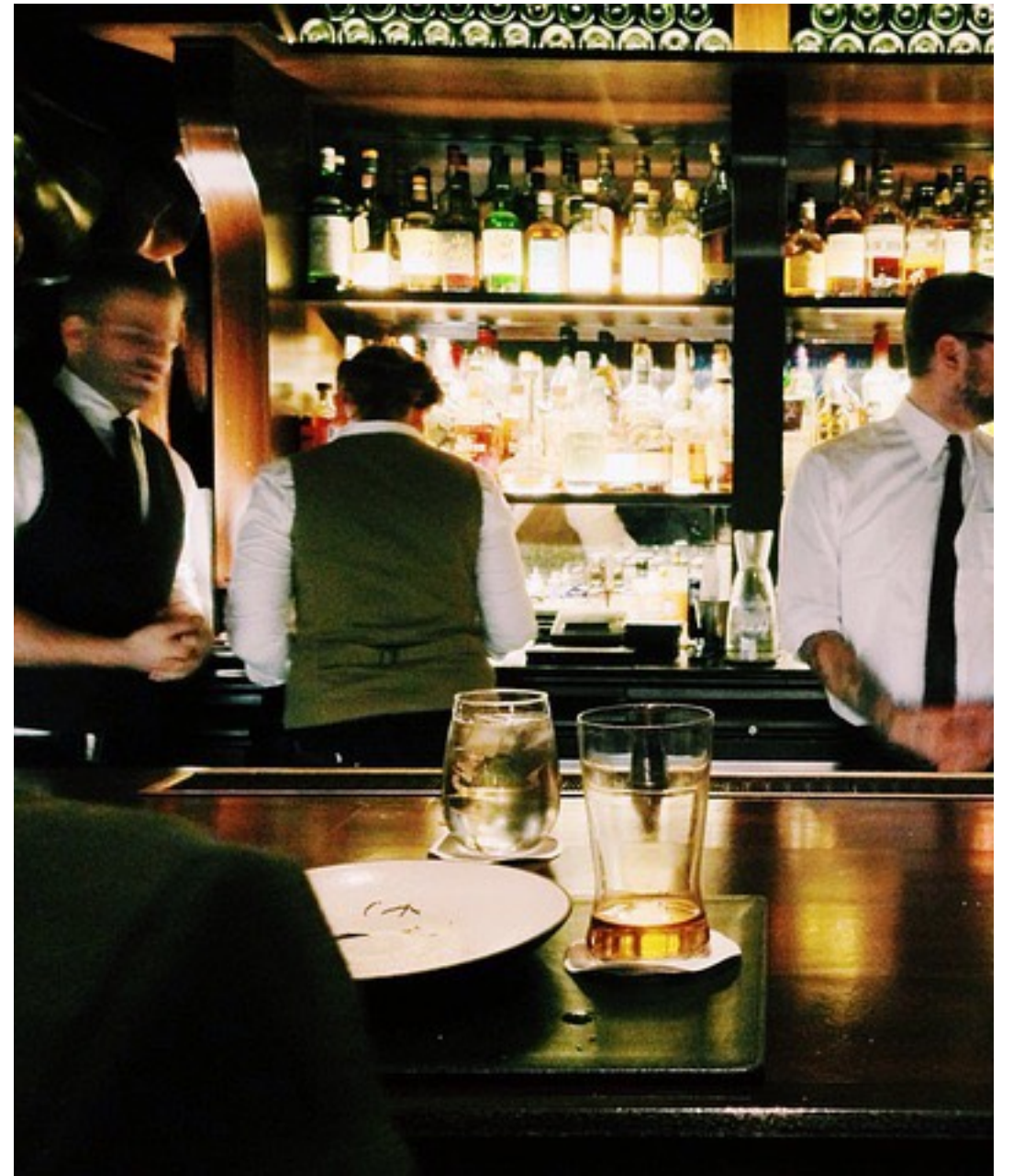
IT SAUNTERS OVER TO TWO TABLES

···

and says…

MIND IF I JOIN YOU?

REFERENCES AND SOURCES

➤ A Primer on SQL: https://leanpub.com/aprimeronsql/read

➤ Interactive SQL Practice: http://sqlbolt.com/

➤ Join diagram: http://www.codeproject.com/Articles/33052/Visual-Representation-of-SQL-Joins

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