CODE 301

Intermediate Software Development

MORE SQL!!!
AND JOINS!!!

SQL Strikes Back

SOMETIMES RELATIONSHIPS NEED A LITTLE SPACE

> 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
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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
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5	If It Fits	Meow Meow	http://meow.com	# I sits...	2014-08-01
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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.

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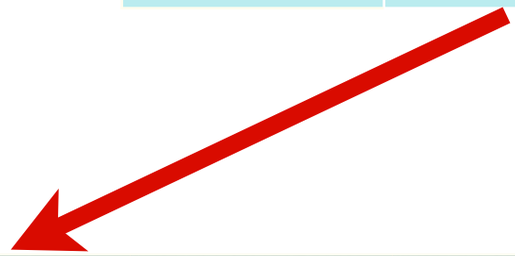
id	A1	A2	B1	B2

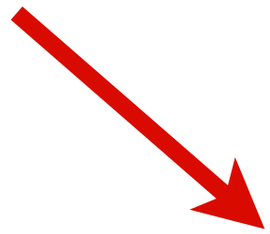
NORMALIZATION: WHAT

- 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

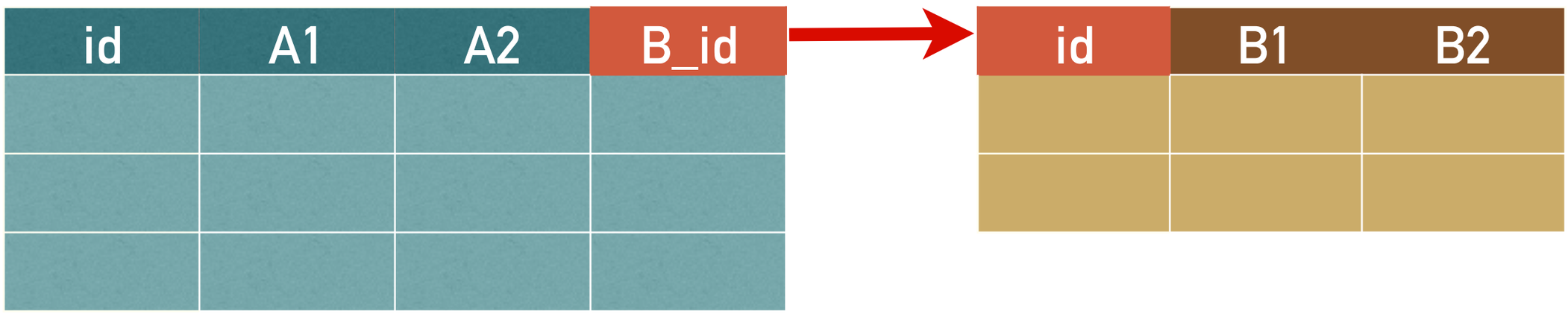
- Decomposing a table into smaller, less redundant tables without losing information.
- Using foreign keys in the old table to reference the primary keys of new tables.

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.



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
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3	Cat Ipsum	Meow Meow	https://meow.com	# chasing...	2013-07-18
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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),
);
```

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

```
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
3	Zatarans	https://cajun.com

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
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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

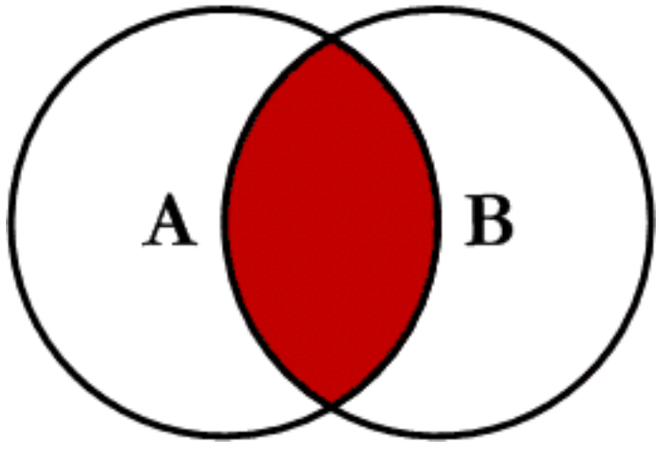
LOOKING TRIM THERE, MR ARTICLES TABLE!

HOLD ON!

HOW DO I COMBINE YOUR INFO WITH AUTHORS?

JOIN ME

INNER JOIN



SELECT QUERY WITH INNER JOIN

```
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;
```

RESULTS: JOINED TABLE

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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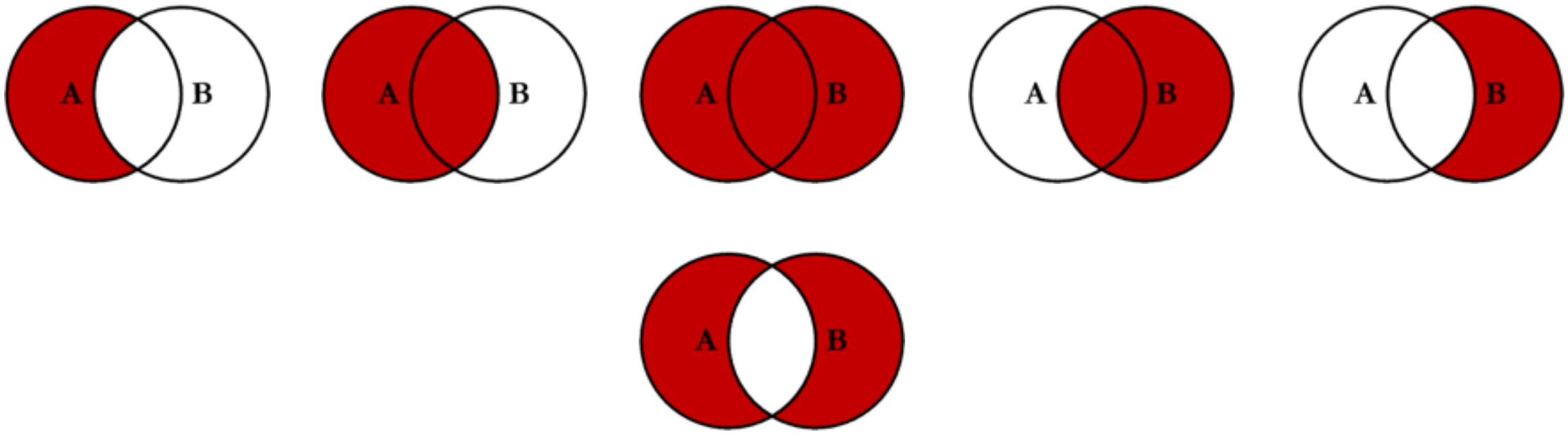
OTHER JOINS



RECAP

- Database normalization is awesome.
- Joins can present data from multiple tables.

SO, SQL WALKS INTO A BAR...

IT WALKS UP TO TWO TABLES

and says...

MIND IF I JOIN YOU?

Fail.

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