CODE 301

Intermediate Software Development

CRUD

Code 301

WHY PERSISTENCE?

➤ It would be frustrating and disappointing if all your data kept disappearing.

➤ Web applications need a way to store data. This process is also called persistence.

➤ Persistence is typically on the server, but can also be in the browser.

WHAT IS A DATABASE?

➤ A database is an organized collection of data.

➤ Database Management Systems (DBMS) have a wide variety of internal architectures, but typically they are composed of tables of data.

➤ Another rapidly growing alternative are documents.

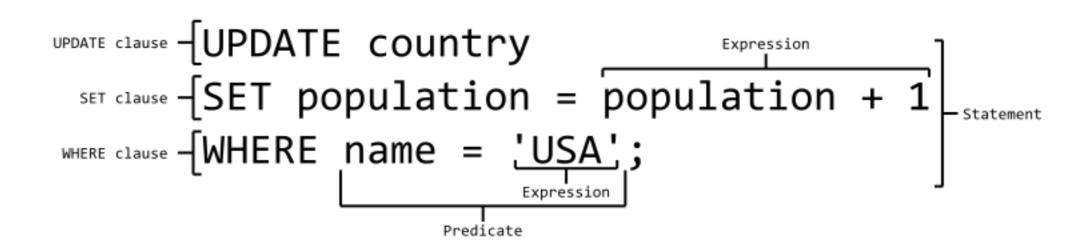➤ We will stick to table based databases because they are still the most common.

DATABASE TABLES

id	Name	Age	Billing Rate	Hours
01	Keesha	28	75.00	40
02	Mark	42	100.00	20
03	Pam	35	123.35	10

STRUCTURED QUERY LANGUAGE (SQL)

➤ Structured Query Language (SQL) is a special-purpose programming language designed for managing data. Developers use SQL for inserting new data, retrieving data, updating data, and deleting data.

➤ SQL statements are made up of clauses, expressions, and predicates as you can see in the image below:

QUERIES

➤ A query retrieves data from one or more tables, or expressions.

```sql
SELECT isbn,
       title,
       price,
       price * 0.06 AS sales_tax
FROM  Book
WHERE price > 100.00
ORDER BY title;
```

DATA DEFINITION LANGUAGE

➤ Data Definition Language (DDL) manages the table and index structure.

➤ The most basic statements in DDL are:

  ➤ CREATE (http://www.w3schools.com/sql/sql_create_table.asp)

  ➤ ALTER (http://www.w3schools.com/sql/sql_alter.asp)

  ➤ DROP (http://www.w3schools.com/sql/sql_drop.asp)

  ➤ TRUNCATE (http://www.w3schools.com/sql/sql_drop.asp)

DATA DEFINITION LANGUAGE

➤ Here's an example of create:

```sql
CREATE TABLE example(
    column1 INTEGER PRIMARY KEY
    column2 VARCHAR(50),
    column3 DATE NOT NULL
);
```

DATA TYPES

➤ A data type is a constraint on the kind of data a column can have.

➤ Having strong types helps you collect accurate and valid data.

➤ Example types are:

  ➤ Integer

  ➤ Float

  ➤ Char

  ➤ Varchar

  ➤ Text

  ➤ Date

  ➤ Time

Exact data types will depend on SQL implementation, of course.

SO HOW DOES THIS RELATE TO MVC?

WHAT IS A MODEL?

➤ Models are, in essence, a simplified description of a real world object. A database table is a simple model.

➤ In object-oriented code, models are objects. The columns correspond to properties. Here's an example constructor in JavaScript:

```javascript
function Employee(name, age, billingRate, hours) {

    this.name        = name;

    this.age         = age;

    this.billingRate = billingRate;

    this.hours       = hours;

}
```

Connect these concepts to recent student work. Update examples as needed.

WHAT IS A MODEL?

➤ Models can also have behavior. In our example, you could have a function (method) that calculates the amount owned per employee. It would be Billing Rate times Hours. In JavaScript it looks like:

```javascript
Employee.prototype.amountOwed = function (billingRate, hours) {

  return billingRate * hours

}
```

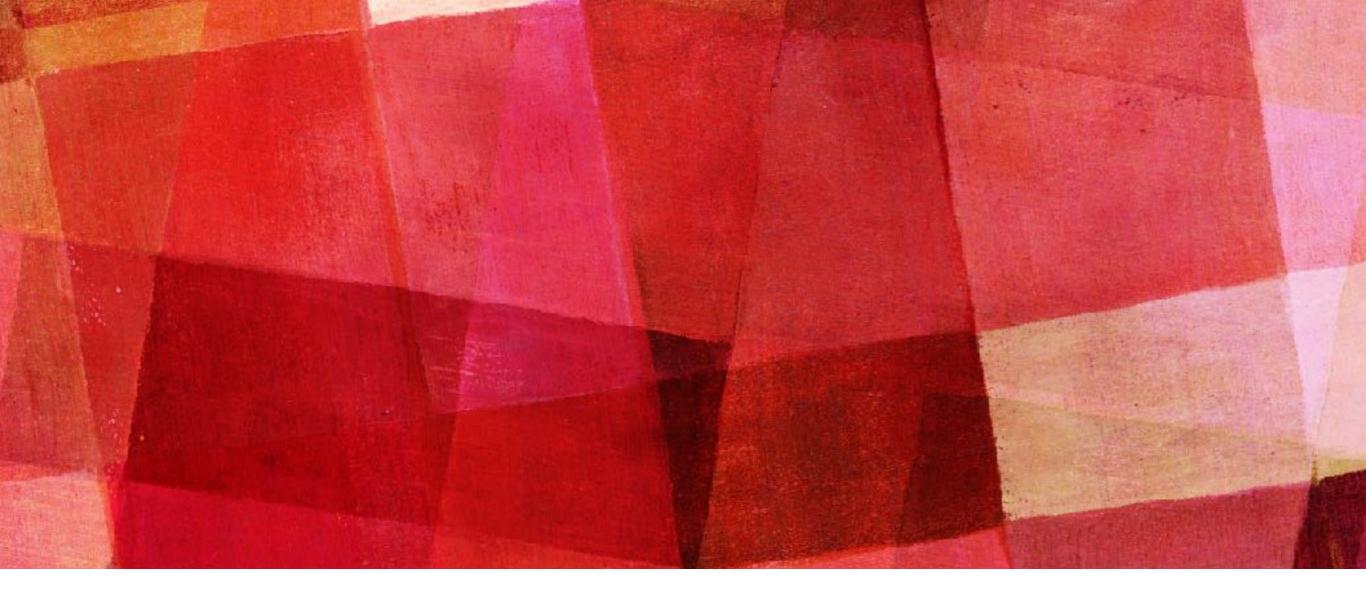# MODELING YOUR DATA WITH SQL

➤ Create tables to model your objects

```sql
CREATE TABLE employees(
    id INTEGER PRIMARY KEY
    name VARCHAR(50)
    age INTEGER,
    billingRate INTEGER,
    hours INTEGER
);
```

WHAT CAN WE DO WITH THIS?

CRUD

Create, Read, Update, and Destroy

CREATE

CRUD

CREATING A TABLE

➤ Name the table and list the desired columns and data types.

```sql
CREATE TABLE articles(
    id INTEGER PRIMARY KEY
    title VARCHAR(50)
    author VARCHAR(50),
    markdown TEXT,
    publishedOn DATETIME
);
```

RESULT: CREATED TABLE

id	title	author	markdown	publishedOn

INSERTING RECORDS

➤ Use INSERT INTO

➤ Name the columns you wish to affect and list the values for the record.

```
INSERT INTO articles (title, author, markdown, publishedOn)
  VALUES  ('Bacon Ipsum', 'Kevin Bacon', '# hickory smoked',
'2015-12-25');
```
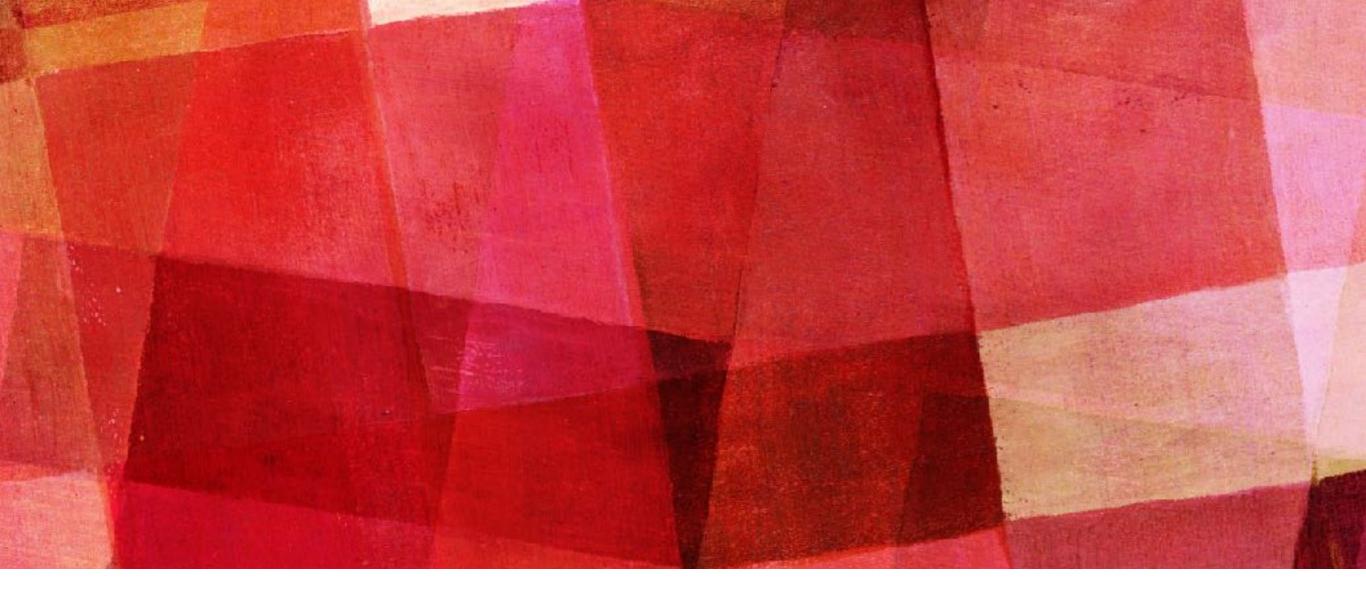
RESULT: TABLE WITH NEW RECORD

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22

MORE RECORDS!

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

HOW TO GET JUST WANT WE WANT?

READ

CRUD

QUERYING DATA

➤ Use the SELECT clause with optional constraints to build rich queries.

```
SELECT title, author, publishedOn

FROM  articles

WHERE publishedOn BETWEEN '2013-01-01' AND  '2013-12-31'

ORDER BY publishedOn DESC;
```

Students should refer to provided resources for more info about constructing queries.

ACTION: SELECT QUERY

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

RESULT: QUERY

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	Keven Bacron	2013-12-13

RESULT: QUERY

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	Keven Bacron	2013-12-13

Draw attention to
and ordering of re

BAD DATA: WHAT TO DO?

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	**Keven Bacron**	2013-12-13

HOW CAN WE CHANGE THIS?

UPDATE

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UPDATING RECORDS

➤ Use the UPDATE clause to alter an existing record.

UPDATE articles

SET author = 'Kevin Bacon'

WHERE author = 'Keven Bacron'

ACTION: UPDATE RECORD

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Kevin Bacon**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

ALWAYS USE A CONDITION WITH UPDATE!

➤ You must remember to use a condition when using update to avoid affecting ALL records.

UPDATE articles

SET author = 'Kevin Bacon'

WHERE author = 'Keven Bacron'

ACTION: UPDATE RECORDS

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

RESULT:

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

RESULT: KEVIN BACON

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Kevin Bacon	# I worked with...	2013-12-13
3	Cat Ipsum	Kevin Bacon	# chasing cute...	2013-07-18
4	Cajun Isum	Kevin Bacon	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Kevin Bacon	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Kevin Bacon	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Kevin Bacon	# prow scuttle	2015-06-08

RESULT: KEVIN BACON

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Kevin Bacon	# I worked with...	2013-12-13
3	Cat Ipsum	Kevin Bacon	chasing cute...	2013-07-18
4	Cajun Isum	Kevin Bacon	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Kevin Bacon	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Kevin Bacon	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Kevin Bacon	# prow scuttle	2015-06-08

KEVIN BACON

All authors become Kevin Bacon!

WHAT IF WE WANT TO REMOVE RECORDS?

DESTROY!

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DELETING RECORDS

➤ Use the DELETE FROM clause to remove an existing record.

```
DELETE FROM articles

WHERE author = 'Keven Bacron'
```

ACTION: DELETE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE (EXCERPT)

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE (EXCERPT)

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacon	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE (EXCERPT)

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05