Class 14: Document Database Operations

- Review: Last Class
- Database Operations
  - Create
  - Read
  - Update
  - Delete

Review

Review: Database

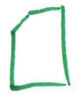
An organized collection of data.

Examples:

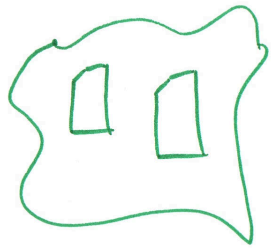
- Library catalog
- Phone contacts
- Music playlist
- Social media feed

Review: Document Database

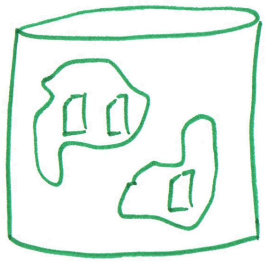
A database that stores and manages large volumes of unstructured or semi-structured data as “documents”, often in JSON format.



Document: A self-contained unit of data that represents a single entity. (Typically JSON)



Collection: A group of documents.



Database: One or more collections of documents.

Review: MongoDB

MongoDB is a popular document database that uses JSON to represent documents.

Document (Object)

```
{
  name: "Asteroid",
  description: "An asteroid is a small
    rocky body that orbits the sun.",
}
```

Collection (Array of Objects)

```
[
  {
    name: "Asteroid",
    description: "An asteroid is a
      small rocky body that orbits
      the sun.",
  },
  {
    name: "Galaxy",
    description: "A galaxy is a
      collection of stars, gas, and
      dust held together by gravity.",
  }
]
```

Activity: Document Database Schema

Working with your peers (2-4), design a **document *database*** *schema* for Plant Scientist blog (https://plantscientist.wordpress.com/) on the board.

A *schema* is a plan for how to organize data in a database. **Define your schema by creating example JSON documents and collections on the board.**

Important Observations:

- The blog has many posts.
- Each post has a title, content, author, etc.
- Every post has zero or more comments.
- Some comment have replies, and some do not.

Review: MongoDB Shell

`mongosh` is a *shell interface* for MongoDB (file extension: `.mongodb.js`).

Specifically, it is a JavaScript and Node.js environment for interacting with MongoDB databases.

```
use('app')

db.space.drop()
db.createCollection('space')

db.questions.drop()
db.createCollection('questions')
```

Database Operations

Primary Database Operations

Create - Insert new documents into a collection.

Read - Query and retrieve documents from a collection.

Update - Modify existing documents in a collection.

Delete - Remove documents from a collection.

MongoDB CRUD Operations

Use the reference documentation!

https://www.mongodb.com/docs/manual/crud/

Create

Insert a single document into a collection:

```
db.TODO_COLLECTION_NAME.insertOne(TODO_DOCUMENT)
```

Insert multiple documents into a collection:

```
db.TODO_COLLECTION_NAME.insertMany([
  TODO_DOCUMENT_1,
  TODO_DOCUMENT_2,
  ...
])
```

Example: Inserting Documents

```
db.space.insertOne({
  name: "Galaxy",
  description: "A galaxy is a collection of stars, gas, and dust held together by gravity.",
  source: "Microsoft Copilot"
})

db.space.insertMany([
  {
    name: "Asteroid",
    description: "An asteroid is a small rocky body that orbits the sun.",
    source: "Microsoft Copilot"
  },
  {
    name: "Black Hole",
    description: "A black hole, a region of space where gravity is so strong that nothing can escape it.",
    source: "Microsoft Copilot",
  },
])
```

Activity: Insert Document into MongoDB

Working with your peers (2-4), initialize a `produce` collection into the `playground` database using the existing data in `playground.mongodb.js`

```
db.produce.insertOne({...})
db.produce.insertMany([ {...},{...}, ... ])
```

Gotcha: Set the Database!

MongoDB Shell defaults to the `test` database. Always make sure to set the database before running any commands!

```
use('app')
```

Read: Querying Documents

Retrieve all documents from a collection:

```
db.TODO_COLLECTION_NAME.find()
```

Retrieve documents that match a specific condition:

```
db.TODO_COLLECTION_NAME.find({ FIELD: VALUE })
```

Retrieve documents that match multiple conditions:

```
db.TODO_COLLECTION_NAME.find({ FIELD1: VALUE1, FIELD2: VALUE2 })
```

Example: Querying Documents

```
// Find all documents in the "space" collection
db.space.find()

// Find all documents where the name is "Galaxy"
db.space.find({ name: "Galaxy" })
```

Interactive MongoDB Shell

`.mongodb.js` files are useful for initializing a database (i.g. `init.mongodb.js`), but they are not ideal for testing queries.

Solution: Use the interactive `mongosh` shell to test your queries.

1. Open a **Terminal**.
2. Run the command: `mongosh`
3. Set the database: `use('app')`
4. Test your queries!
5. When you're done, exit the shell by running: `exit`

Activity: Query Documents in MongoDB

Together, let's retrieve all documents from the `produce`, `space`, and `questions` collections.

MongoDB Query Operators

```
db.TODO_COLLECTION_NAME.find({ FIELD: { OPERATOR: VALUE } })
```

Operator	Description
`$eq`	Equal to
`$ne`	Not equal to
`$gt`	Greater than
`$gte`	Greater than or equal to
`$lt`	Less than
`$lte`	Less than or equal to

Example: Query Operators

```
// Find all documents that are not "Galaxy"
db.space.find({ name: { $ne: "Galaxy" } })
```

Note: `$eq` is the default operator. These queries are equivalent:

```
db.space.find({ name: "Galaxy" })
db.space.find({ name: { $eq: "Galaxy" } })
```

Activity: Query with Operators in MongoDB

Working with your peers, complete items **#1** and **#2** on the handout.

Use `mongosh` to test your queries, then write your answer on the handout.

Example:

```
// Find all documents that are not "Galaxy"
db.space.find({ name: { $ne: "Galaxy" } })
```

Update: Modifying Documents

Update a single document:

```
db.TODO_COLLECTION_NAME.updateOne(
  { FIELD: VALUE }, // Filter
  { $set: { FIELD_TO_UPDATE: NEW_VALUE } } // Update
)
```

Update multiple documents:

```
db.TODO_COLLECTION_NAME.updateMany(
  { FIELD: VALUE }, // Filter
  { $set: { FIELD_TO_UPDATE: NEW_VALUE } } // Update
)
```

Update Operators

```
db.TODO_COLLECTION_NAME.updateOne(
  { FIELD: VALUE }, // Filter
  { UPDATE_OPERATOR: { FIELD_TO_UPDATE: NEW_VALUE } } // Update
)
```

Operator	Description
`$set`	Set the value of a field
`$inc`	Increment the value of a field
`$push`	Add an item to an array field
`$pull`	Remove an item from an array field

Activity: Update Documents in MongoDB

Working with your peers, complete item **#3** on the handout.

Use `mongosh` to test your queries, then write your answer on the handout.

Example:

```
db.space.updateOne(
  { name: "Galaxy" },
  { $set: { description: "A galaxy is a massive system of stars,
    gas, and dust held together by gravity." } }
)
```

Delete: Removing Documents

Delete a single document:

```
db.TODO_COLLECTION_NAME.deleteOne({ FIELD: VALUE })
```

Delete multiple documents:

```
db.TODO_COLLECTION_NAME.deleteMany({ FIELD: VALUE })
```

Activity: Delete Documents in MongoDB

Working with your peers, complete item **#4** on the handout.

Use `mongosh` to test your queries, then write your answer on the handout.

```
// Delete the "Galaxy" document
db.space.deleteOne({ name: "Galaxy" })
```

Project 2

Project 2: Community Events SPA

For your second project you will design and implement an interactive **community events** single-page application using the MERN stack. For this project, you may only use the methods taught in this course.

The idea for this project to encourage community engagement by providing a platform for community members to discover and participate in local events. However, community engagement is not a strict requirement for this project. You may create an events web application for any type of events you like regardless of whether it promotes community engagement.

Summary

- The primary database operations are Create, Read, Update, and Delete (CRUD).
- Create inserts new documents into a collection.
- Read queries and retrieves documents from a collection.
- Update modifies existing documents in a collection.
- Delete removes documents from a collection.

What's Next

Wednesday: Project 2, Milestone 1 Released

Friday: Practice Problem Workshop (Document Databases)