Workshop 6 - Database

Helen Lu

What is MongoDB?

THE DOCUMENT MODEL

As a programmer, you think in objects. Now your database does too.

MongoDB is a document database, which means it stores data in JSON-like documents. We believe this is the most natural way to think about data, and is much more expressive and powerful than the traditional row/column model.

What is MongoDB?

```
{
    name: "Helen",
    age: 20,
    hobbies: ["nappin", "snaccin"]
}
```

Why use MongoDB?

- Efficient when we need to write a lot to the database
- The structure of the data is very prone to changes
  - NoSQL gives us flexibility
- Relatively easy to use

Structure

- MongoDB Instance

Structure

- MongoDB Instance
  - Database

Structure

- MongoDB Instance
  - Database
    - Collections

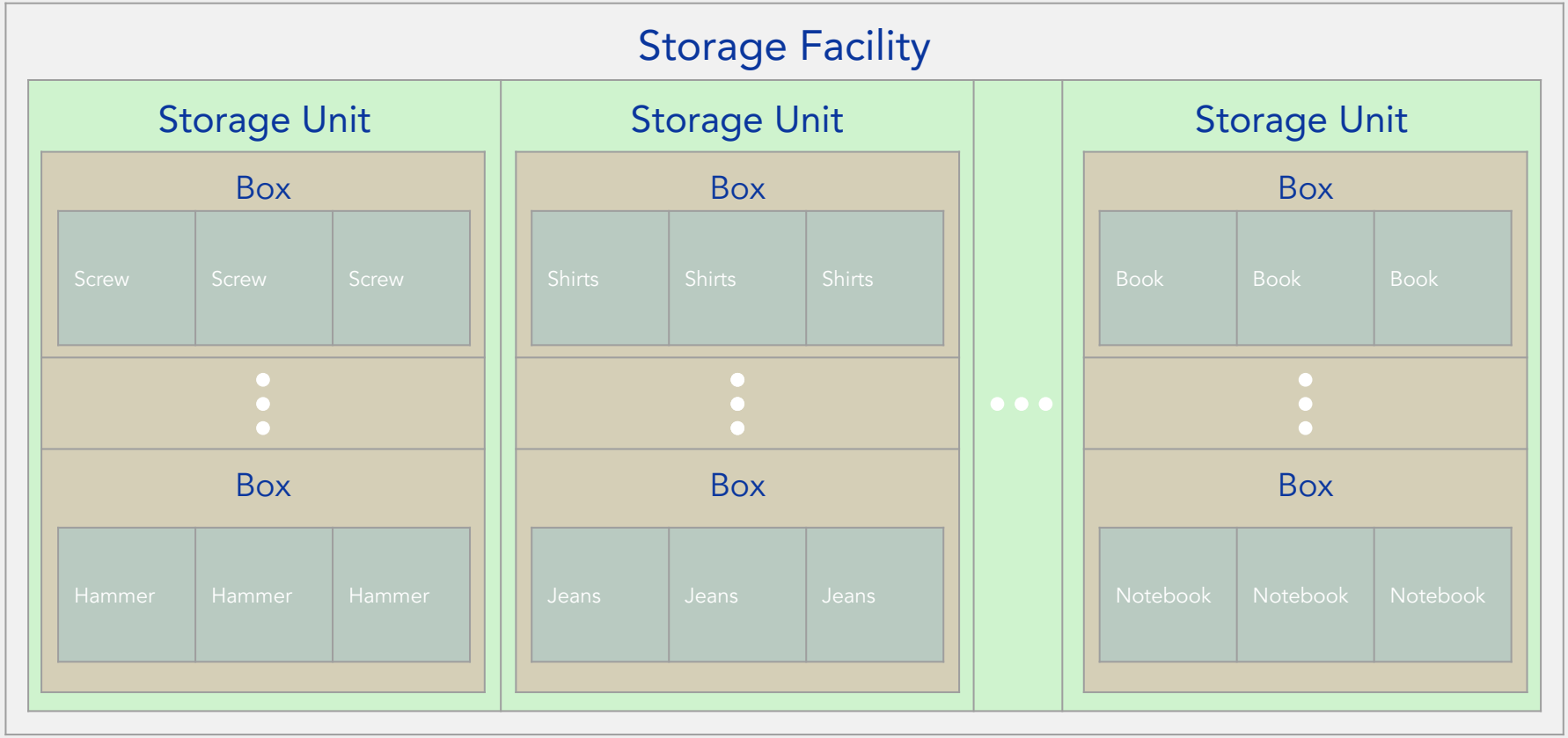
Structure

- MongoDB Instance
  - Database
    - Collections
      - Documents

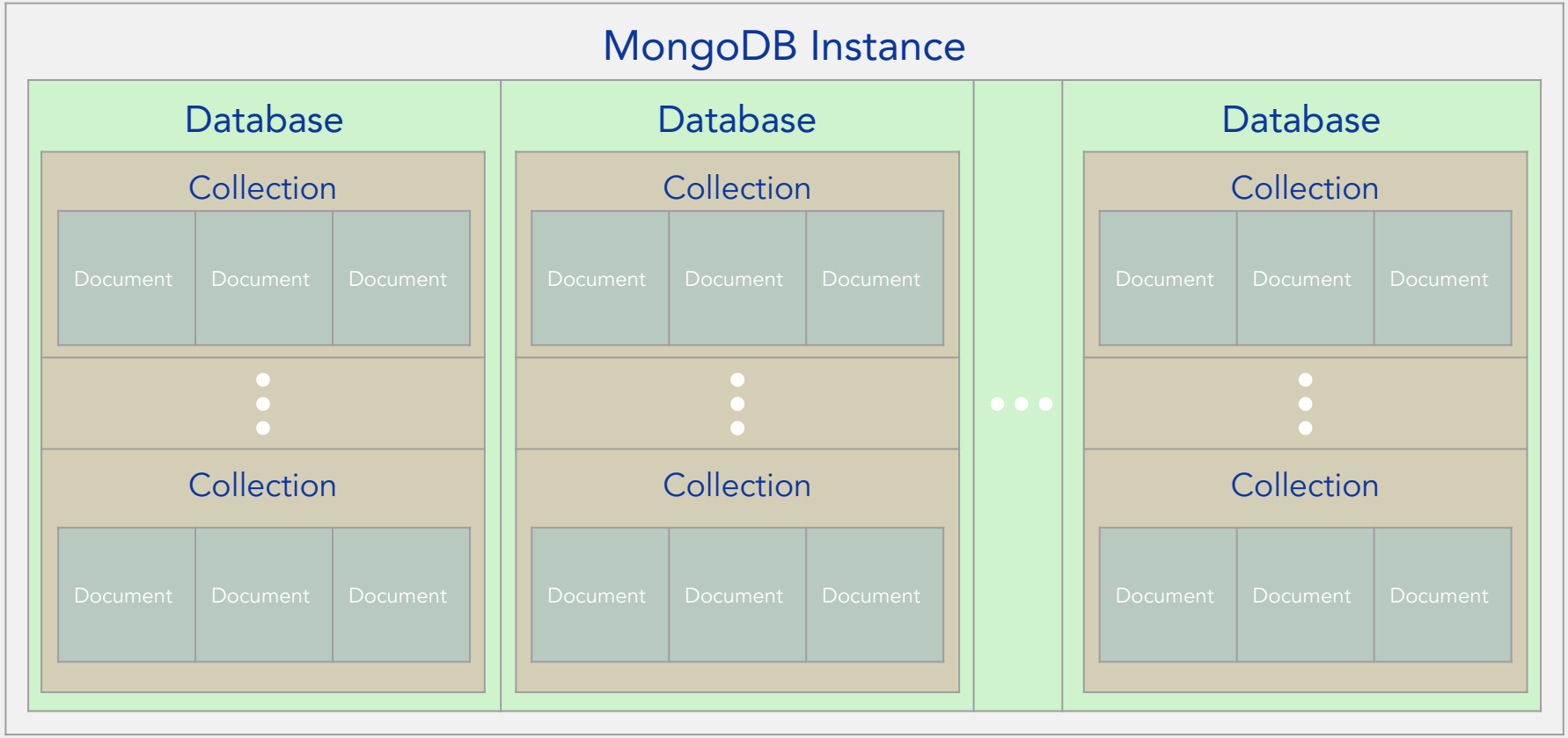
Structure

- MongoDB Instance
  - Database
    - Collections
      - Documents
        - Fields

Structure


Storage Facility
Storage Unit
Box
Screw
Screw
Screw
Box
Hammer
Hammer
Hammer
Storage Unit
Box
Shirts
Shirts
Shirts
Box
Jeans
Jeans
Jeans
Storage Unit
Box
Book
Book
Book
Box
Notebook
Notebook
Notebook

Structure


MongoDB Instance
Database
Collection
Document
Document
Document
Collection
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Database
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Document

Questions?
weblab.to/questions

Mongoose

NodeJS library that allows MongoDB integration

What is Mongoose?

wrapper that allows you to interact with MongoDB API

What does Mongoose do?

- Connects to cluster
  - We'll cover code in the workshop
- Creates documents
- Interacts with databases
  - GET, POST, Edit, Delete, and more!

Why do we need Mongoose?

Mongoose vs Vanilla Mongo

- Mongo does not guarantee all documents in a collection have the same structure.

Schemas!

What is a Schema?

- Schemas define the structure of your documents
- Organization is key!

Mongoose Schema Example

```
Schema({
  name: String,
  age: Number,
  hobbies: [String]
})
```



```
{
    name: "Helen",
    age: 20,
    hobbies: ["nappin", "snaccin"]
}
```

Mongoose Schemas: Processing Documents

- Means of structuring MongoDB documents
  - Specify fields within a document
- Each collection *should* have a schema

Mongoose Schema types

```
String
Number
Date
Buffer
Boolean
Mixed
ObjectId
Array
```

Read more about schema types:
http://mongoosejs.com/docs/schematypes.html

Mongoose Models

Models let you:

- Construct documents
- Get documents fitting the model
- Post documents
- ...or anything with documents fitting the model!

Creating a Mongoose Model (Generally)

1. Create a mongoose.Schema

```
const UserSchema = new mongoose.Schema({
    name: String,
    age: Number,
    pets: [String],
});
```

2. Create a mongoose.model

```
const User = mongoose.model("User", UserSchema)
```

Creating Documents

```
const User = mongoose.model("User", UserSchema)

const Tim = new User({name: "Tim", age: 21, pets: ["cloudy"]});

Tim.save()
    .then((student) => console.log(`Added ${student.name}`));
```

All together

```
const mongoose = require("mongoose");

const mongoConnectionSRV = "mongodb+srv://user:password@somecluster.gcp.mongodb.net/test?retryWrites=true&w=majority";
const databaseName = "test";
const options = {useNewUrlParser: true, useUnifiedTopology: true, dbName: databaseName};
```

All together

```
const mongoose = require("mongoose");

const mongoConnectionSRV = "mongodb+srv://user:password@somecluster.gcp.mongodb.net/test?retryWrites=true&w=majority";
const databaseName = "test";
const options = {useNewUrlParser: true, useUnifiedTopology: true, dbName: databaseName};


mongoose.connect(mongoConnectionSRV, options)
    .then(() => console.log("Connected."))
    .catch((error) => console.log(error));
```

All together

```
const mongoose = require("mongoose");

const mongoConnectionSRV = "mongodb+srv://user:password@somecluster.gcp.mongodb.net/test?retryWrites=true&w=majority";
const databaseName = "test";
const options = {useNewUrlParser: true, useUnifiedTopology: true, dbName: databaseName};


mongoose.connect(mongoConnectionSRV, options)
    .then(() => console.log("Connected."))
    .catch((error) => console.log(error));


const UserSchema = new mongoose.Schema({
    name: String,
    age: Number,
    pets: [String],
});



const User = mongoose.model("User", UserSchema)
```

All together

```
const mongoose = require("mongoose");

const mongoConnectionSRV = "mongodb+srv://user:password@somecluster.gcp.mongodb.net/test?retryWrites=true&w=majority";
const databaseName = "test";
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mongoose.connect(mongoConnectionSRV, options)
    .then(() => console.log("Connected."))
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const UserSchema = new mongoose.Schema({
    name: String,
    age: Number,
    pets: [String],
});



const User = mongoose.model("User", UserSchema)

let Tim = new User({name: "Tim", age: 21, pets: ["cloudy"]});

Tim.save()
   .then((student) => console.log(`Added ${student.name}`));
```

Meanwhile on Atlas…

Anton

VERSION 4.0.14 REGION

Overview | Real Time | Metrics | Collections | Profiler | Performance Advisor | Command Line Tools

DATABASES: 1 COLLECTIONS: 1 REFRESH

+ Create Database

NAMESPACES

test

users

test.users

COLLECTION SIZE: 237B TOTAL DOCUMENTS: 3 INDEXES TOTAL SIZE: 36KB

Find | Indexes | Aggregation

INSERT DOCUMENT

FILTER {"filter":"example"} Find Reset

QUERY RESULTS 1-1 OF 1

```
_id: ObjectId("5e1417389212a60d14c36ae7")
pets: Array
  0: "cloudy"
name: "Tim"
age: 21
__v: 0
```

```
_id: ObjectId("5e1417389212a60d14c36ae7")
pets: Array
    0: "cloudy"
name: "Tim"
age: 21
__v: 0
```

Wait

```
_id: ObjectId("5e1417389212a60d14c36ae7")
```

_id

- Every document is automatically assigned a unique identifier
- The identifier is assigned under the “_id” field.
- Useful when there’s a relationship between documents

Finding Documents

```
// Returns all documents
User.find({})
    .then((users) => console.log(`Found ${users.length} users`));
```

The first argument describes how to filter the collection

Finding Documents

- You can add as many parameters as you want to the filter. This is very useful!

```
// Returns all documents
User.find({})
    .then((users) => console.log(`Found ${users.length} users`));

// Returns all users age 21
User.find({name: "Tim"})
    .then((users) => console.log(`Found ${users.length} users`));

// Returns all users age 21 named Tim
User.find({name: "Tim", age: 21})
    .then((users) => console.log(`Found ${users.length} users`));
```

Deleting Documents

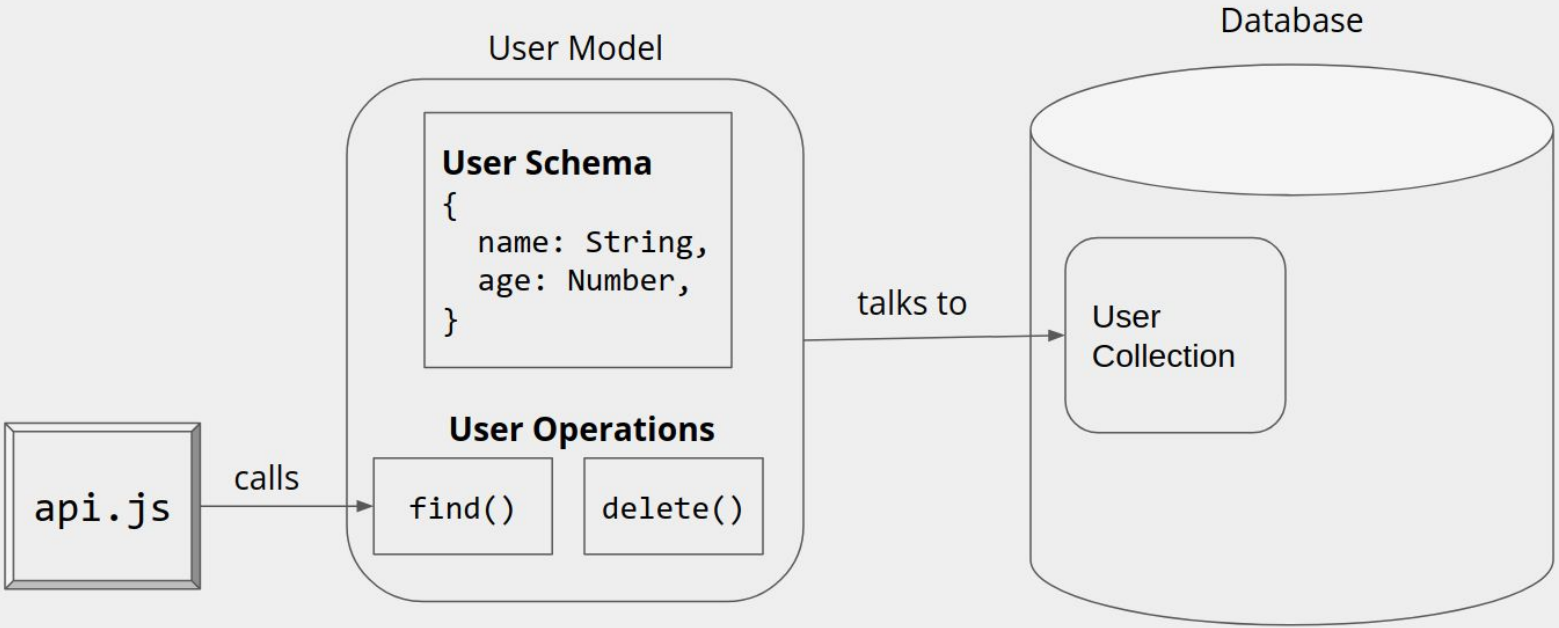
```
// Deletes the first user in the collection named Tim
User.deleteOne({"name": "Tim"})
    .then((err) => {
        if (err) return console.log("error 😟");
        console.log("Deleted 1 user! 🎉");
    });
```

Deleting Documents

```
// Deletes the first user in the collection named Tim
User.deleteOne({"name": "Tim"})
    .then((err) => {
        if (err) return console.log("error 😦");
        console.log("Deleted 1 user! 🎉");
    });

// Deletes all users in the collection named Tim
User.deleteMany({"name": "Tim"})
    .then((err) => {
        if (err) return console.log("Couldn't delete 🤦‍♀️");
        console.log("Deleted all users! 😮")
    });
```

Mongoose Structure



"Models are responsible for creating and reading documents from the underlying MongoDB database."

Mongoose Parameters

http://mongoosejs.com/docs/schematypes.html (from “All Schema Types”)

More advanced: http://mongoosejs.com/docs/validation.html

More advanced: http://mongoosejs.com/docs/guide.html

Workshop:
Hook Database to Your Catbook App

Workshop Plan

- Hook back-end server up with mongo database
- Create models for our comments & stories
- Modify our API endpoints to use our Mongoose models

For sample code, see:
weblab.to/mongo-snippets

STEP -1:

Connect Your App to MongoDB with Mongoose

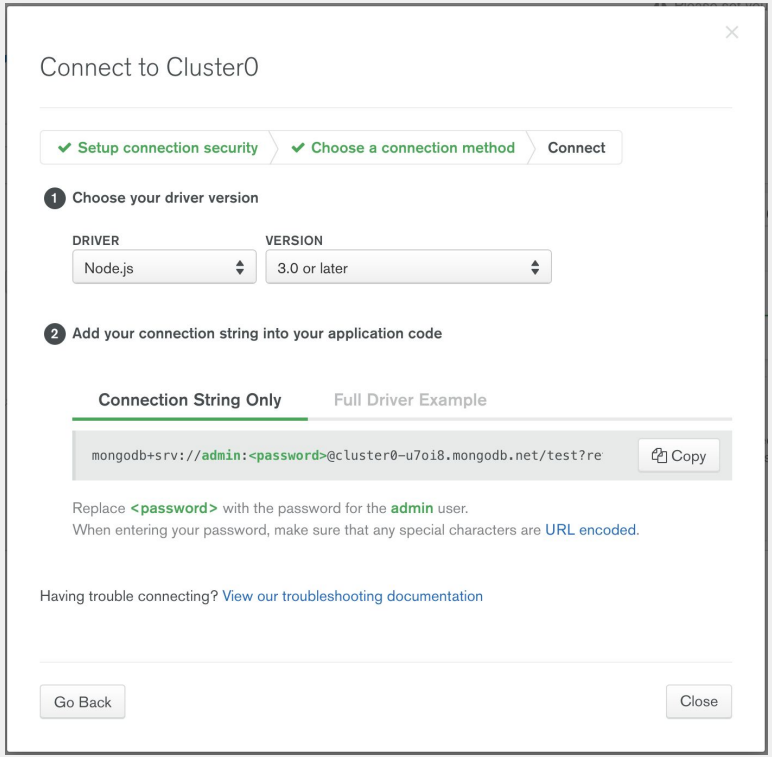
SETUP:

```
git fetch
git reset --hard
git checkout w6-starter
```

Connect Your App to Your Mongo DBMS

Use Mongoose to Connect to your database in `server.js`:

Enter your SRV from MongoDB Atlas where it says to do it in the comments.



Setting Up MongoDB with Mongoose

server.js.

```
const mongoose = require("mongoose");

// Server configuration below
// TODO change connection URL after setting up your own database
const mongoConnectionURL =
  "mongodb+srv://weblab:jAT4po55IAgYWQgR@catbook-ylndp.mongodb.net/test?retryWrites=true&w=majority";
// TODO change database name to the name you chose
const databaseName = "catbook";
const options = { useNewUrlParser: true, useUnifiedTopology: true, dbName: databaseName}

// connect to mongodb
mongoose
  .connect(mongoConnectionURL, options)
  .then(() => console.log("Connected to MongoDB"))
  .catch((err) => console.log(`Error connecting to MongoDB: ${err}`));
```

If you're having trouble, make sure you included your username & password

Run It From Your Root Directory

- `npm install`
- `npm start`
- If you run it now, you should get a “Connected to MongoDB” message.

Connect Your App to Your Mongo DBMS (“solution”)

Use Mongoose to Connect to your database in `server.js`. It should look like:

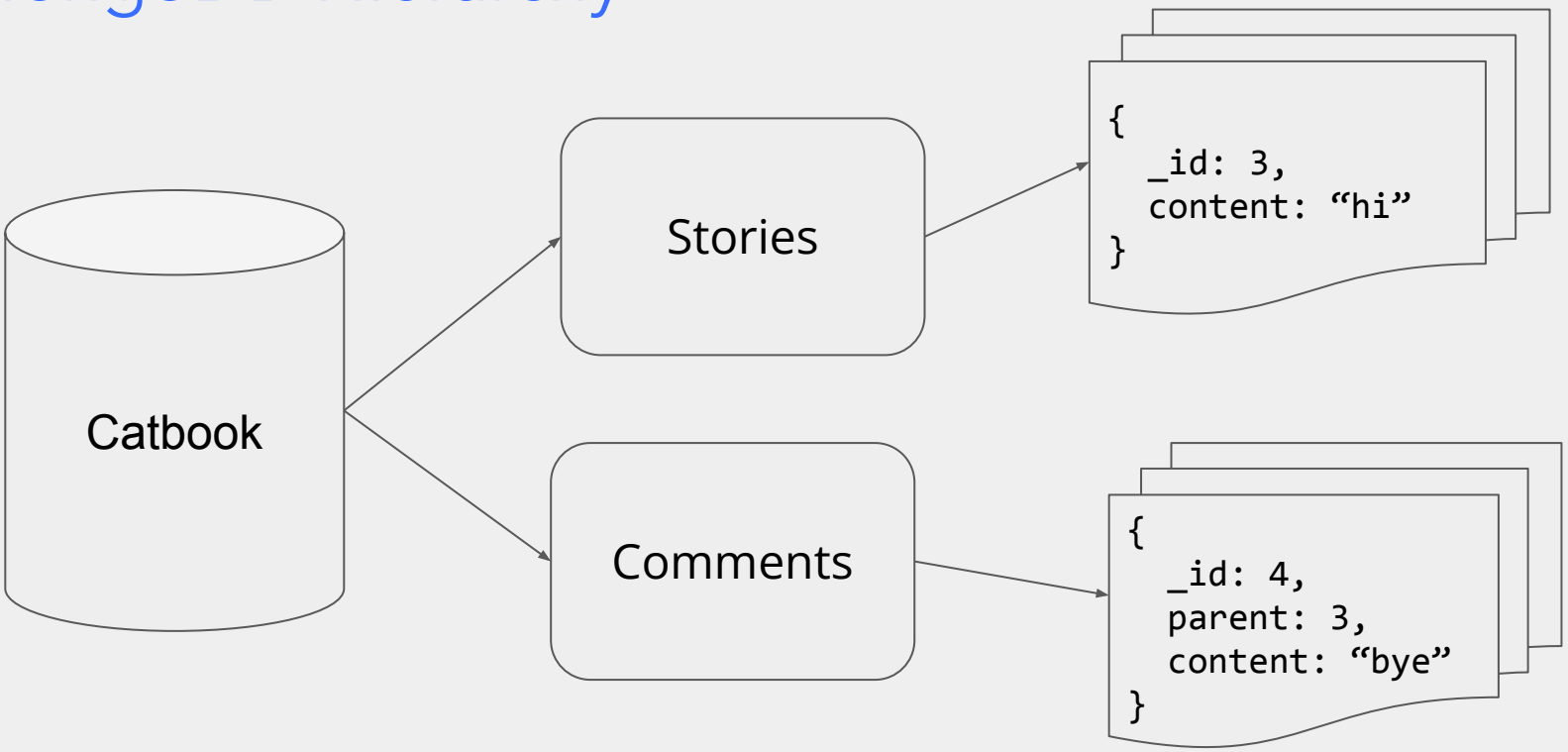
```
const mongoConnectionURL =
"mongodb+srv://weblab:jAT4po55IAgYWQgR@catbook-yln
dp.mongodb.net/test?retryWrites=true&w=majority";
```

(in one line!)

STEP 0:

Create Comment and Story Mongoose Models.

MongoDB Hierarchy



Database **Collections** **Documents**

Add Comment and Story Mongoose Models: Story

In the `models` directory, open `story.js`.

We want each story to have a `creator_id`, `creator_name`, and `content`, and we want each of these to be of type `String`.

Any idea how we can do this?

Add Comment and Story Mongoose Models: Story

In the `models` directory, open `story.js`.

We want each story to have a `creator_id`, `creator_name`, and `content`, and we want each of these to be of type `String`.

Any idea how we can do this?

We use schemas and mongoose models!

Add Story Mongoose Model

Enter the following into **`story.js`**.

```
const mongoose = require("mongoose");
```

Add Story Mongoose Model

Enter the following into **`story.js`**.

```
const mongoose = require("mongoose");

//define a story schema for the database
const StorySchema = new mongoose.Schema({
  creator_name: String,
  content: String,
});
```

Add Story Mongoose Model

Enter the following into `story.js`.

```
const mongoose = require("mongoose");

//define a story schema for the database
const StorySchema = new mongoose.Schema({
  creator_name: String,
  content: String,
});

// compile model from schema
module.exports = mongoose.model("story", StorySchema);
```

Add Comment Mongoose Models (Your Turn)

Create the comment model for story comments in `comment.js`.

We want the model for comment to have

- `creator_name`
- `parent` (which describes the story this `comment` is going into)
- `content`

We want all these fields to be `String`s.

Make sure to include the `module.exports` statement.

Add Comment Mongoose Models (Solution)

Enter the following into `comment.js`.

```
const mongoose = require("mongoose");

//define a comment schema for the database
const CommentSchema = new mongoose.Schema({
  creator_name: String,
  parent: String, // links to the _id of a parent story (_id i
  content: String,
});

// compile model from schema
module.exports = mongoose.model("comment", CommentSchema);
```

STEP 1:

Link the Frontend and Backend with our Newly Implemented MongoDB database (Atlas)

STEP 1 SETUP:

```
git reset --hard
git checkout w6-step1
```

Recopy your SRV into server.js

Use `api` Route for Database Requests

Open `api.js` from the `./server` directory.

Part 1: Update `require` path

This allows us to use the exported models!

Within `api.js`, import the comment model below "`const Story = require("./models/story.js");`"

Now, import the Comment model (use the path for story.js as an example).

Part 1: Update `require` path

This allows us to use the exported models!

Within `api.js`, import the comment model below "`const Story = require("./models/story.js");`"

Now, import the Comment model (use the path for story.js as an example).

```
const Comment = require('./models/comment');
```

Part 2: Get all the stories via `GET /stories`

This endpoint asks the server to return ALL the stories saved in the database.

How would we do this?

Hint: try to find relevant code in weblab.to/mongo-snippets

Part 2: GET /stories (solution)

```
router.get("/stories", (req, res) => {
  // empty selector means get all documents
  Story.find({}).then((stories) => res.send(stories));
});
```

Part 3: Implement `POST /story`

This server creates a new story based on the “`content`” parameter given in the request.

Where do we get the content?

req.query vs. req.body

For GET requests:

Use req.query

E.g. req.query.content

For POST request:

Use req.body

req.body.content

How would you implement /story?

Note: You want to use the constant MY_NAME as the creator_name since we do not have access to the creator name yet.

Hint: try to find relevant code in weblab.to/mongo-snippets

Part 3: POST /story (solution)

```
router.post("/story", (req, res) => {
  const newStory = new Story({
    creator_name: MY_NAME,
    content: req.body.content,
  });

  newStory.save().then((story) => res.send(story));
});
```

STEP 2 SETUP:

```
git reset --hard
git checkout w6-step2
```

Recopy your SRV into server.js

Your turn! Implement `GET /comment`

Choose the right parent to use!

Find "`/* input the parent parameter here */`" in the code and put your response there.

Hint: req.query has the content of the get request

GET /comment (solution)

```
router.get("/comment", (req, res) => {
  Comment.find({ parent: req.query.parent }).then((comments) => {
    res.send(comments);
  });
});
```

Your turn! Implement `POST /comment`

This endpoint saves a new comment into the database with both the "`parent`" and the "`content`" from the request.

Hint: Look at `POST /story` and weblab.to/mongo-snippets

Part 5: POST /comment (solution)

```
router.post("/comment", (req, res) => {
  const newComment = new Comment({
    creator_name: MY_NAME,
    parent: req.body.parent,
    content: req.body.content,
  });

  newComment.save().then((comment) => res.send(comment));
});
```

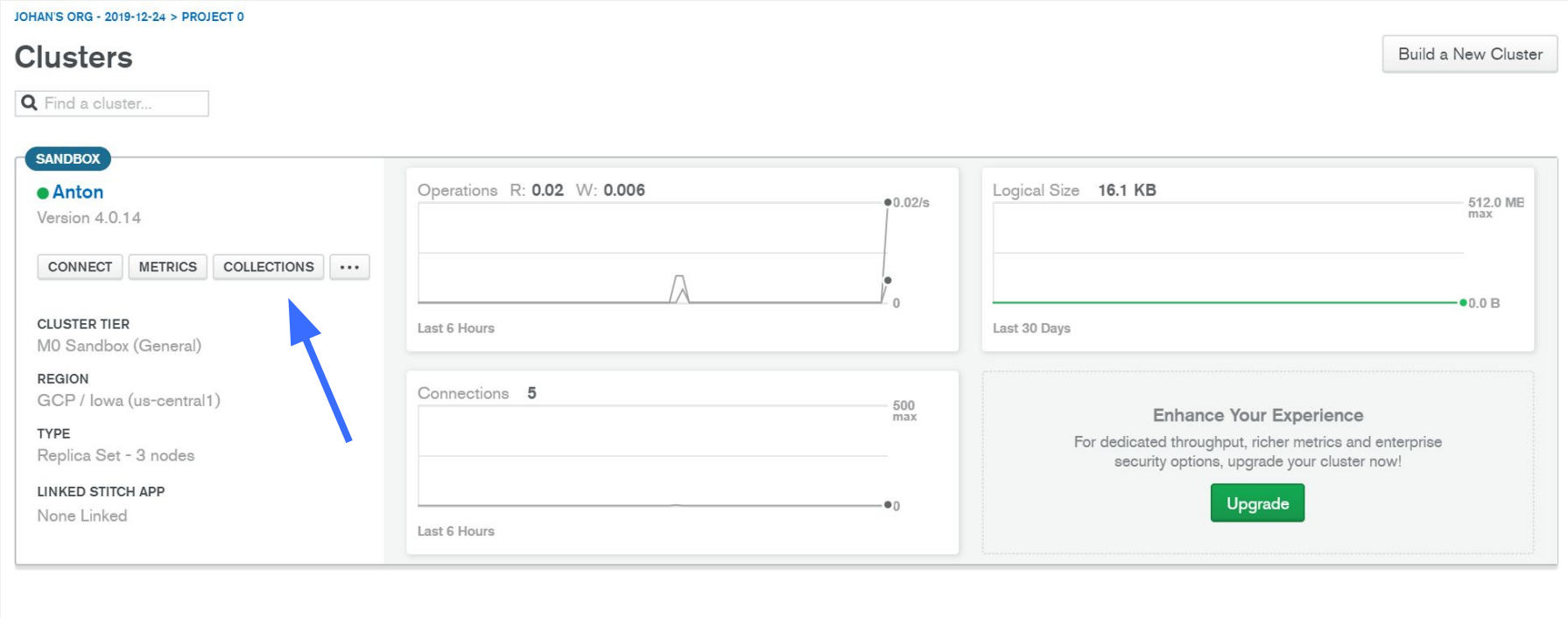
Testing!

- `npm start`
- `npm run hotloader`
- Post a story
- Post a comment

```
git reset --hard
git checkout w6-complete
```

Recopy your SRV into server.js

Testing!


JOHAN'S ORG - 2019-12-24 > PROJECT 0
Clusters
Build a New Cluster
Find a cluster...
SANDBOX
Anton
Version 4.0.14
CONNECT
METRICS
COLLECTIONS
CLUSTER TIER
M0 Sandbox (General)
REGION
GCP / Iowa (us-central1)
TYPE
Replica Set - 3 nodes
LINKED STITCH APP
None Linked
Operations R: 0.02 W: 0.006
0.02/s
0
Last 6 Hours
Logical Size 16.1 KB
512.0 MB
max
0.0 B
Last 30 Days
Connections 5
500
max
0
Last 6 Hours
Enhance Your Experience
For dedicated throughput, richer metrics and enterprise security options, upgrade your cluster now!
Upgrade

Testing!

mongoDB. Atlas All Clusters

Eastern Time (US & Canada) Usage This Month:$0.00 details Johan

CONTEXT
Project 0

ATLAS
Clusters
Data Lake BETA

SECURITY
Database Access
Network Access
Advanced

PROJECT
Access Management
Activity Feed
Alerts 0
Integrations
Settings

SERVICES
Charts
Stitch
Triggers

HELP
Docs
Support

JOHAN'S ORG - 2019-12-24 > PROJECT 0 > CLUSTERS

Anton

VERSION 4.0.14 REGION

Overview | Real Time | Metrics | Collections | Profiler | Performance Advisor | Command Line Tools

DATABASES: 1 COLLECTIONS: 2 REFRESH

+ Create Database

NAMESPACES

catbook
- comments
- stories

catbook.stories

COLLECTION SIZE: 166B TOTAL DOCUMENTS: 2 INDEXES TOTAL SIZE: 16KB

Find | Indexes | Aggregation

INSERT DOCUMENT

FILTER {"filter":"example"} Find Reset

QUERY RESULTS 1-2 OF 2

```
_id: ObjectId("5e17ed3549be2f3fa0d34ff5")
creator_name: "Anonymous User"
content: "hello"
__v: 0
```

```
_id: ObjectId("5e18122a85d53c4b70ddfa09")
creator_name: "Anonymous User"
content: "marco"
__v: 0
```

System Status: All Good Last Login: 18.21.162.13

https://cloud.mongodb.com/v2/5e027d77cf09a2bc51b9a6d0#

Recap

We learned to:

- Understand database structure, schemas, models
- Hook remote mongodb instances to our nodejs app
- Interact with database via an api
- Use that api in the frontend

THAT'S IT!

Mongoose Documentations & Further Readings

MongoDB Documentations: https://docs.mongodb.com

Mongoose Getting Started: http://mongoosejs.com/docs/

Documentations: http://mongoosejs.com/docs/guide.html

Atlas documentation: https://docs.atlas.mongodb.com/import/