Building a Simple CRUD app with Express and MongoDB

I finally understood how to work with Node, Express, and MongoDB. I want to write a comprehensive tutorial so you won't have to go through the same headache I went through.

CRUD, Express, and MongoDB

CRUD, Express and MongoDB are big words for a person who has never touched any server-side programming in their life. Let's quickly introduce what they are before we diving into the tutorial.

Express is a framework for building web applications on top of Node.js. It simplifies the server creation process that is already available in Node. In case you were wondering, Node allows you to use JavaScript as your server-side language.

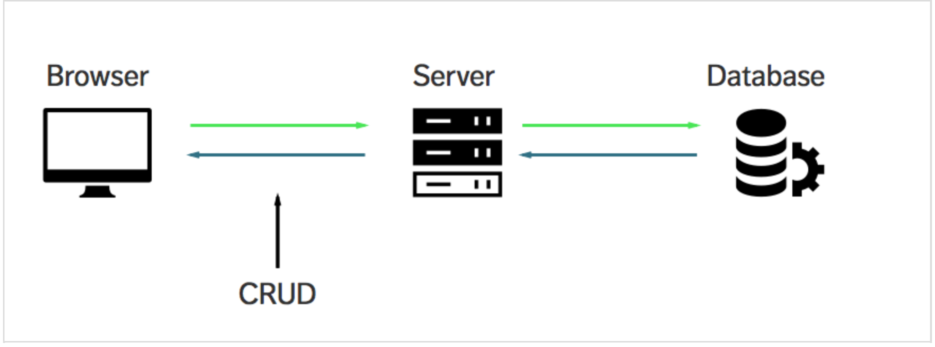
MongoDB is a database. This is the place where you store information for your websites (or applications).

CRUD is an acronym for Create, Read, Update and Delete. It is a set of operations we get servers to execute (`POST`, `GET`, `PUT` and `DELETE` requests respectively). This is what each operation does:

- Create (POST) - Make something
- Read (GET)- Get something
- Update (PUT) - Change something
- Delete (DELETE)- Remove something

`POST`, `GET`, `PUT`, and `DELETE` requests let us construct Rest APIs.

If we put CRUD, Express and MongoDB together into a single diagram, this is what it would look like:

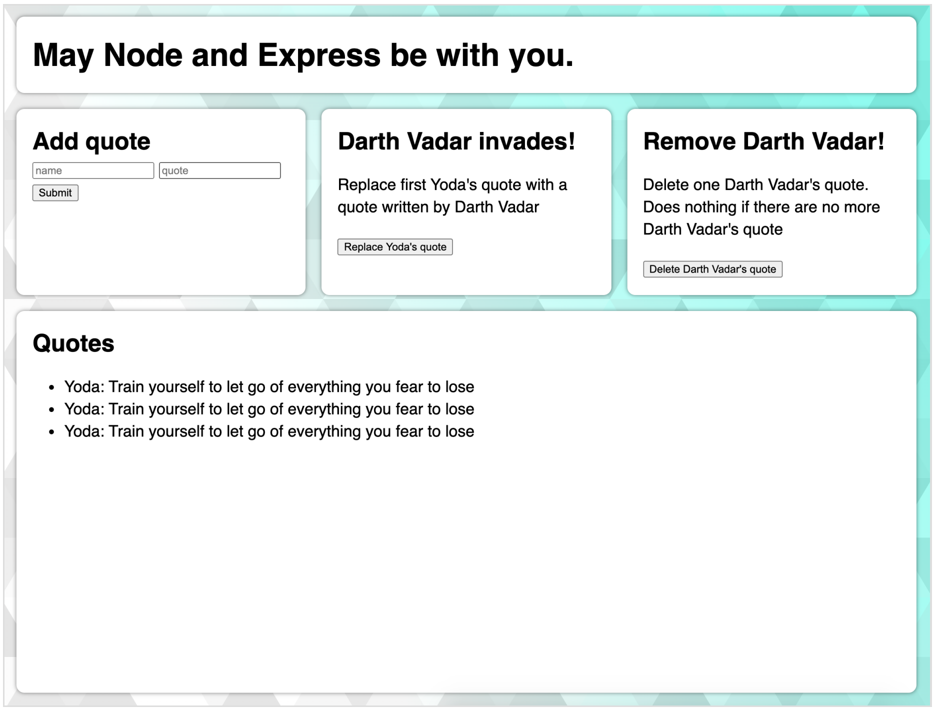


Does CRUD, Express and MongoDB makes more sense to you now?

Great. Let's move on.

We'll build a simple application together

Let's build a simple application that lets you track a list of quotes from Star Wars Characters. Here's what it looks like:



May Node and Express be with you.

Add quote

Darth Vadar invades!

Replace first Yoda's quote with a quote written by Darth Vadar

Remove Darth Vadar!

Delete one Darth Vadar's quote. Does nothing if there are no more Darth Vadar's quote

Quotes

- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose

Free free to check out the demo before continuing with this tutorial.

This article is LONG! Remember to grab the source code by leaving your name and email address in this form. I'll also send you this article in PDF so you can read it at your leisure.

By the way, I'm not going to focus on the styles since we're focusing on learning Crud, Express, and MongoDB in this tutorial.

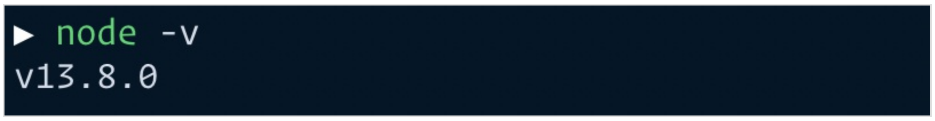
Prerequisites

You'll need two things to get started with this tutorial:

1. You are not afraid of typing commands into a Command Line. If you're afraid, use this article to get over your fear.
2. You need to have Node installed.

To check if you have Node installed, open up your Command Line and run the following code:

```
$ node -v
```



```
▶ node -v
v13.8.0
```

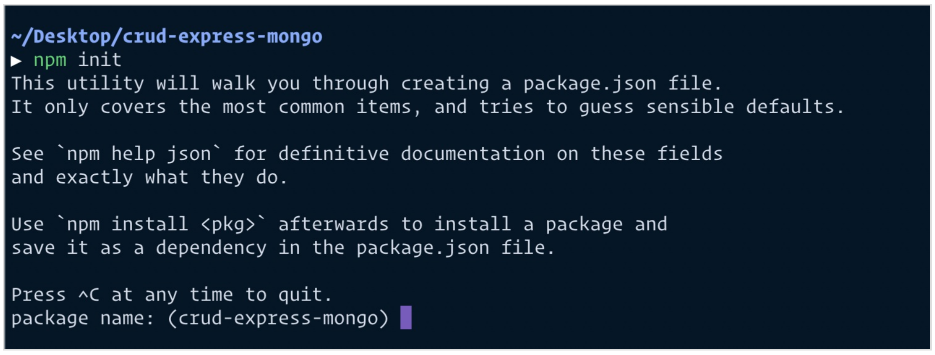
You should get a version number if you have Node installed. If you don't, you can install Node either by downloading the installer from Node's website or downloading it through package managers like Homebrew (Mac) and Chocolatey (Windows).

Getting started

Start by creating a folder for this project. Feel free to call it anything you want. After you've created the folder, navigate into it with the Terminal and run `npm init`.

`npm init` creates a `package.json` file which helps you manage dependencies (which we will install as we go through the tutorial).

```
$ npm init
```



```
~/Desktop/crud-express-mongo
▶ npm init
This utility will walk you through creating a package.json file.
It only covers the most common items, and tries to guess sensible defaults.

See `npm help json` for definitive documentation on these fields
and exactly what they do.

Use `npm install <pkg>` afterwards to install a package and
save it as a dependency in the package.json file.

Press ^C at any time to quit.
package name: (crud-express-mongo)
```

Just hit enter through everything that appears. I'll talk about the ones you need to know as we go along.

Running Node for the first time in your life

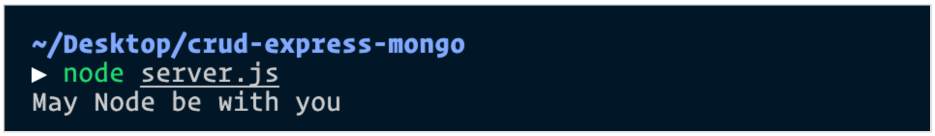
The simplest way to use node is to run the `node` command, and specify a path to a file. Let's create a file called `server.js` to run node with.

```
touch server.js
```

Next, put this a `console.log` statement into `server.js`. This lets us know whether Node is running properly.

```
// server.js
console.log('May Node be with you')
```

Now, run `node server.js` in your command line and you should see this:



```
~/Desktop/crud-express-mongo
▶ node server.js
May Node be with you
```

Great. Node works. The next step is to learn to use Express.

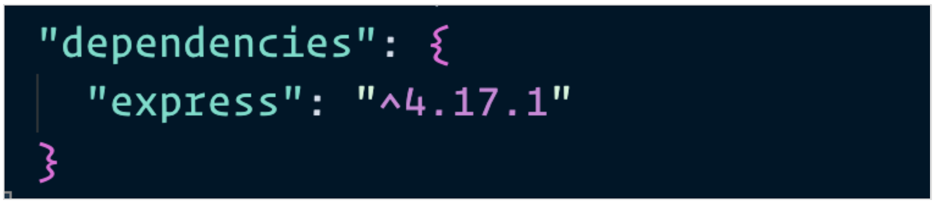
Using Express

First, we have to install Express. We can do this by running the `npm install` command. (`npm` is installed with Node, which is why you use commands like `npm init` and `npm install`).

Run `npm install express --save` command in your command line.

The `--save` flag saves `express` as a `dependency` in `package.json`. It's important to know these dependencies because `npm` can retrieve dependencies with another `npm install` command when you need it later.

```
npm install express --save
```



```
"dependencies": {
  "express": "^4.17.1"
}
```

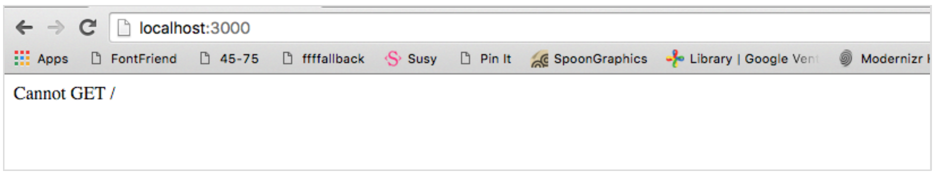
Next, we use express in `server.js` by requiring it.

```
const express = require('express');
const app = express();
```

We need to create a server that browsers can connect to. We do this by using the Express's `listen` method.

```
app.listen(3000, function() {
  console.log('listening on 3000')
})
```

Now, run `node server.js` and navigate to `localhost:3000` on your browser. You should see a message that says `cannot get /`.



Cannot GET /

That's a good sign. It means we can now communicate to our express server through the browser. This is where we begin CRUD operations.

CRUD - READ

Browsers perform the READ operation when you visit a website. Under the hood, they send a GET request to the server to perform this READ operation.

You see `cannot get /` because our server sent nothing back to the browser.

In Express, we handle a GET request with the `get` method:

```
app.get(endpoint, callback)
```

`endpoint` is the requested endpoint. It's the value that comes after your domain name. Here are some examples:

- When you visit `localhost:3000`, you're actually visiting `localhost:3000/`. In this case, browsers requested for `/`.
- You're reading this article on `https://zellwk.com/blog/crud-express-mongodb/`. The domain name is `zellwk.com`. The requested endpoint is anything that comes after `zellwk.com` (which is `/blog/crud-express-mongodb`).

`callback` tells the server what to do when the requested endpoint matches the endpoint stated. It takes two arguments: A `request` object and a `response` object.

```
// We normally abbreviate `request` to `req` and `response` to
`res`.
app.get('/', function (req, res) {
  // do something here
})
```

For now, let's write `Hello World` back to the browser. We do so by using a `send` method that comes with the `response` object:

```
app.get('/', function(req, res) {
  res.send('Hello World')
})
```

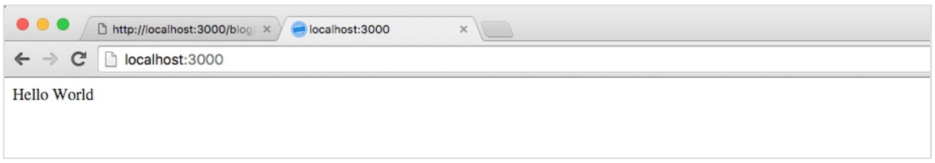
I'm going to start writing in ES6 code and show you how to convert to ES6 along the way as well. First off, I'm replacing `function()` with an [ES6 arrow function](). The below code is the same as the above code:

```
app.get('/', (req, res) => {
  res.send('Hello World')
})
```

Now, restart your server by doing the following:

1. Stop the current server by hitting `CTRL + C` in the command line.
2. Run `node server.js` again.

Then, navigate to `localhost:3000` on your browser. You should be able to see a string that says "Hello World".



Hello World

Great.

Next, let's change `server.js` so we serve up an `index.html` page back to the browser. To do this, we use the `sendFile` method that's provided by the `res` object.

```
app.get('/', (req, res) => {
  res.sendFile(__dirname + '/index.html')
  // Note: __dirname is directory current directory you're in. Try logging it and see what you get!
  // Mine was '/Users/zellwk/Projects/demo-repos/crud-express-mongo' for this app.
})
```

In the `sendFile` method above, we told Express to serve an `index.html` file that can be found in the root of your project folder. We don't have that file yet. Let's make it now.

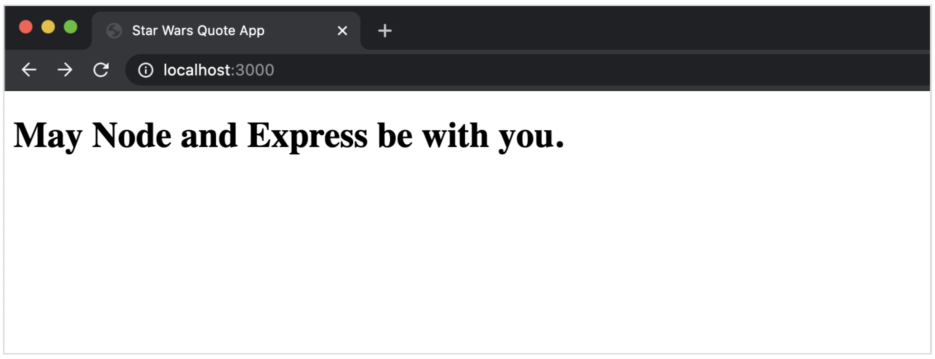
```
touch index.html
```

Let's put some text in our `index.html` file as well:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>MY APP</title>
</head>
<body>
  <h1> May Node and Express be with you. </h1>
</body>
```

```
</html>
```

Restart your server and refresh your browser. You should be able to see your HTML file now.



May Node and Express be with you.

This is how Express handles a GET request (READ operation) in a nutshell.

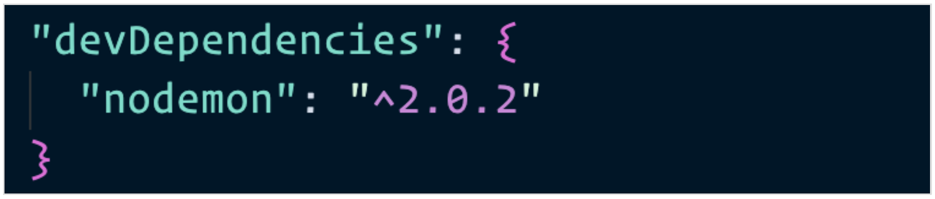
At this point, you probably have realized that you need to restart your server whenever you make a change to `server.js`. This is process is incredibly tedious, so let's take a quick detour and streamline it by using a tool called nodemon.

Enter Nodemon

Nodemon restarts the server automatically when you save a file that's used by the `server.js`. We can install Nodemon with the following command:

```
$ npm install nodemon --save-dev
```

We use a `--save-dev` flag here because we only use Nodemon when we are developing stuff. We won't use Nodemon on an actual server. `--save-dev` here adds Nodeman as a `devDependency` in the `package.json` file.



```
"devDependencies": {
  "nodemon": "^2.0.2"
}
```

Nodemod behaves like Node. So you can run `nodemon server.js` and you'd expect to see the same thing. Unfortunately, this only works if you've installed nodemon globally with the `-g` flag (and we didn't do this).

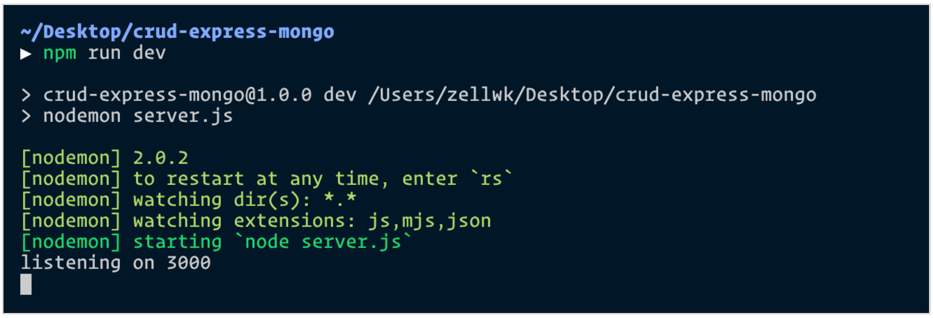
We have other ways to run Nodemon. For example, you can execute Nodemon directly from the `node_modules` folder. This is super unweildy, but it works:

```
./node_modules/.bin/nodemon server.js
```

We can make things simpler by adding `script` key in the `package.json` file. This lets us run `nodemon server.js` without the `./node_modules...` preamble.

```
{
  // ...
  "scripts": {
    "dev": "nodemon server.js"
  }
  // ...
}
```

Now, you can run `npm run dev` to trigger `nodemon server.js`.



```
~/Desktop/crud-express-mongo
▶ npm run dev

> crud-express-mongo@1.0.0 dev /Users/zellwk/Desktop/crud-express-mongo
> nodemon server.js

[nodemon] 2.0.2
[nodemon] to restart at any time, enter `rs`
[nodemon] watching dir(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting `node server.js`
listening on 3000
```

Back to the main topic. We're going to cover the CREATE operation next.

CRUD - CREATE

Browsers can only perform a CREATE operation if they send POST request to the server. This `POST` request can be triggered through JavaScript or through a `<form>` element.

Let's figure out how to use a `<form>` element to create new entries for this Star Wars quote application for now. We'll examine how to send requests via JavaScript later.

To send a POST request through a `<form>`, you need to add the `<form>` element to your `index.html` file.

You need three things on this form element:

1. An `action` attribute
2. A `method` attribute
3. `name` attributes on each `<input>` elements within the form

```
<form action="/quotes" method="POST">
  <input type="text" placeholder="name" name="name">
  <input type="text" placeholder="quote" name="quote">
  <button type="submit">Submit</button>
</form>
```

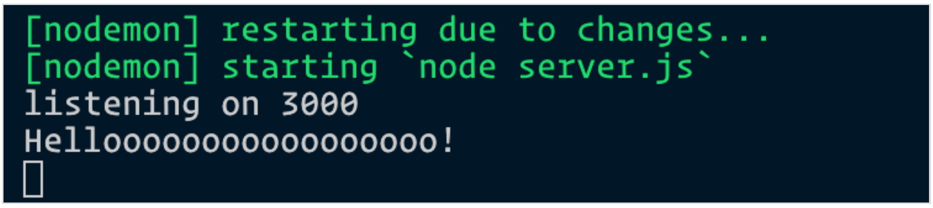
The `method` tells browsers what kind of request to send. In this case, we use `POST` because we're sending a `POST` request.

The `action` attribute tells the browser where to send the `POST` request. In this case, we're send the `POST` request to `/quotes`.

We can handle this `POST` request with a `post` method in `server.js`. The `path` path should be the value you placed in the `action` attribute.

```
app.post('/quotes', (req, res) => {
  console.log('Helloooooooooooooooo!')
})
```

Restart your server (hopefully you've set up Nodemon so it restarts automatically) and refresh your browser. Then, enter something into the `<form>` element and submit the form. Next, look at your command line. You should see `Helloooooooooooooooo!` in your command line.



```
[nodemon] restarting due to changes...
[nodemon] starting `node server.js`
listening on 3000
Helloooooooooooooooo!
```

Great, we know that Express is handling the form for us right now. The next question is, how do we get the input values with Express?

Turns out, Express doesn't handle reading data from the `<form>` element on it's own. We have to add another package called body-parser to gain this functionality.

```
npm install body-parser --save
```

Body-parser is a middleware. They help to tidy up the `request` object before we use them. Express lets us use middleware with the `use` method.

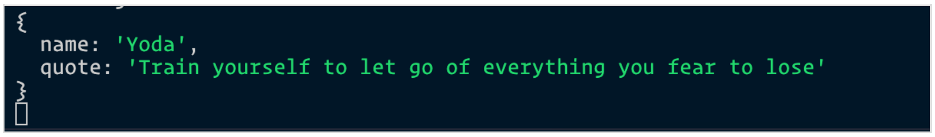
```
const express = require('express')
const bodyParser= require('body-parser')
const app = express()

// Make sure you place body-parser before your CRUD handlers!
app.use(bodyParser.urlencoded({ extended: true }))

// All your handlers here...
app.get('/', (req, res) => {/*...*/})
app.post('/quotes', (req, res) => {/*...*/})
```

The `urlencoded` method within body-parser tells body-parser to extract data from the `<form>` element and add them to the `body` property in the `request` object.

You should be able to see values from the `<form>` element inside `req.body` now. Try doing a `console.log` and see what it is!

```
app.post('/quotes', (req, res) => {
  console.log(req.body)
})
```

You should see an object similar to the following:



```
{
  name: 'Yoda',
  quote: 'Train yourself to let go of everything you fear to lose'
}
```

Hmmm.

Master Yoda has spoken! Let's make sure we remember Yoda's words. It's important. We want to be able to retrieve it the next time we load our index page.

Enter the database, MongoDB.

MongoDB

MongoDB is a database. We can store information into this database to remember Yoda's words. Then, we can retrieve this information and display to people who view our app.

I normally use Mongoose (which is a framework for MongoDB) when I use MongoDB. I'll teach you how to use basic MongoDB in this article. If you want to learn Mongoose, consider reading my article on Mongoose.

First, we need to install MongoDB via npm.

```
npm install mongodb --save
```

Once installed, we can connect to MongoDB through the `MongoClient`'s connect method as shown in the code below:

```
const MongoClient = require('mongodb').MongoClient
```

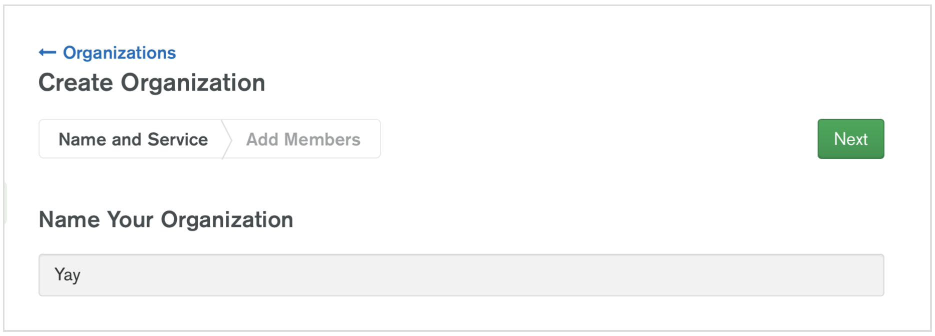
```
MongoClient.connect('mongodb-connection-string', (err, client)
=> {
  // ... do something here
})
```

The next part is to get the correct link to our database. Most people store their databases on cloud services like MongoDB Atlas. We're going to do same as well. (It's free).

You can also create a database on your computer for development work. Read "How to setup a local MongoDB Connection" for instructions.

Setting up MongoDB Atlas

Go ahead and create an account on MongoDB Atlas . Once you're done, you need to create an "Organization". It's sort of like a company name. You can name it anything you want. (You can change it later).


← Organizations

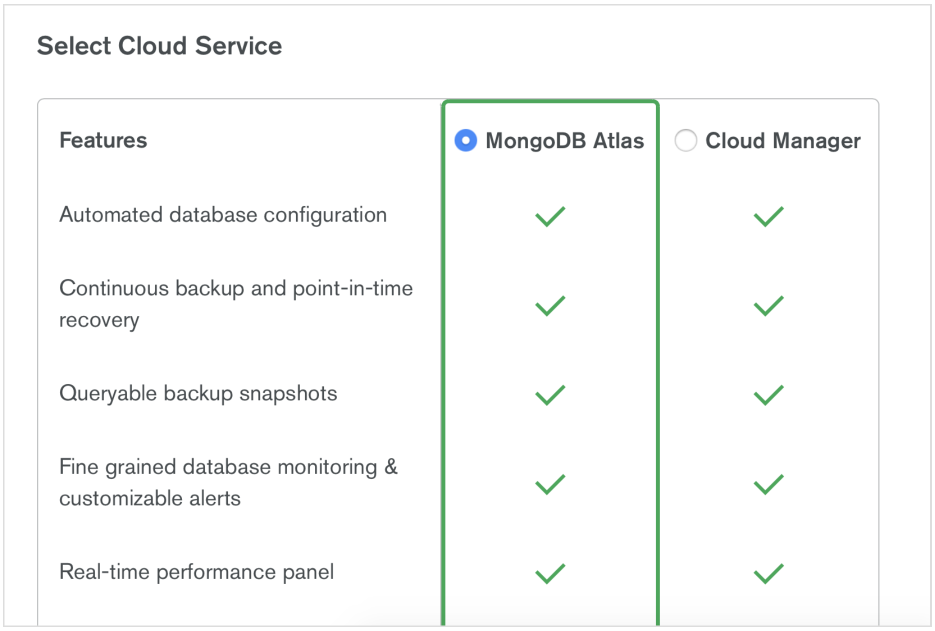
Create Organization

Name and Service 〉 Add Members — Next

Name Your Organization

Yay

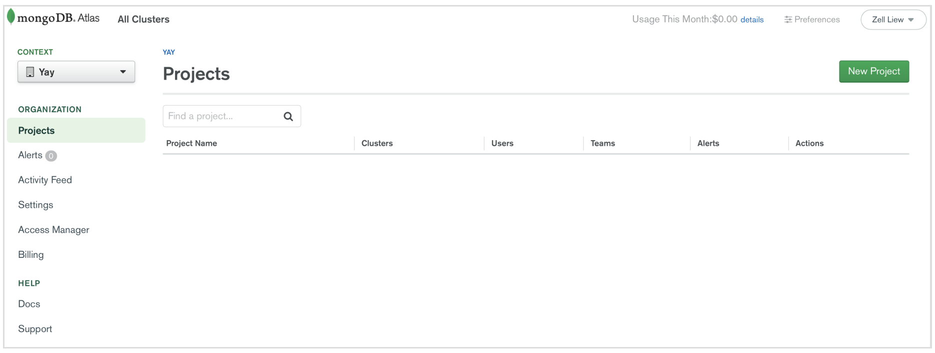
You also need to select a cloud service. Go ahead with MongoDB Atlas in this case.


Select Cloud Service

Features	● MongoDB Atlas	○ Cloud Manager
Automated database configuration	✓	✓
Continuous backup and point-in-time recovery	✓	✓
Queryable backup snapshots	✓	✓
Fine grained database monitoring & customizable alerts	✓	✓
Real-time performance panel	✓	✓

Next, you need to set permissions for users. MongoDB Atlas will automatically fill up your current email address as the user. So just continue to the next step.

You should end up with a screen that looks like this:


mongoDB. Atlas   All Clusters   Usage This Month:$0.00 details   Preferences   Zell Liew ▾

CONTEXT: Yay

ORGANIZATION: Projects, Alerts 0, Activity Feed, Settings, Access Manager, Billing

HELP: Docs, Support

YAY

Projects — New Project

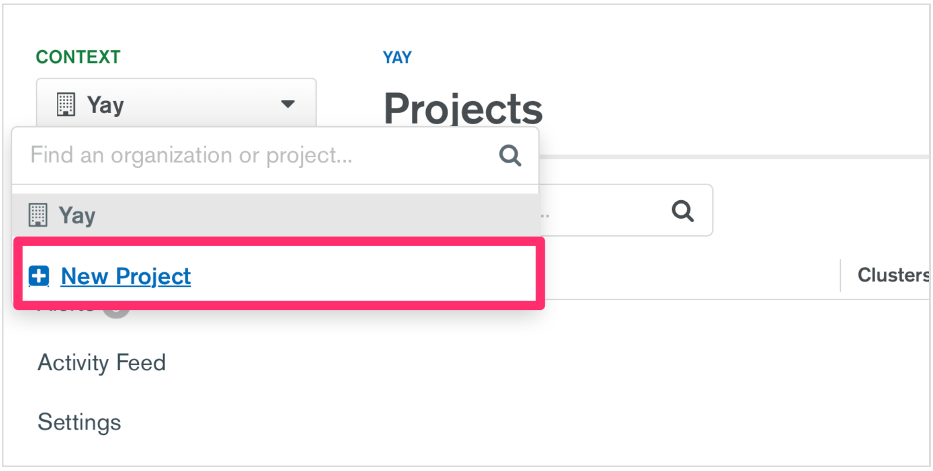
Find a project...

Project Name	Clusters	Users	Teams	Alerts	Actions

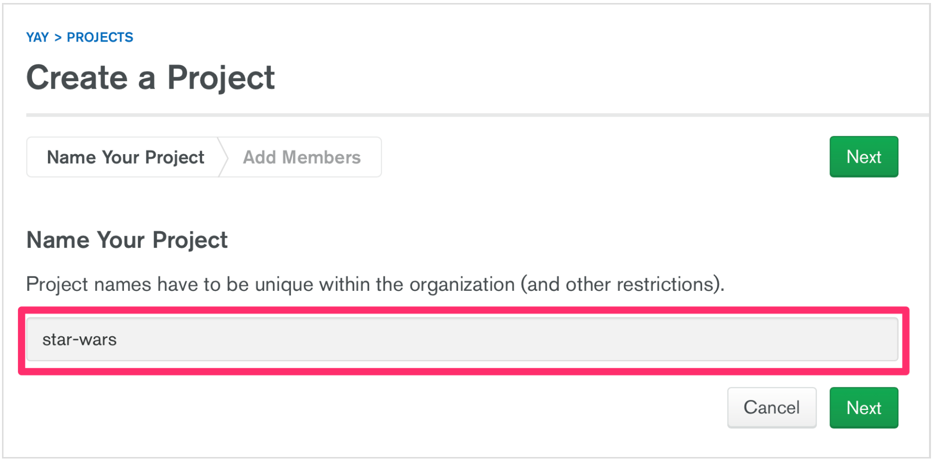
Next, you need to create a Database in MongoDB Atlas. There are several steps to do this.

First, you need to create a new Project. You can do this by going under "Context" in the top left hand menu. Click the Dropdown. Then, select New

Project.



Next, you will need to name your project. Call it anything you want. I'm going to call this `star-wars`.

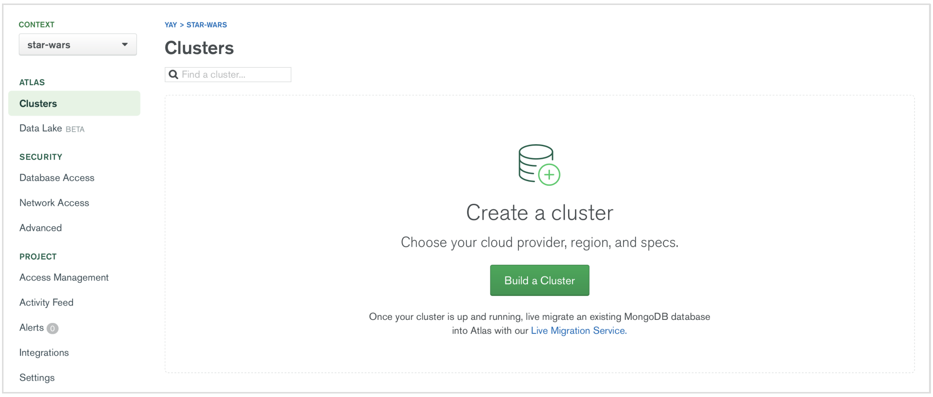


Project names have to be unique within the organization (and other restrictions).

star-wars

Then, you will need to add members. Again, you're already added so go ahead and click "Create Project" to move on.

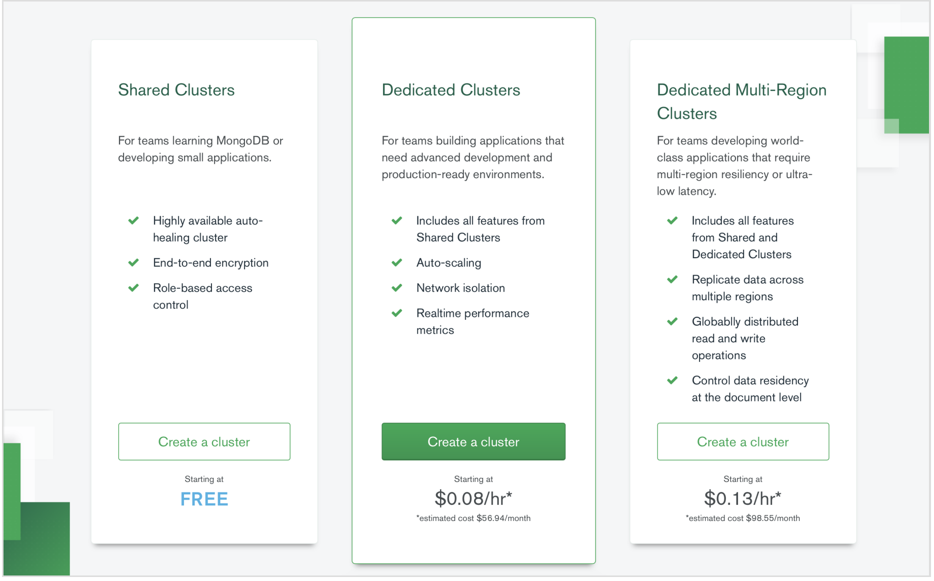
You should end up with a screen that says Create a Cluster.



Choose your cloud provider, region, and specs.

Once your cluster is up and running, live migrate an existing MongoDB database into Atlas with our Live Migration Service.

Click on "Build a Cluster". You should see this screen:


Shared Clusters

For teams learning MongoDB or developing small applications.

- Highly available auto-healing cluster
- End-to-end encryption
- Role-based access control

Create a cluster

Starting at FREE

Dedicated Clusters

For teams building applications that need advanced development and production-ready environments.

- Includes all features from Shared Clusters
- Auto-scaling
- Network isolation
- Realtime performance metrics

Create a cluster

Starting at $0.08/hr*

*estimated cost $56.94/month

Dedicated Multi-Region Clusters

For teams developing world-class applications that require multi-region resiliency or ultra-low latency.

- Includes all features from Shared and Dedicated Clusters
- Replicate data across multiple regions
- Globablly distributed read and write operations
- Control data residency at the document level

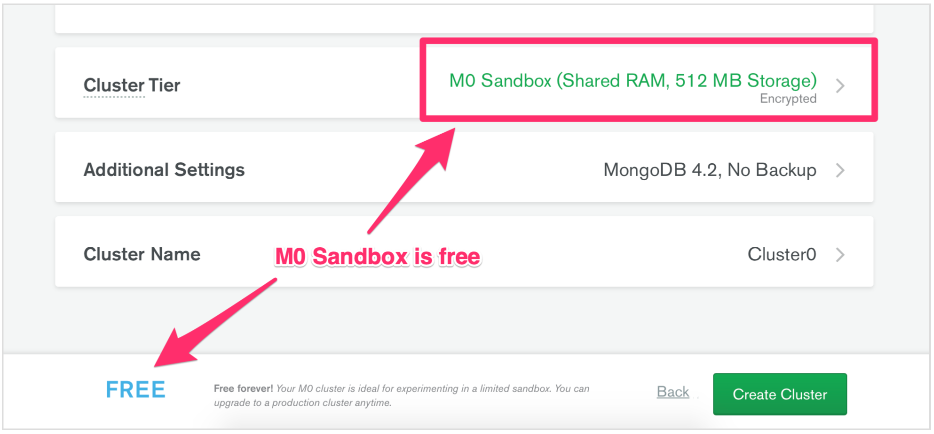
Create a cluster

Starting at $0.13/hr*

*estimated cost $98.55/month

Select the free cluster (left option) and continue. You should now see a screen to configure a cluster. Scroll down. Make sure you see these two things:

1. Cluster Tier is Mo Sandbox
2. Monthly Estimate is FREE


Cluster Tier: M0 Sandbox (Shared RAM, 512 MB Storage) Encrypted

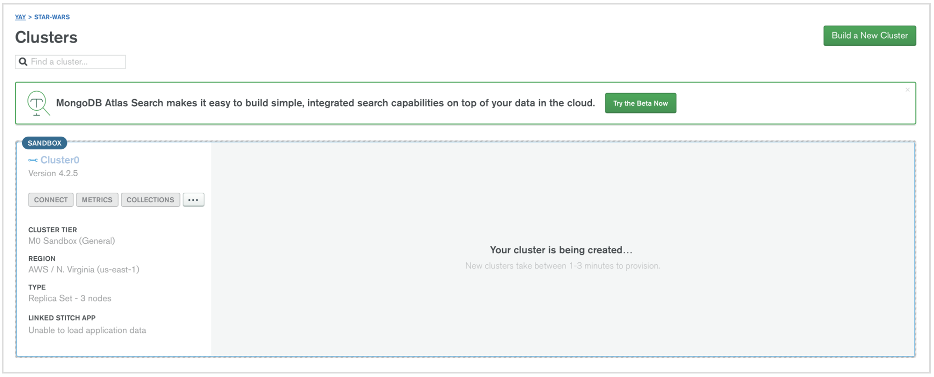
Additional Settings: MongoDB 4.2, No Backup

Cluster Name: Cluster0

FREE

Free forever! *Your M0 cluster is ideal for experimenting in a limited sandbox. You can upgrade to a production cluster anytime.*

Click on Create cluster next. You should see “Your cluster is being created”.


YAY > STAR-WARS

Clusters

MongoDB Atlas Search makes it easy to build simple, integrated search capabilities on top of your data in the cloud.

SANDBOX

Cluster0

Version 4.2.5

CLUSTER TIER
M0 Sandbox (General)

REGION
AWS / N. Virginia (us-east-1)

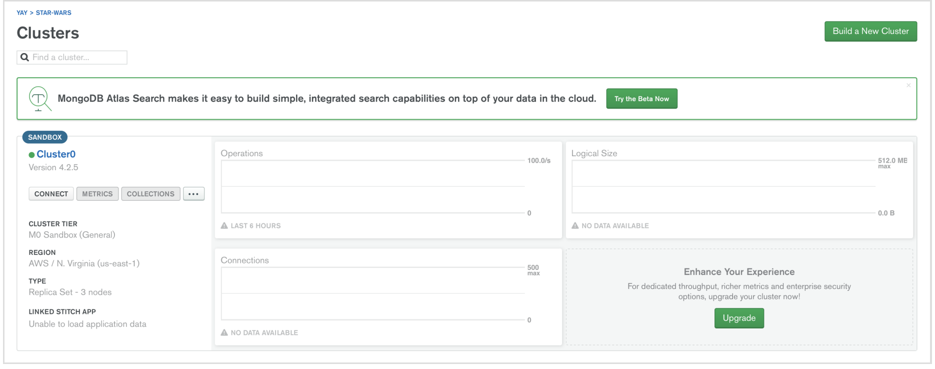
TYPE
Replica Set - 3 nodes

LINKED STITCH APP
Unable to load application data

Your cluster is being created…

New clusters take between 1-3 minutes to provision.

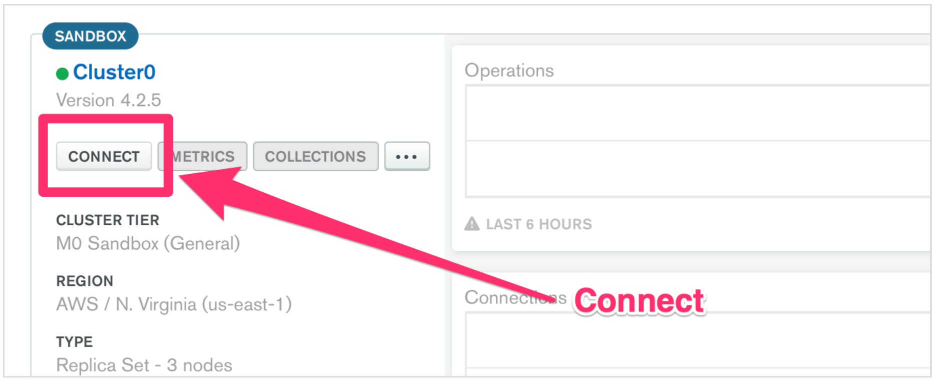
You have to wait for approximately 5 minutes for the cluster creation. When the cluster is ready, you’ll see this:



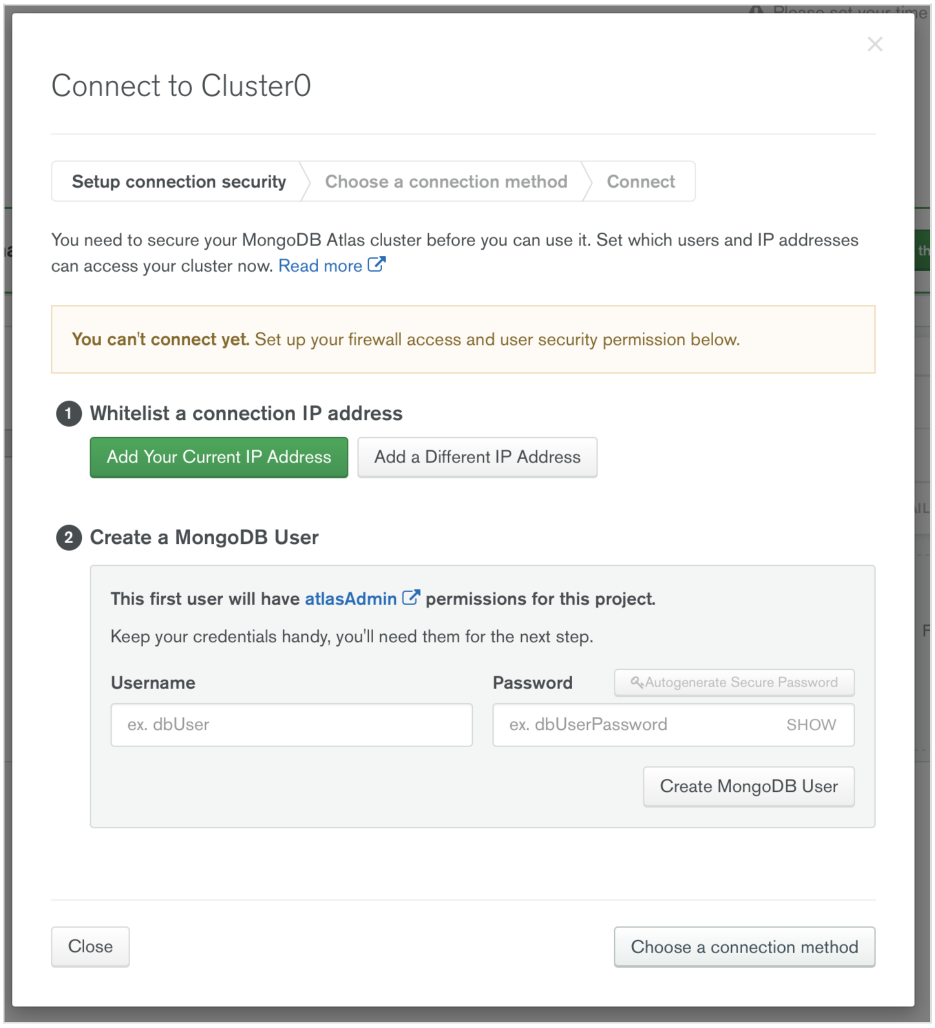
Now, we need to connect our Star Wars app with this cluster.

Connecting to MongoDB Atlas

Click on the Connect button.



A modal should pop up.



Connect to Cluster0

Setup connection security | Choose a connection method | Connect

You need to secure your MongoDB Atlas cluster before you can use it. Set which users and IP addresses can access your cluster now. Read more

You can't connect yet. Set up your firewall access and user security permission below.

1 Whitelist a connection IP address

Add Your Current IP Address | Add a Different IP Address

2 Create a MongoDB User

This first user will have atlasAdmin permissions for this project.

Keep your credentials handy, you'll need them for the next step.

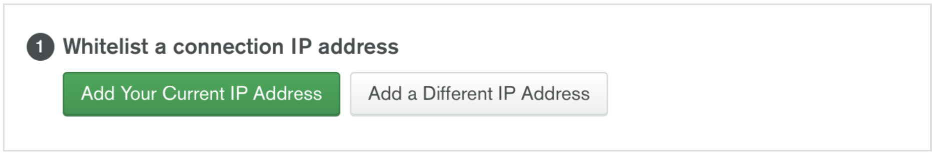
Username	Password
ex. dbUser	ex. dbUserPassword SHOW

Autogenerate Secure Password

Create MongoDB User

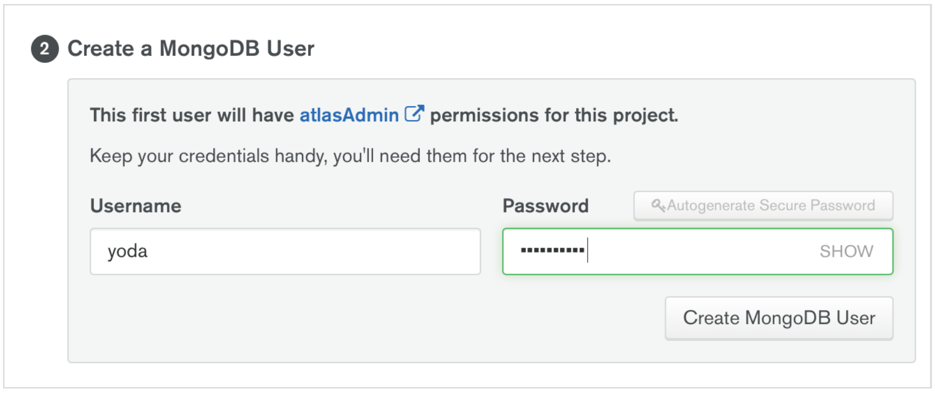
Close | Choose a connection method

You need to whitelist your IP address before you can connect to your cluster. This is a security feature built into MongoDB Atlas. Go ahead and click "Add your Current IP Address".


1 Whitelist a connection IP address
Add Your Current IP Address
Add a Different IP Address

Next, you need to create a MongoDB user. This username and password is different from the one you used to login to MongoDB Atlas. This username and password is used ONLY for the database.

Make sure you remember MongoDB user and password. We'll use it to connect to the database.


2 Create a MongoDB User

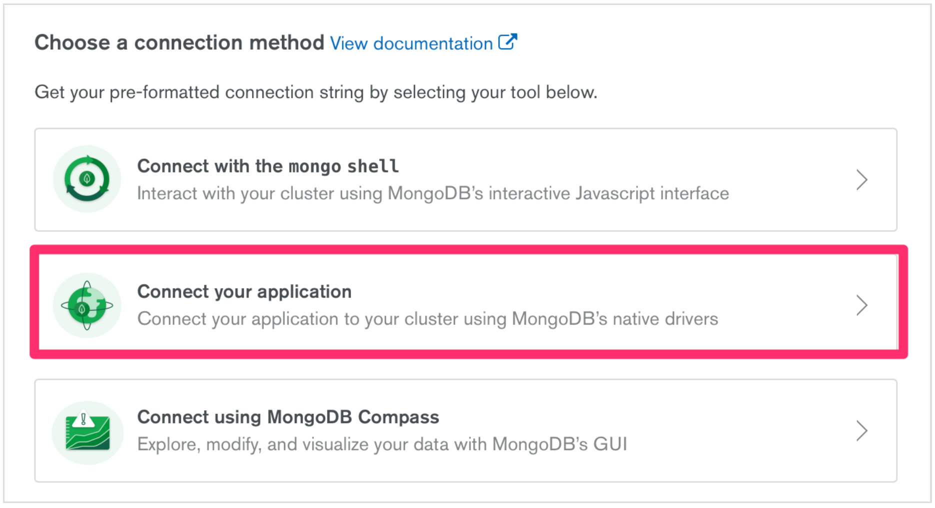
This first user will have atlasAdmin permissions for this project.

Keep your credentials handy, you'll need them for the next step.

Username: yoda

Password: ••••••••••

Next, click on choose your connection method. Select "Connect to your application" and copy the connection string.

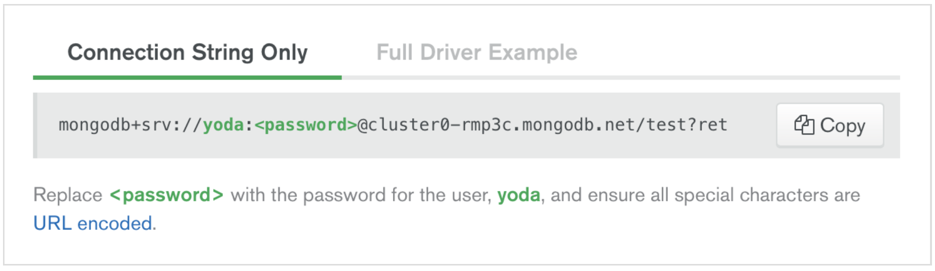

Choose a connection method View documentation

Get your pre-formatted connection string by selecting your tool below.

Connect with the mongo shell
Interact with your cluster using MongoDB's interactive Javascript interface

Connect your application
Connect your application to your cluster using MongoDB's native drivers

Connect using MongoDB Compass
Explore, modify, and visualize your data with MongoDB's GUI



```
mongodb+srv://yoda:<password>@cluster0-rmp3c.mongodb.net/test?ret
```

Replace <password> with the password for the user, yoda, and ensure all special characters are URL encoded.

The connection string should look something like this:

```
'mongodb+srv://<username>:<password>@<clustername>-
rmp3c.mongodb.net/test?retryWrites=true&w=majority'
```

You need to replace 2 things here:

1. Replace `<username>` with your Database username
2. Replace `<password>` with the Database user's password

The `test` in the connection string points to a `test` database. You would need to replace `test` with the name of your database if you use Mongoose. You can leave it as `test` if you use MongoClient like what we're doing in this tutorial.

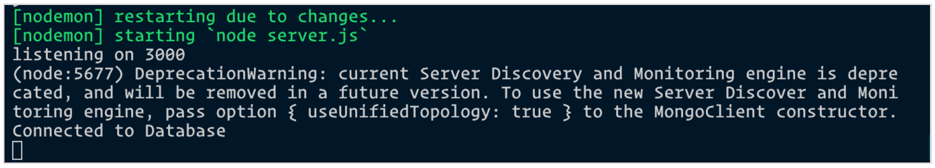
Put this connection string inside the `MongoClient.connect` .

```
MongoClient.connect(connectionString, (err, client) => {
  // ... do something here
}))
```

We know we've connected to the database if there are no errors. Let's create `console.log` statement that says "Connected to database". This will help us know we've connected to the database when we restart the server.

```
MongoClient.connect(connectionString, (err, client) => {
  if (err) return console.error(err)
  console.log('Connected to Database')
})
```

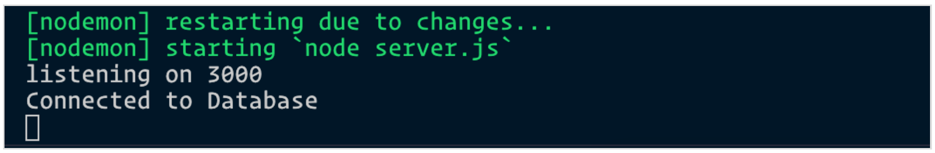
You should see something like this:



```
[nodemon] restarting due to changes...
[nodemon] starting `node server.js`
listening on 3000
(node:5677) DeprecationWarning: current Server Discovery and Monitoring engine is depre
cated, and will be removed in a future version. To use the new Server Discover and Moni
toring engine, pass option { useUnifiedTopology: true } to the MongoClient constructor.
Connected to Database
```

You can remove the deprecation warning by adding the option into `MongoClient.connect`

```
MongoClient.connect(connectionString, {
  useUnifiedTopology: true
}, (err, client) => {
  if (err) return console.error(err)
  console.log('Connected to Database')
})
```



```
[nodemon] restarting due to changes...
[nodemon] starting `node server.js`
listening on 3000
Connected to Database
```

MongoDB supports promises. If you want to use promises instead of callbacks, you can write `MongoClient.connect` like this. It behaves exactly like the code above.

```
MongoClient.connect(connectionString, { useUnifiedTopology: true
})
  .then(client => {
    console.log('Connected to Database')
  })
  .catch(error => console.error(error))
```

Read this article if you want to learn about promises in JavaScript.

Changing the Database

We need to change the database from `test` to something else. You can name it anything you want. I chose name my new database `star-wars-quotes` because it helps me remember what I'm building.

```
MongoClient.connect(connectionString, { useUnifiedTopology: true
})
  .then(client => {
    console.log('Connected to Database')
    const db = client.db('star-wars-quotes')
  })
```

MongoDB and Server

We need the `db` variable from the connection to to access MongoDB. This means we need to put our express request handlers into the MongoClient's `then` call.

```
MongoClient.connect(/* ... */)
  .then(client => {
    // ...
    const db = client.db('star-wars-quotes')
    app.use(/* ... */)
    app.get(/* ... */)
    app.post(/* ... */)
    app.listen(/* ... */)
  })
  .catch(console.error)
```

We can finally store Yoda's quote into the database now!

CRUD - CREATE (continued)

We need to create a `collection` before we can store items into a database. Here's a simple analogy to help you clear up the terms in MongoDB:

- Imagine a Database is a Room.
- A Room contains boxes (`collections`).

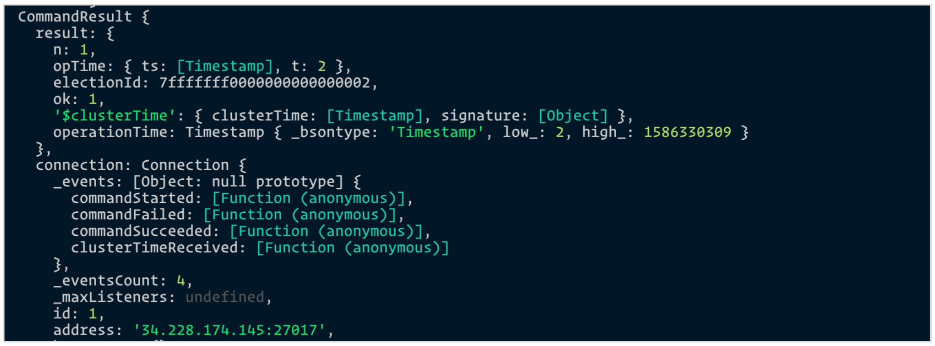
Like Databases, you can name collections anything you want. In this case, let's store quotes into a `quotes` collection. We use `db.collection` to specify the collection.

```
MongoClient.connect(/* ... */)
  .then(client => {
    // ...
    const db = client.db('star-wars-quotes')
    const quotesCollection = db.collection('quotes')

    // ...
  })
```

We can use the `insertOne` method to add items into a MongoDB collection.

```
app.post('/quotes', (req, res) => {
  quotesCollection.insertOne(req.body)
    .then(result => {
      console.log(result)
    })
    .catch(error => console.error(error))
})
```

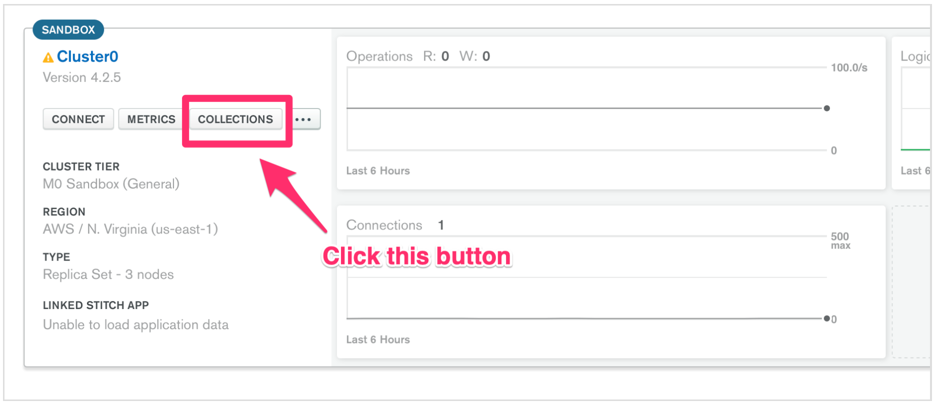
Try submitting the `<form>` from the browser. You should see a big scary looking `result` in the Terminal.



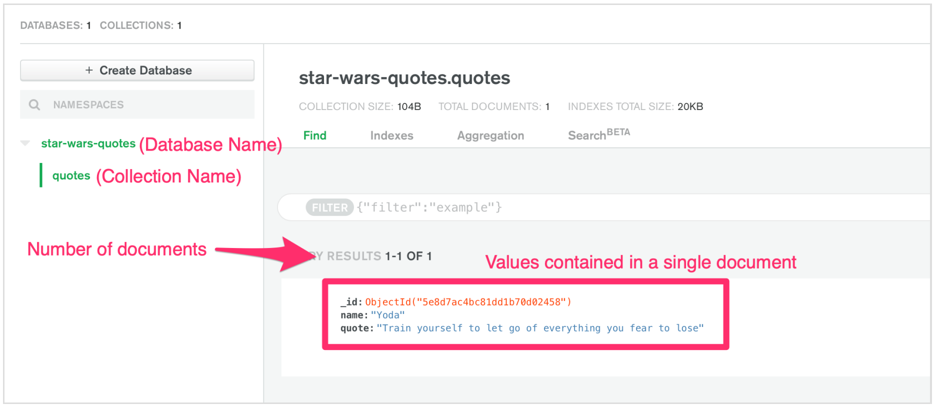
```
CommandResult {
  result: {
    n: 1,
    opTime: { ts: [Timestamp], t: 2 },
    electionId: 7fffffff0000000000000002,
    ok: 1,
    '$clusterTime': { clusterTime: [Timestamp], signature: [Object] },
    operationTime: Timestamp { _bsontype: 'Timestamp', low_: 2, high_: 1586330309 }
  },
  connection: Connection {
    _events: [Object: null prototype] {
      commandStarted: [Function (anonymous)],
      commandFailed: [Function (anonymous)],
      commandSucceeded: [Function (anonymous)],
      clusterTimeReceived: [Function (anonymous)]
    },
    _eventsCount: 4,
    _maxListeners: undefined,
    id: 1,
    address: '34.228.174.145:27017',
```

If you see this, congratulations! You've successfully add the quote into the database.

You can check the items inside the database by going to "Collections" in MongoDB Atlas.

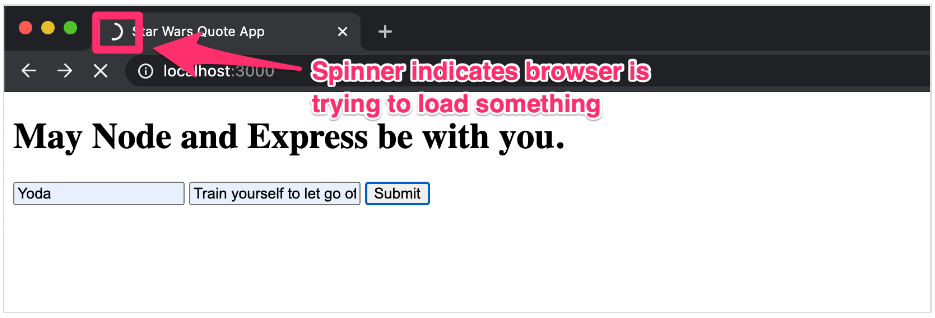


You should see a document in your database. (Each database entry is called a document).


DATABASES: 1 COLLECTIONS: 1
+ Create Database
NAMESPACES
star-wars-quotes (Database Name)
quotes (Collection Name)
star-wars-quotes.quotes
COLLECTION SIZE: 104B TOTAL DOCUMENTS: 1 INDEXES TOTAL SIZE: 20KB
Find
Indexes
Aggregation
Search BETA
FILTER {"filter":"example"}
Number of documents
RESULTS 1-1 OF 1
Values contained in a single document

```
_id: ObjectId("5e8d7ac4bc81dd1b70d02458")
name: "Yoda"
quote: "Train yourself to let go of everything you fear to lose"
```

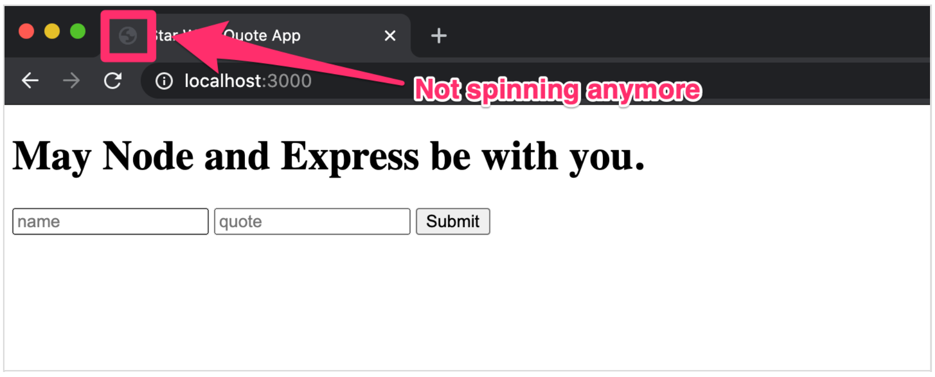
If you go back to the Browser, you'll see it's still trying to load something.


Star Wars Quote App
localhost:3000
Spinner indicates browser is trying to load something
May Node and Express be with you.
Yoda
Train yourself to let go of
Submit

This happens because the browser expects something back from the server.

In this case, we don't need to send the browser information. Let's ask the browser to redirect back to `/` instead. We do this with `res.redirect`.

```
app.post('/quotes', (req, res) => {
  quotesCollection.insertOne(req.body)
    .then(result => {
      res.redirect('/')
    })
    .catch(error => console.error(error))
})
```



Yay!

Since we have some quotes in the collection, let's show them to our user when they land on the page!

Showing quotes to users (READ operation)

We need to do two things to show quotes from MongoDB Atlas to our users.

1. Get quotes from MongoDB Atlas.
2. Rendering the quotes in HTML with a template engine

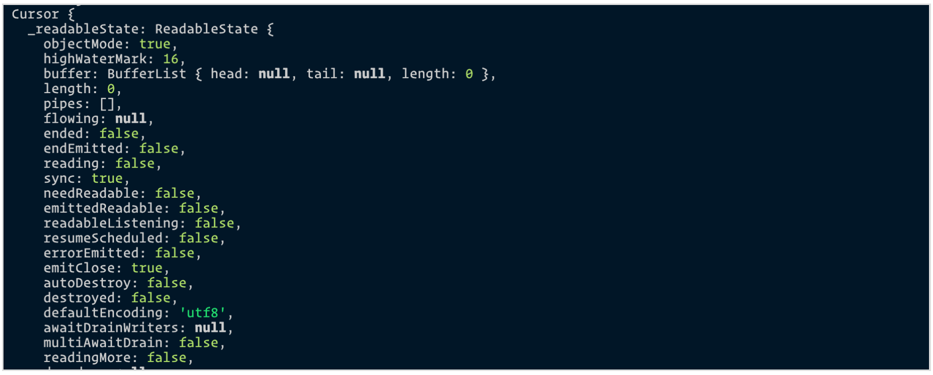
Let's go one step at a time.

Getting quotes from MongoDB

We can get quotes we stored in MongoDB with the `find` method. This method from mLab by using the `find` method that's available in the `collection` method.

```
app.get('/', (req, res) => {
  const cursor = db.collection('quotes').find()
  console.log(cursor)
  // ...
})
```

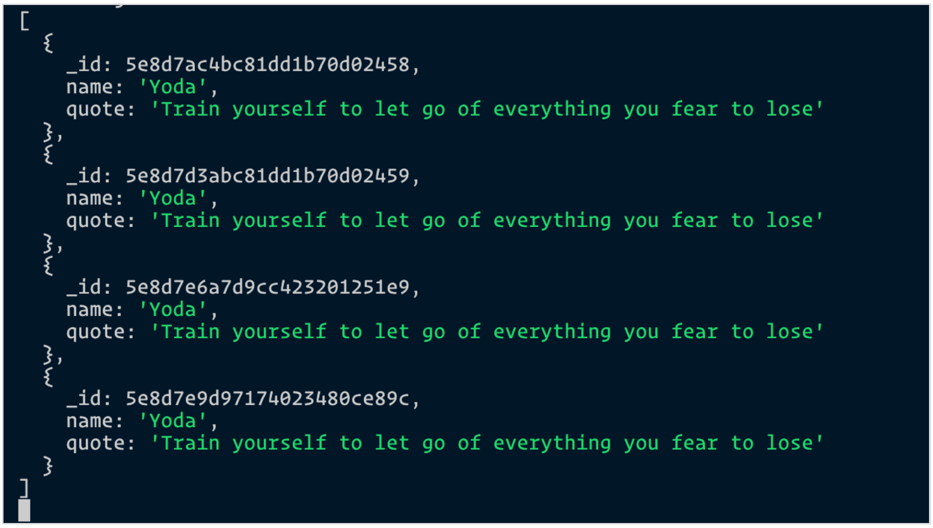
The `find` method returns a `cursor` which won't make sense if you tried logging it.



```
Cursor {
  _readableState: ReadableState {
    objectMode: true,
    highWaterMark: 16,
    buffer: BufferList { head: null, tail: null, length: 0 },
    length: 0,
    pipes: [],
    flowing: null,
    ended: false,
    endEmitted: false,
    reading: false,
    sync: true,
    needReadable: false,
    emittedReadable: false,
    readableListening: false,
    resumeScheduled: false,
    errorEmitted: false,
    emitClose: true,
    autoDestroy: false,
    destroyed: false,
    defaultEncoding: 'utf8',
    awaitDrainWriters: null,
    multiAwaitDrain: false,
    readingMore: false,
```

But this `cursor` object contains all quotes from our database! It has a bunch of method that lets us get our data. For example, we can use `toArray` to convert the data into an array.

```
app.get('/', (req, res) => {
  db.collection('quotes').find().toArray()
    .then(results => {
      console.log(results)
    })
    .catch(error => console.error(error))
  // ...
})
```



```
[
  {
    _id: 5e8d7ac4bc81dd1b70d02458,
    name: 'Yoda',
    quote: 'Train yourself to let go of everything you fear to lose'
  },
  {
    _id: 5e8d7d3abc81dd1b70d02459,
    name: 'Yoda',
    quote: 'Train yourself to let go of everything you fear to lose'
  },
  {
    _id: 5e8d7e6a7d9cc423201251e9,
    name: 'Yoda',
    quote: 'Train yourself to let go of everything you fear to lose'
  },
  {
    _id: 5e8d7e9d97174023480ce89c,
    name: 'Yoda',
    quote: 'Train yourself to let go of everything you fear to lose'
  }
]
```

Great! We see the quotes we added! (You see so many of the same quotes because I added them all when writing this tutorial 🅰🅰).

Next we want to generate a HTML that contains all our quotes.

Rendering the HTML

We cannot serve up the `index.html` file and expect quotes to magically appear because there's no way to add dynamic content to a HTML file.

What we can do, instead, is to use a template engine to generate the HTML. Popular template engines include Pug, Embedded JavaScript, and Nunjucks.

I've wrote extensively about the how and why of template engines in a separate post. You might want to check it out if you have no idea what template engines are.
I use Nunjucks as my template engine of choice. Feel free to check out the post to find out why.

For this tutorial, we will use Embedded JavaScript (EJS) as our template engine because it's the easiest to start with. You'll find it familiar from the get-go since you'll be writing HTML and JavaScript.

Using EJS

First, we need to install EJS.

```
npm install ejs --save
```

Next, we need to set `view engine` to `ejs`. This tells Express we're using EJS as the template engine. You can need to place it before any `app.use`, `app.get` or `app.post` methods.

```
app.set('view engine', 'ejs')

// Middlewares and other routes here...
```

We can now generate HTML that contains the quotes. This process is called rendering the HTML.

We will use the `render` method built into Express's `response`. It needs to follow the following syntax:

```
res.render(view, locals)
```

- `view` is the name of the file we're rendering. This file must be placed inside a `views` folder.
- `locals` is the data passed into the file.

Let's create a view. We'll make an `index.ejs` file inside the views folder.

```
mkdir views
touch views/index.ejs
```

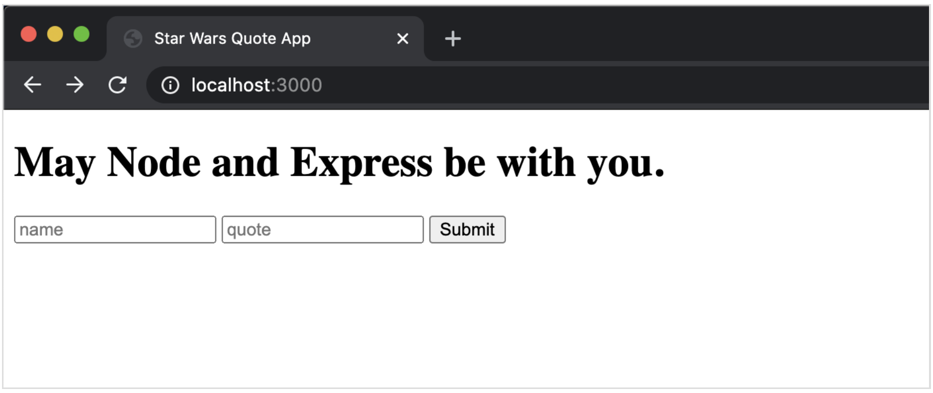
We'll copy/paste everything from `index.html` into `index.ejs`.

```
<!-- index.ejs -->
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <title>Star Wars Quote App</title>
  </head>

  <body>
    <h1>May Node and Express be with you.</h1>

    <form action="/quotes" method="POST">
      <input type="text" placeholder="name" name="name" />
      <input type="text" placeholder="quote" name="quote" />
      <button type="submit">Submit</button>
    </form>
  </body>
</html>
```

Next, we'll use `res.render` to render this `index.ejs` file.

```
app.get('/', (req, res) => {
  db.collection('quotes').find().toArray()
    .then(/* ... */)
    .catch(/* ... */)
  res.render('index.ejs', {})
})
```

If you refresh the page, you should still see the same thing. Nothing should change, nothing should break.



May Node and Express be with you.

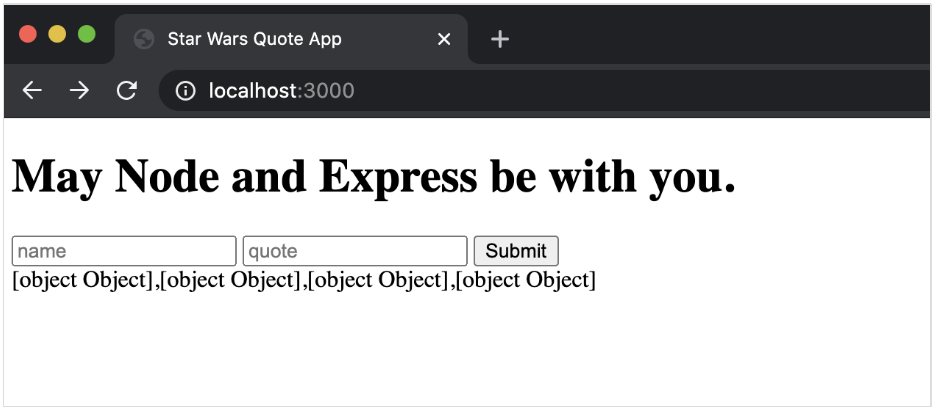
Let's put the quotes into `index.ejs`. To do this, we need to pass the quotes into the `render` method.

```
app.get('/', (req, res) => {
  db.collection('quotes').find().toArray()
    .then(results => {
      res.render('index.ejs', { quotes: results })
    })
    .catch(/* ... */)
})
```

In `index.ejs`, we can use place variables between `<%=` and `%>` tags. Let's try putting `quotes` into the HTML:

```
<!-- In index.ejs -->
<body>
  <h1> ... </h1>
  <form> ... </form>
  <%= quotes %>
</body>
```

You should see this:



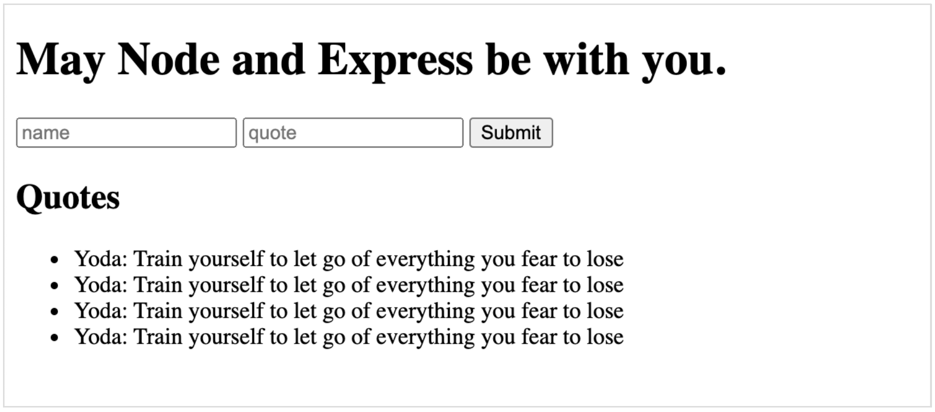
May Node and Express be with you.

[object Object],[object Object],[object Object],[object Object]

We see lots of `[object Object]` because each quote inside `results` is a JavaScript object. `ejs` cannot convert that object into HTML automatically.

We need to loop through the quotes. We can do this with a `for` loop. In EJS, we write a for loop like how we write a JavaScript `for` loop. The only difference is we need to put the `for` loop statements between `<%` and `%>` .

```
<h2> Quotes </h2>

<ul class="quotes">
  <!-- Loop through quotes -->
  <% for(var i = 0; i < quotes.length; i++) {%>
    <li class="quote">
      <!-- Output name from the iterated quote object -->
      <span><%= quotes[i].name %></span>:
      <!-- Output quote from the iterated quote object -->
      <span><%= quotes[i].quote %></span>
    </li>
  <% } %>
</ul>
```



May Node and Express be with you.

Quotes

- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose

CRUD - UPDATE

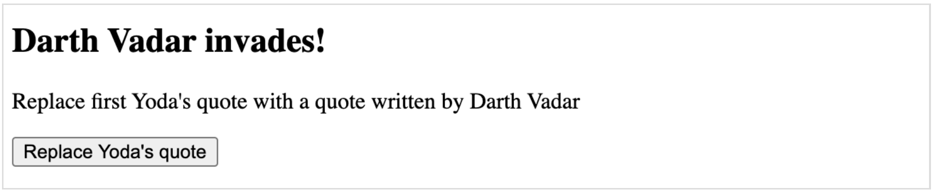
We use the UPDATE operation when we want to change something. It can be triggered with a PUT request. Like `POST` , `PUT` can be triggered either through JavaScript or through a `<form>` element.

Let's switch things up and use JavaScript since you already know how to use `<form>` elements.

For this update operation, we will create a button that replaces the first quote by Yoda to something written by Darth Vadar.

To do this, we need to add a `button` into the `index.ejs` file:

```
<div>
  <h2>Darth Vadar invades!</h2>
  <p>
    Replace first Yoda's quote with a quote written by Darth
Vadar
  </p>
  <button id="update-button">Replace Yoda's quote</button>
</div>
```


Darth Vadar invades!

Replace first Yoda's quote with a quote written by Darth Vadar

We will also create an external JavaScript file to execute a `PUT` request. According to Express conventions, this JavaScript is kept in a folder called `public`

```
$ mkdir public
$ touch public/main.js
```

Then, we have to tell Express to make this `public` folder accessible to the public by using a built-in middleware called `express.static`

```
app.use(express.static('public'))
```

We now can add the `main.js` file to the `index.ejs` file:

```
<body>
  <!-- ... -->
  <script src="/main.js"></script>
</body>
```

We will send a `PUT` request when the button gets clicked. This means we need to listen to a `click` event.

Next, we're going to send the PUT request when the button is clicked:

```
// main.js
const update = document.querySelector('#update-button')

update.addEventListener('click', _ => {
  // Send PUT Request here
})
```

Sending a PUT Request

The easiest way to trigger a PUT request in modern browsers is to use the

Fetch API.

Fetch has the following syntax:

```
fetch(endpoint, options)
```

In this case, let's say we want to send the request to `/quotes`. We'll set `endpoint` to `/quotes`.

```
update.addEventListener('click', _ => {
  fetch('/quotes', {/* ... */})
})
```

We need to send a `PUT` request this time. We can do this by setting Fetch's method to `put`.

```
update.addEventListener('click', _ => {
  fetch('/quotes', {
    method: 'put'
  })
})
```

Modern applications send JSON data to servers. They also receive JSON data back to servers. JSON stands for JavaScript Object Notation. They're like JavaScript objects, but each property and value are written between two quotation marks.

Here's an example of JavaScript data:

```
const data = {
  name: 'Darth Vadar',
  quote: 'I find your lack of faith disturbing.'
}
```

And what its JSON counterpart looks like. (Notice how everything is wrapped between two `"`).

```
{
  "name": "Darth Vadar",
  "quote": "I find your lack of faith disturbing."
}
```

We need to tell the server we're sending JSON data by setting the `Content-Type` headers to `application/json`.

```
update.addEventListener('click', _ => {
  fetch('/quotes', {
    method: 'put',
    headers: { 'Content-Type': 'application/json' },
  })
})
```

Next, we need to convert the data we send into JSON. We can do this with `JSON.stringify`. This data is passed via the `body` property.

```
update.addEventListener('click', _ => {
  fetch('/quotes', {
    method: 'put',
    headers: { 'Content-Type': 'application/json' },
    body: JSON.stringify({
      name: 'Darth Vadar',
      quote: 'I find your lack of faith disturbing.'
    })
  })
})
```

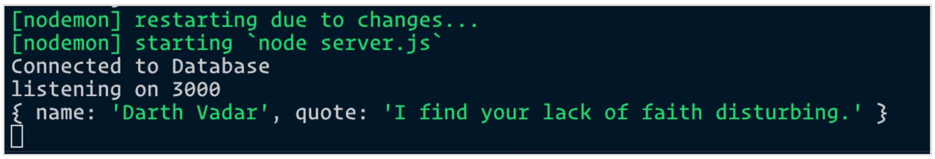
Accepting the PUT request

Our server doesn't accept JSON data yet. We can teach it to read JSON by adding the `body-parser` 's `json` middleware.

```
app.use(bodyParser.json())
```

Next, we can handle the `PUT` request with a `put` method. You should be able to see the values we send from the fetch request.

```
app.put('/quotes', (req, res) => {
  console.log(req.body)
})
```



```
[nodemon] restarting due to changes...
[nodemon] starting `node server.js`
Connected to Database
listening on 3000
{ name: 'Darth Vadar', quote: 'I find your lack of faith disturbing.' }
```

The next step is to change the Yoda's first quote to this quote by Darth Vadar.

Changing Yoda's quote

MongoDB Collections come with a method called `findOneAndUpdate` . This method lets us find and change one item in the database. It has the following syntax:

```
quotesCollection.findOneAndUpdate(
  query,
  update,
  options
)
  .then(result => {/* ... */})
  .catch(error => console.error(error))
```

`query` lets us filter the collection with key-value pairs. If we want to filter quotes to those written by Yoda, we can set `{ name: 'Yoda' }` as the query.

```
quotesCollection.findOneAndUpdate(
  { name: 'Yoda' },
  update,
  options
)
  .then(result => {/* ... */})
  .catch(error => console.error(error))
```

`update`, tells MongoDB what to change. It uses MongoDB's update operators like `$set`, `$inc` and `$push`.

We will use the `$set` operator since we're changing Yoda's quotes into Darth Vadar's quotes:

```
quotesCollection.findOneAndUpdate(
  { name: 'Yoda' },
  {
    $set: {
      name: req.body.name,
      quote: req.body.quote
    }
  },
  options
)
  .then(result => {/* ... */})
  .catch(error => console.error(error))
```

`options` tells MongoDB to define additional options for this update request.

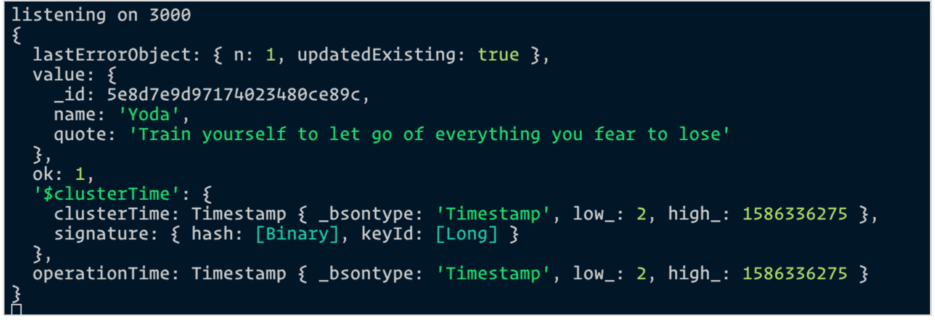
In this case, it's possible that no Yoda quotes exist in the database. We can force MongoDB to create a new Darth Vadar quote if no Yoda quotes exist. We do this by setting `upsert` to `true`. `upsert` means: Insert a document if no documents can be updated.

```
quotesCollection.findOneAndUpdate(
  { name: 'Yoda' },
  {
    $set: {
      name: req.body.name,
      quote: req.body.quote
    }
  },
  {
    upsert: true
  }
)
  .then(result => {/* ... */})
  .catch(error => console.error(error))
```

Finally, let's log the `result` into the command line.

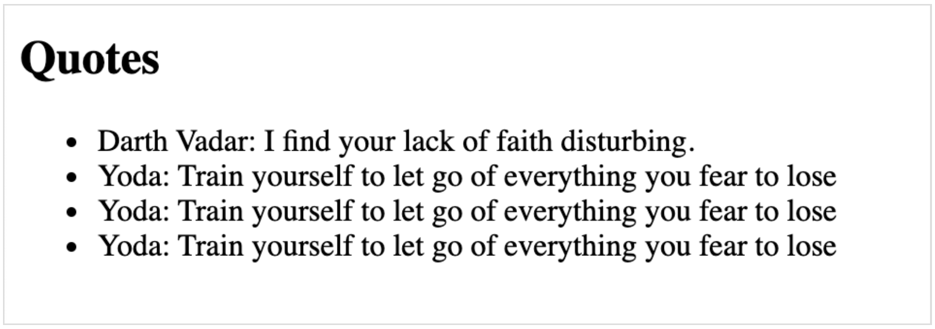
```
app.put('/quotes', (req, res) => {
  quotesCollection.findOneAndUpdate(/* ... */)
    .then(result => {
      console.log(result)
     })
    .catch(error => console.error(error))
}
```

Try clicking the "replace first Yoda quote" button in the browser. You should see this result in your command line. This says we changed one of Yoda's quote.



```
listening on 3000
{
  lastErrorObject: { n: 1, updatedExisting: true },
  value: {
    _id: 5e8d7e9d97174023480ce89c,
    name: 'Yoda',
    quote: 'Train yourself to let go of everything you fear to lose'
  },
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp { _bsontype: 'Timestamp', low_: 2, high_: 1586336275 },
    signature: { hash: [Binary], keyId: [Long] }
  },
  operationTime: Timestamp { _bsontype: 'Timestamp', low_: 2, high_: 1586336275 }
}
```

If you refresh the browser, you should see Darth Vadar's quote as the first quote.



Quotes

- Darth Vadar: I find your lack of faith disturbing.
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose

Does the `findOneAndUpdate` look complicated to you? Well, It IS complicated. This is why I use Mongoose instead of MongoDB. You can find out more about Mongoose in this article.

Finally, we need to respond to the JavaScript that sent the `PUT` request. In this case, we'll simply send the `success` message.

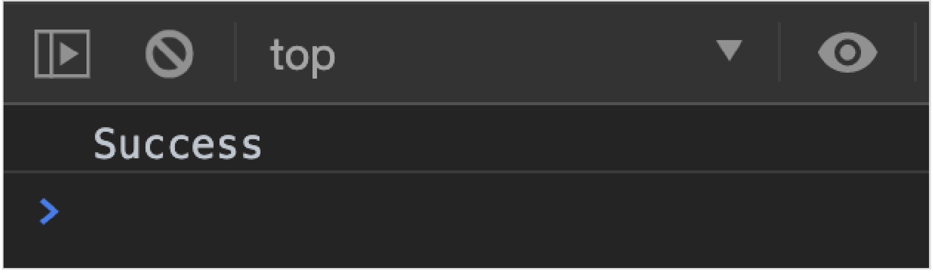
```
app.put('/quotes', (req, res) => {
  quotesCollection.findOneAndUpdate(/* ... */)
    .then(result => {
       res.json('Success')
     })
    .catch(error => console.error(error))
}
```

Next, we can handle the response from the server via a `then` object. (We do this because `fetch` returns a promise). However, Fetch is slightly different from most promises. You need to use another `then` object to get the response from the server.

Here's what you should do:

```
fetch({ /* request */ })
  .then(res => {
    if (res.ok) return res.json()
  })
  .then(response => {
    console.log(response)
  })
```

You should be able to see a `Success` message from the server in the console.



Success

I wrote an article on the Fetch API if you're wondering why we need two `then` calls. Give it a read! It'll help cement your understanding.

If you are working on a fancy webapp, you can use JavaScript to update the DOM, so users see the new changes immediately.

However, updating the DOM is out of scope of this article, so we're just going to refresh the browser to see the changes.

```
fetch({ /* request */ })
  .then(res => {
    if (res.ok) return res.json()
  })
  .then(response => {
    window.location.reload(true)
  })
```

If you want to learn to use JavaScript to update the DOM, I suggest going through my Learn JavaScript course. I even teach you how make your interface fast and snappy! (Check the Todolist Component).

That's it for the UPDATE operation! Let's move on to delete.

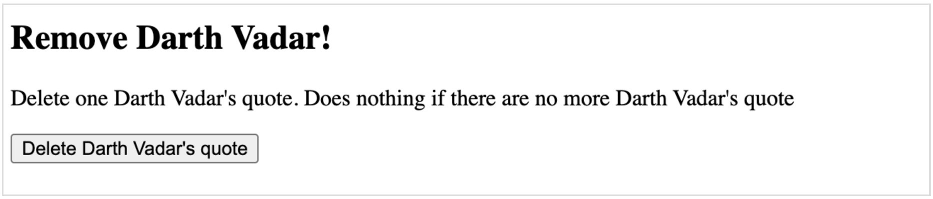
CRUD - DELETE

The DELETE operation can be triggered through a DELETE request. It's similar to the `UPDATE` request so this should be simple if you understand what we've done above.

For this, let's delete the first quote by Darth Vadar.

First, we need to add a delete button to `index.ejs`.

```
<div>
  <h2>Remove Darth Vadar!</h2>
  <p>
    Delete one Darth Vadar's quote. Does nothing if there are no
more Darth
    Vadar's quote
  </p>
  <button id="delete-button">Delete Darth Vadar's quote</button>
</div>
```



Remove Darth Vadar!

Delete one Darth Vadar's quote. Does nothing if there are no more Darth Vadar's quote

Then, we'll trigger a DELETE request through Fetch when a user clicks the delete button.

```
const deleteButton = document.querySelector('#delete-button')

deleteButton.addEventListener('click', _ => {
  fetch('/quotes', {
    method: 'delete',
  })
})
```

Since we're deleting a quote by Darth Vadar, we only need to send Darth Vadar's name to the server.

```
deleteButton.addEventListener('click', _ => {
  fetch(/* ... */, {
    method: 'delete',
    headers: { 'Content-Type': 'application/json' },
    body: JSON.stringify({
      name: 'Darth Vadar'
    })
  })
    .then(res => {
      if (res.ok) return res.json()
    })
    .then(data => {
      window.location.reload()
    })
})
```

We can then handle the event on our server side with the `delete` method:

```
app.delete('/quotes', (req, res) => {
  // Handle delete event here
})
```

Deleting a document from MongoDB

MongoDB Collections has a method called `deleteOne`. It lets us remove a document from the database. It takes in two parameters: `query` and `options`.

```
quotesCollection.remove(
  query,
  options
)
  .then(result => {/* ... */})
  .catch(error => console.error(error))
```

`query` works like `query` in `findOneAndUpdate`. It lets us filter the collection to the entries we're searching for. In this case, we can set `name` to Darth Vadar.

```
quotesCollection.remove(
  { name: 'Darth Vadar' },
  options
)
  .then(result => {/* ... */})
```

```
    .catch(error => console.error(error))
```

However, since we already pass the name `Darth Vadar` from Fetch, we don't need to hardcode it in Express anymore. We can simply use `req.body.name`.

```
app.delete('/quotes', (req, res) => {
  quotesCollection.remove(
    { name: req.body.name },
    options
  )
})
```

In this case, we don't need to change any options, so we can omit `options`.

```
app.delete('/quotes', (req, res) => {
  quotesCollection.deleteOne(
    { name: req.body.name }
  )
})
```

Then, we can send a response back to the JavaScript in the `then` call.

```
app.delete('/quotes', (req, res) => {
  quotesCollection.deleteOne(
    { name: req.body.name }
  )
    .then(result => {
      res.json(`Deleted Darth Vadar's quote`)
    })
    .catch(error => console.error(error))
})
```

Now, when you click the delete button, the browser will sends *DELETE* request through Fetch to our Express server. Then, the server responds by sending either an error or a message back.

What if there are no more Darth Vadar quotes?

If there are no more Darth Vadar quotes, `result.deletedCount` will be `0`. We can send a message that says tells the browser that there are no more Darth Vadar quotes to delete.

```
app.delete('/quotes', (req, res) => {
  quotesCollection.deleteOne(/* ... */)
    .then(result => {
      if (result.deletedCount === 0) {
        return res.json('No quote to delete')
      }
      res.json(`Deleted Darth Vadar's quote`)
    })
    .catch(error => console.error(error))
})
```

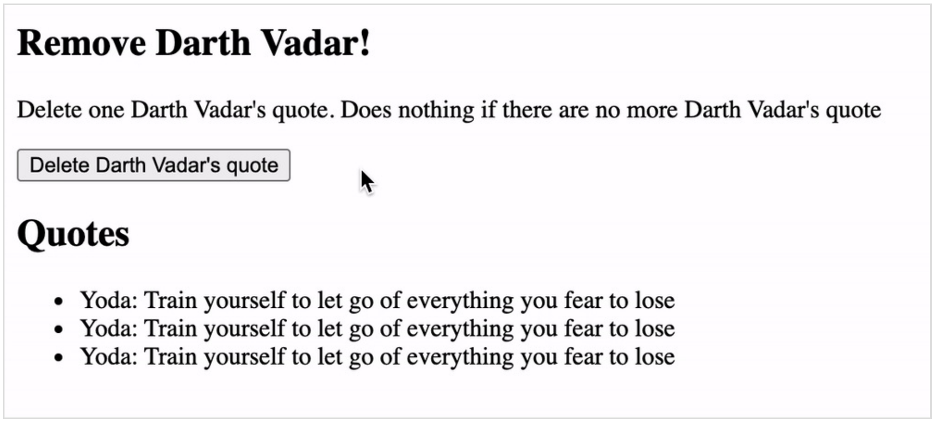
If the JavaScript receives a `No quote to delete` response, we can tell the user there's no Darth Vadar quote to delete.

To do this, let's add an element where we can tell users about this message.

```
<div id="message"></div>
```

If we receive `No quote to delete`, we can change the `textContent` of this `.message` div.

```
const messageDiv = document.querySelector('#message')

deleteButton.addEventListener('click', _ => {
  fetch(/* ... */)
    .then(/* ... */)
    .then(response => {
      if (response === 'No quote to delete') {
        messageDiv.textContent = 'No Darth Vadar quote to delete'
      } else {
        window.location.reload(true)
      }
    })
    .catch(/* ... */)
})
```


Remove Darth Vadar!

Delete one Darth Vadar's quote. Does nothing if there are no more Darth Vadar's quote

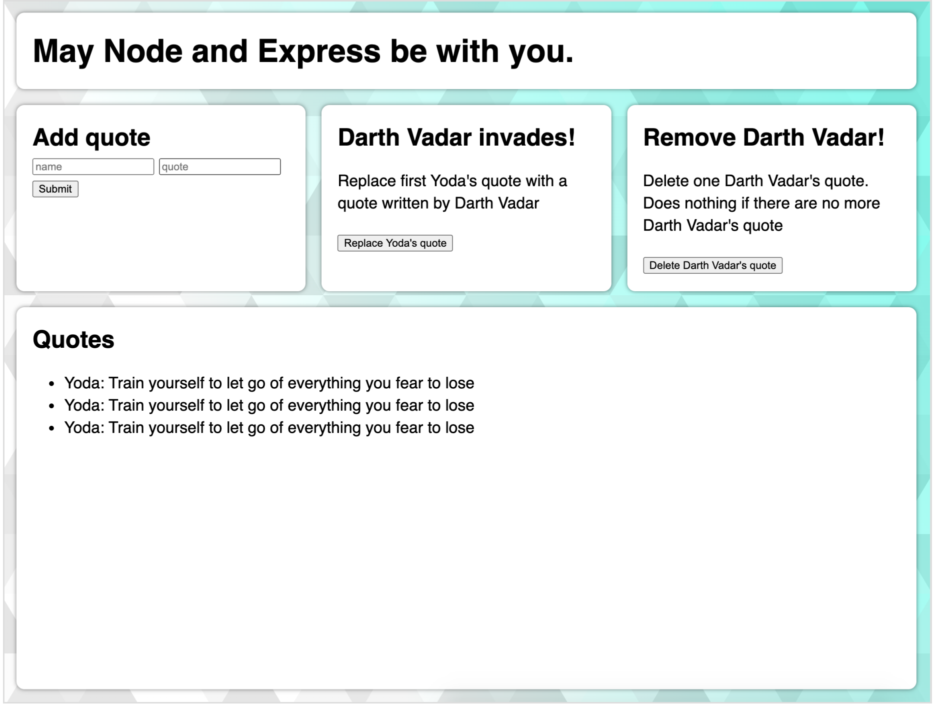
Quotes

- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose

That's it for the DELETE operation!

Make it look better...

The final step is to make the app look a little better by sprinkling some styles!


May Node and Express be with you.

Add quote

Darth Vadar invades!

Replace first Yoda's quote with a quote written by Darth Vadar

Remove Darth Vadar!

Delete one Darth Vadar's quote. Does nothing if there are no more Darth Vadar's quote

Quotes

- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose
- Yoda: Train yourself to let go of everything you fear to lose

Wrapping Up

We covered A LOT in this mega tutorial. Here's a list of things we've done together:

1. Understood what Express, Node, and MongoDB are used for
2. Understood CRUD
3. Executed Create, Read, Update and Delete operations
4. Created an Atlas account for MongoDB
5. Save, read, update, and delete from MongoDB
6. Display variable data with template engines

You have now learned all you need to know about creating simple applications with Node, Express, and MongoDB. Now, go forth and create more applications, young padawan. May the force be with you.

Grab the Source Code

You can grab the source code by leaving your name and email address in this form. I'll also send you this article in PDF so you can read it at your leisure.

Further reading

Here's some further readings if you're interested to continue with the Node, Express, MongoDB journey

- Express articles
  - 3 useful Express middleware
  - Handling Express errors

- JavaScript Async/await
    - Using Async/await in Express
- MongoDB articles
    - Mongoose 101
- Testing related articles
    - Endpoint testing with Jest and Supertest
    - Connecting Jest and Mongoose

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