DIT 637 Smart and Secure Systems
TT03 Experiencing DevOps - A Full-Stack Mobile App

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Key Concepts and Tools for Cloud-based Full Stack Continuous Integration & Deployment (CI/CD)

Full-Stack – MERN (MongoDB, Express, React Native, Node)
Developing a full-stack mobile app involves creating an application from beginning to end. This includes designing the user interface (frontend) and implementing the server-side logic (backend) that powers all the functionality behind the scenes.

Frontend
To create the visual part of a mobile app that users interact with

- **React Native**: To efficiently build dynamic and responsive user interfaces for mobile apps.

Backend
The backend of a web application is responsible for the server-side logic, handling database interactions, user authentication, and application logic. It processes incoming requests, applies business rules, accesses databases, and sends responses back to the client.

- **Express or ExpressJS**: A minimal and flexible Node.js web application framework that provides robust features for web and mobile applications. It is used to build the server-side logic of web applications.

Database
A database is an organized collection of data generally stored and accessed electronically from a computer system. It is essential for storing and managing large amounts of data efficiently. There are two types: SQL and NoSQL DB.

- **MongoDB Atlas**: A cloud-based NoSQL database service for modern applications, providing a fully managed and global cloud database with built-in automation for resource and workload management.

Development Environment
Codespaces: To provide a cloud-based development environment using containerization that is easy to set up and use from anywhere, similar to Google Docs, but for coding.

Version Control and Collaboration
GitHub as Repo: To store and manage code with version control, making collaboration more manageable, just like using Google Drive for sharing documents.

Example: Movie Search Application
To practice and demonstrate the capabilities of React Native and Express in creating real-world applications, like searching for movies on Netflix.

Uploading three image files to your GitHub Repository generated from GitHub Classroom

1. The screenshot of your ‘Network Access’ as ‘*first_last*_network_access.png’ by using your first and last name.
2. The screenshot of your backend Express web application as ‘*first_last*_backend.png’ by using your first and last name.
3. The screenshot of your frontend mobile app as ‘*first_last*_frontend.jpg’ by using your first and last name.

1) User Case

As a movie enthusiast using a **mobile device**, I want to search and browse a list of movies with details such as title, genre, and year so that I can easily find information about movies I am interested in while on the go.

Note: The user story didn't change from the previous TT01 and TT02. The question then is how a full-stack mobile app works with DevOps Tools (GitHub and GitHub Codespaces).

Why Do We Need a Backend and Database?

1. **Data Management:**
   - **Database:** Storing and managing large amounts of movie data (titles, genres, years, etc.) efficiently. A database like MongoDB Atlas is ideal for handling such documents and providing quick access to them.
   - **Backend:** Facilitating the retrieval, manipulation, and updating of data from the database. The backend (using Express) acts as an intermediary that requests from the frontend, queries the database, and sends the relevant data back to the frontend.
2. **Business Logic:**
   - **Backend:** Encapsulating the business logic required to process data and perform operations such as filtering movies by genre, searching for specific titles, and handling user preferences. It separates the logic from the frontend, making the application more modular and easier to maintain.

Why Do We Need Full-Stack Development?

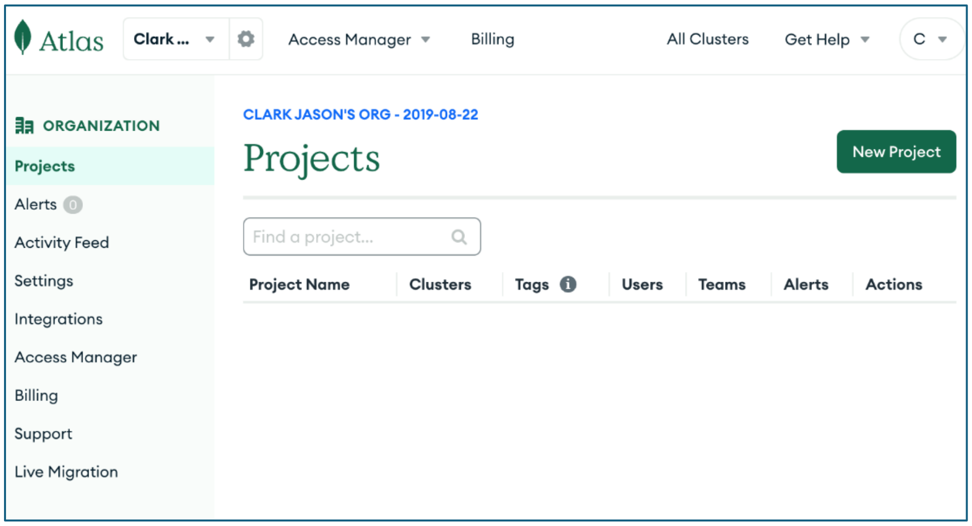
1. **Limited Data Handling:**
   - React Native alone cannot efficiently handle large datasets or complex queries. It is primarily a frontend framework meant for building user interfaces, not for managing or processing data.
2. **No Data Persistence:**
   - Without a backend and database, data would be stored locally on the device, making it inaccessible if the user switches devices or uninstalls the app. A cloud database ensures that data is persistent and accessible from anywhere.
3. **Security Concerns:**
   - Storing and processing data directly on the client-side exposes it to security risks. A backend server ensures data is processed securely and can implement necessary security protocols.
4. **Separation of Concerns:**
   - Maintaining a clear separation between frontend and backend simplifies development and maintenance. It allows each part to be developed, tested, and scaled independently.

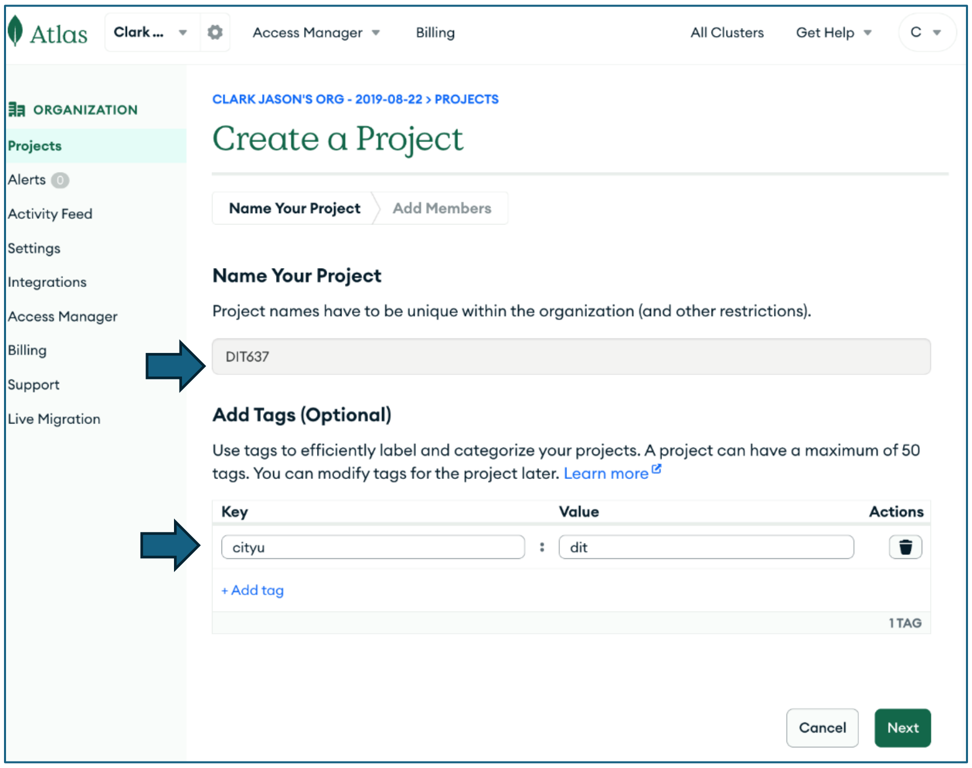
2) Project Setup

Creating our database in the cloud

MongoDB Atlas and Load Sample Data

4. Create an account in MongoDB Atlas.
5. Create a New Project and follow along with the screenshot. Use any values when required and use any default values if given.





Name Your Project

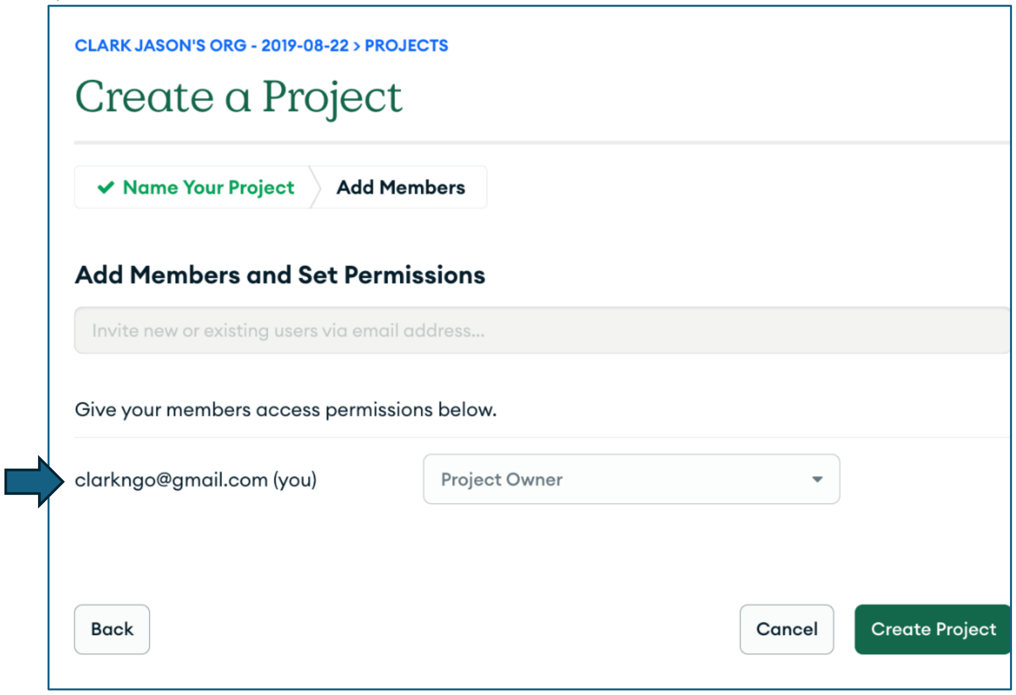
Project names have to be unique within the organization (and other restrictions).

DIT637

Use tags to efficiently label and categorize your projects. A project can have a maximum of 50 tags. You can modify tags for the project later. Learn more

Key	Value
cityu	dit

Use your email.


CLARK JASON'S ORG - 2019-08-22 > PROJECTS

Create a Project

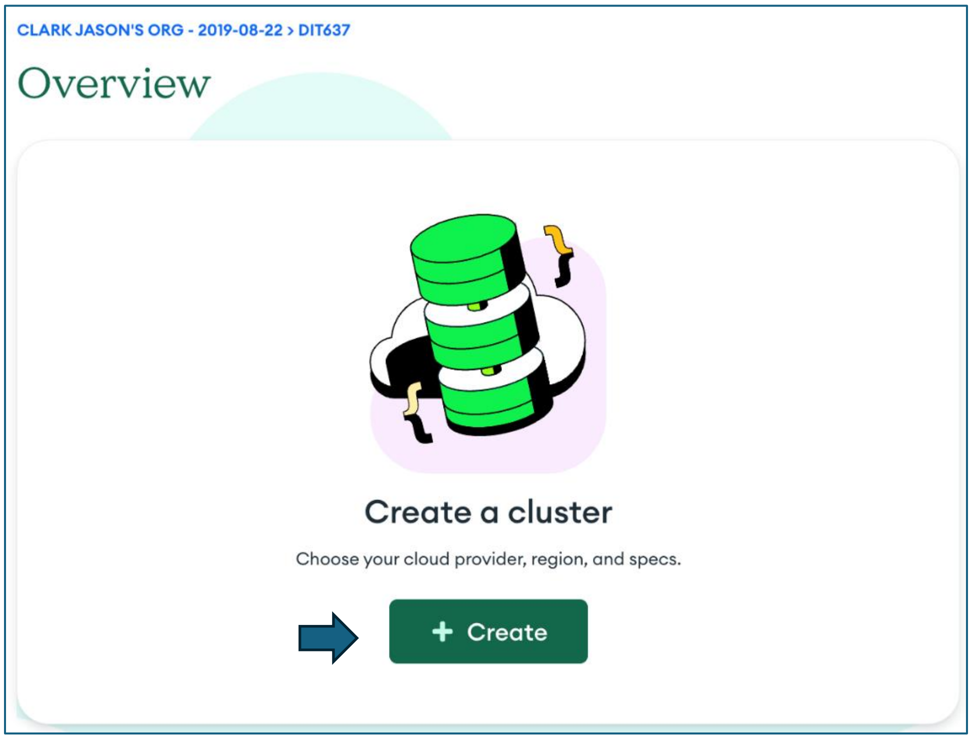
Add Members and Set Permissions

Invite new or existing users via email address...

Give your members access permissions below.

clarkngo@gmail.com (you) Project Owner

6. Choose M0 Free. Select the provider (AWS) and the region according to your location.

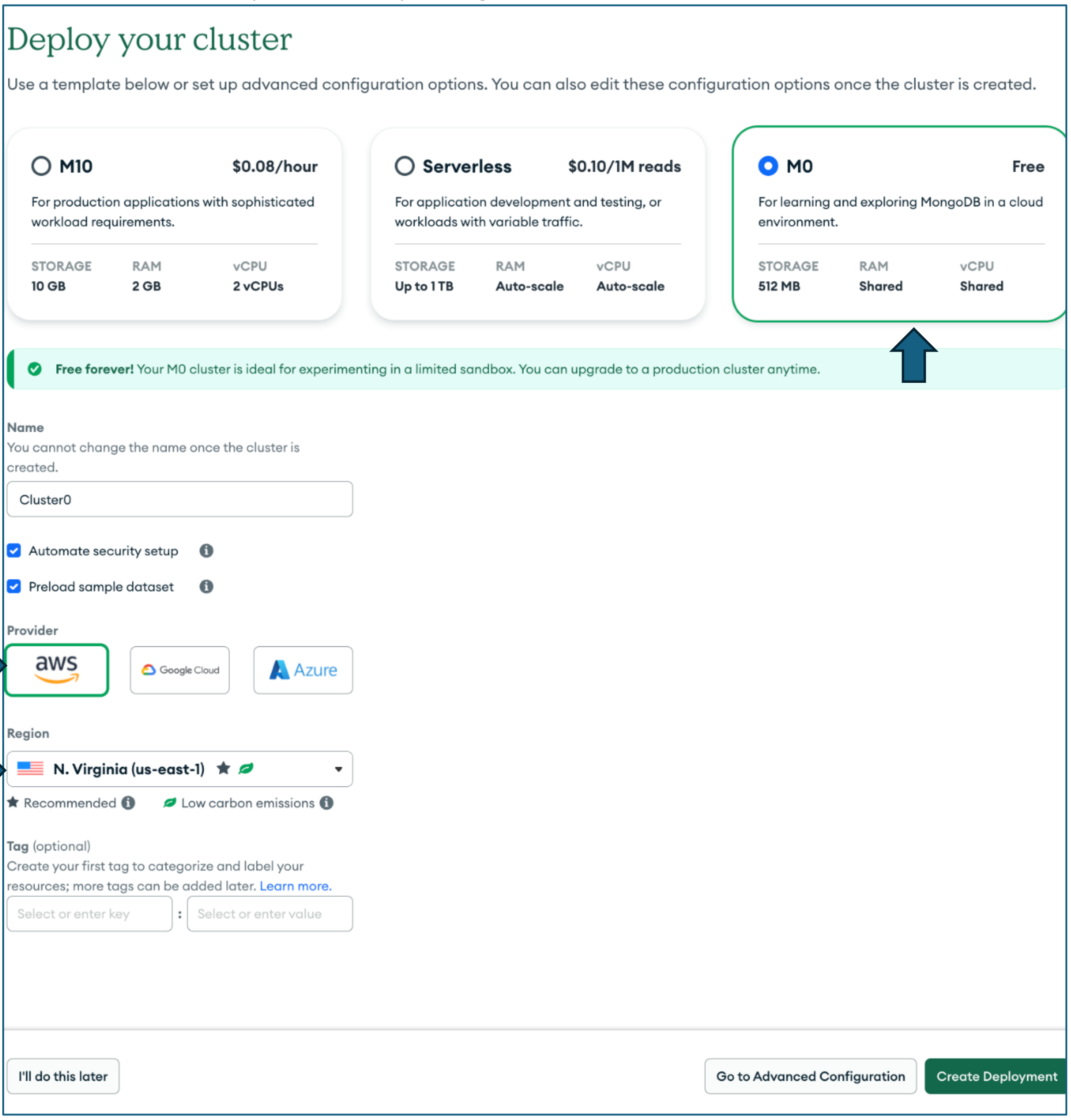

CLARK JASON'S ORG - 2019-08-22 > DIT637

Overview

Create a cluster

Choose your cloud provider, region, and specs.

Select the AWS as provider and your region.



Deploy your cluster

Use a template below or set up advanced configuration options. You can also edit these configuration options once the cluster is created.

M10 — $0.08/hour	Serverless — $0.10/1M reads	[✓ M0] — Free
For production applications with sophisticated workload requirements.	For application development and testing, or workloads with variable traffic.	For learning and exploring MongoDB in a cloud environment.
STORAGE 10 GB · RAM 2 GB · vCPU 2 vCPUs	STORAGE Up to 1 TB · RAM Auto-scale · vCPU Auto-scale	STORAGE 512 MB · RAM Shared · vCPU Shared

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

Name
You cannot change the name once the cluster is created.
Cluster0

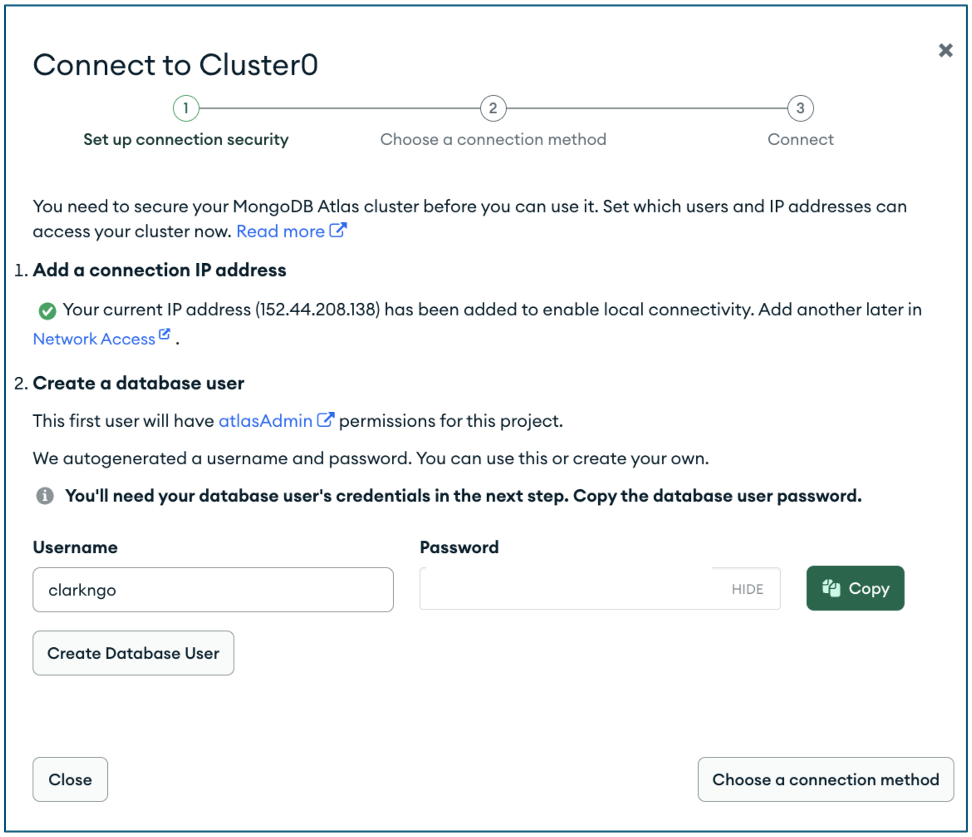
☑ Automate security setup
☑ Preload sample dataset

Provider
[✓ aws] Google Cloud Azure

Region
N. Virginia (us-east-1) ★
★ Recommended · Low carbon emissions

Tag (optional)
Create your first tag to categorize and label your resources; more tags can be added later. Learn more.
Select or enter key : Select or enter value

7. Copy and save your password (if you lose it, you can regenerate a new one in left pane side menu 'Database Access' under 'SECURITY').



Connect to Cluster0

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

1. **Add a connection IP address**

Your current IP address (152.44.208.138) has been added to enable local connectivity. Add another later in Network Access .

2. **Create a database user**

This first user will have atlasAdmin permissions for this project.

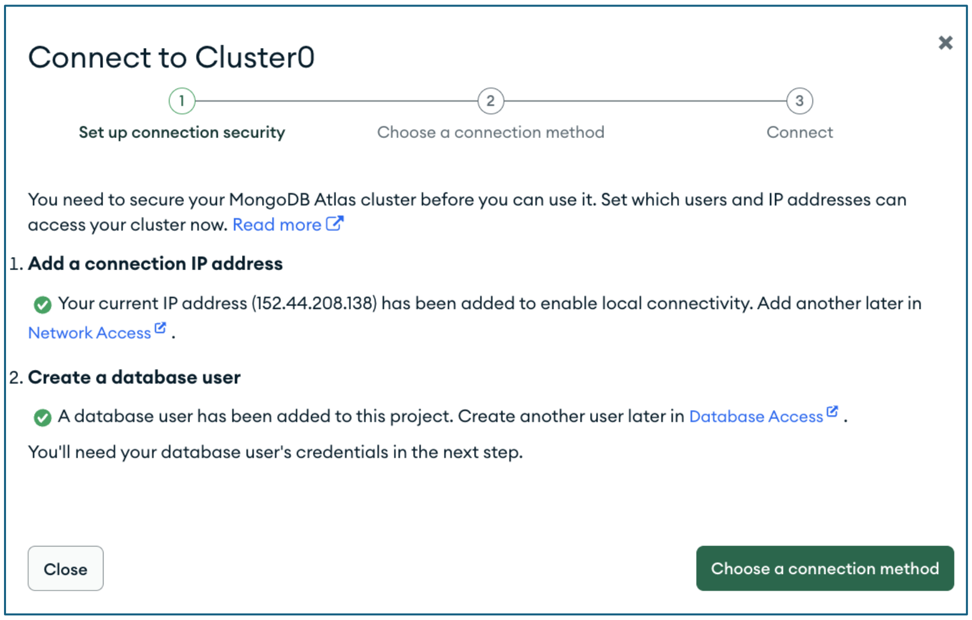
We autogenerated a username and password. You can use this or create your own.

You'll need your database user's credentials in the next step. Copy the database user password.

Username: clarkngo

Password:

HIDE
Copy
Create Database User
Close
Choose a connection method



Connect to Cluster0

1 Set up connection security
2 Choose a connection method
3 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

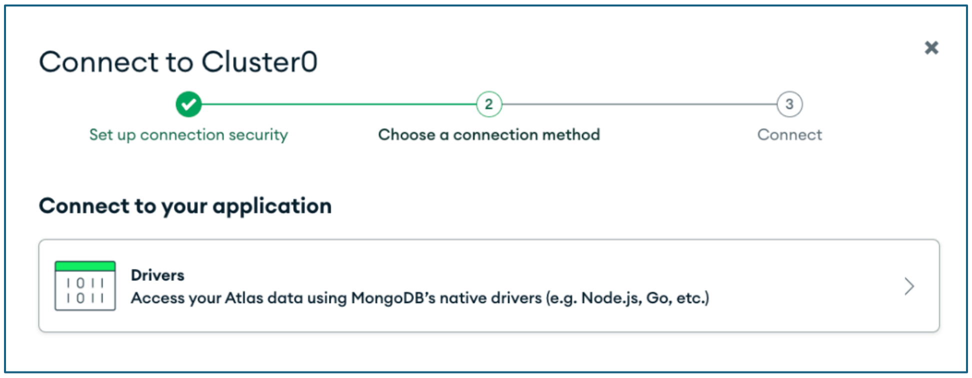
1. **Add a connection IP address**

Your current IP address (152.44.208.138) has been added to enable local connectivity. Add another later in Network Access .

2. **Create a database user**

A database user has been added to this project. Create another user later in Database Access .

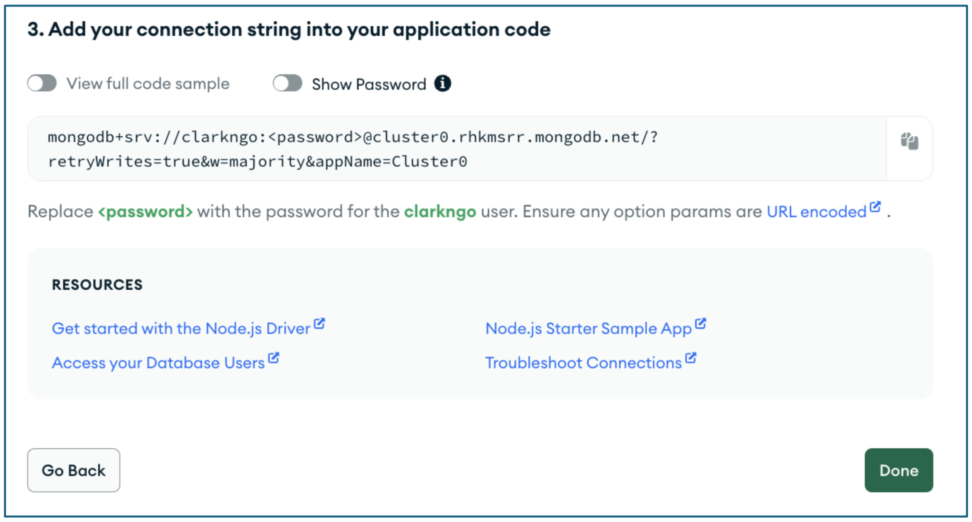
You'll need your database user's credentials in the next step.


Connect to Cluster0

Connect to your application

Drivers
Access your Atlas data using MongoDB's native drivers (e.g. Node.js, Go, etc.)

8. Replace the <password> (including <>) with the password you copied when you created a user. Copy the 'mongodb' connection string in a notepad for now.


3. Add your connection string into your application code

View full code sample
Show Password

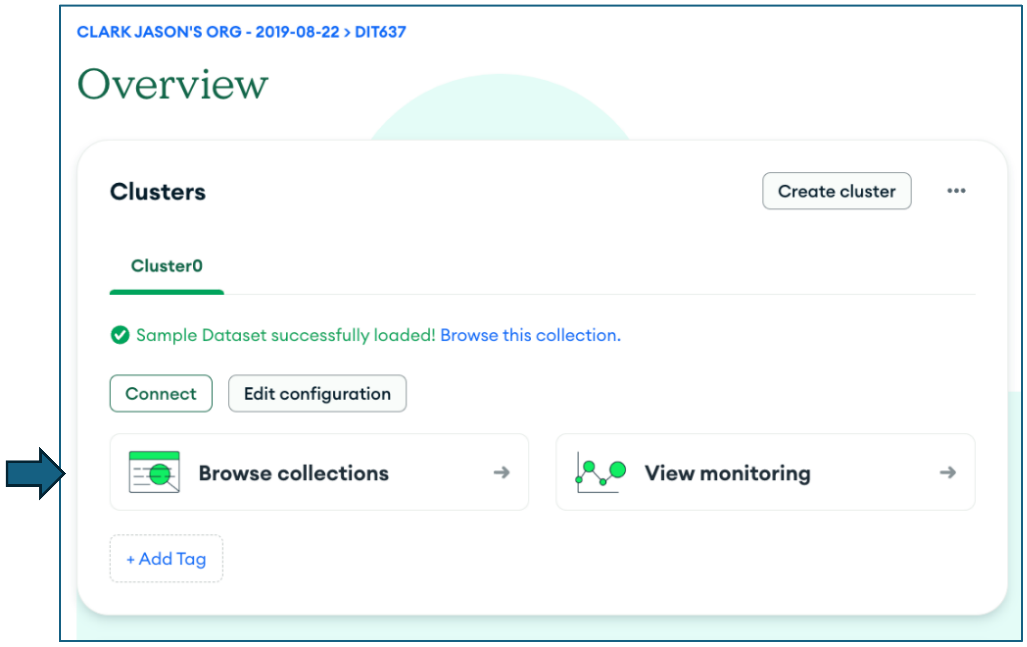
```
mongodb+srv://clarkngo:<password>@cluster0.rhkmsrr.mongodb.net/?
retryWrites=true&w=majority&appName=Cluster0
```

Replace **<password>** with the password for the **clarkngo** user. Ensure any option params are URL encoded .

RESOURCES

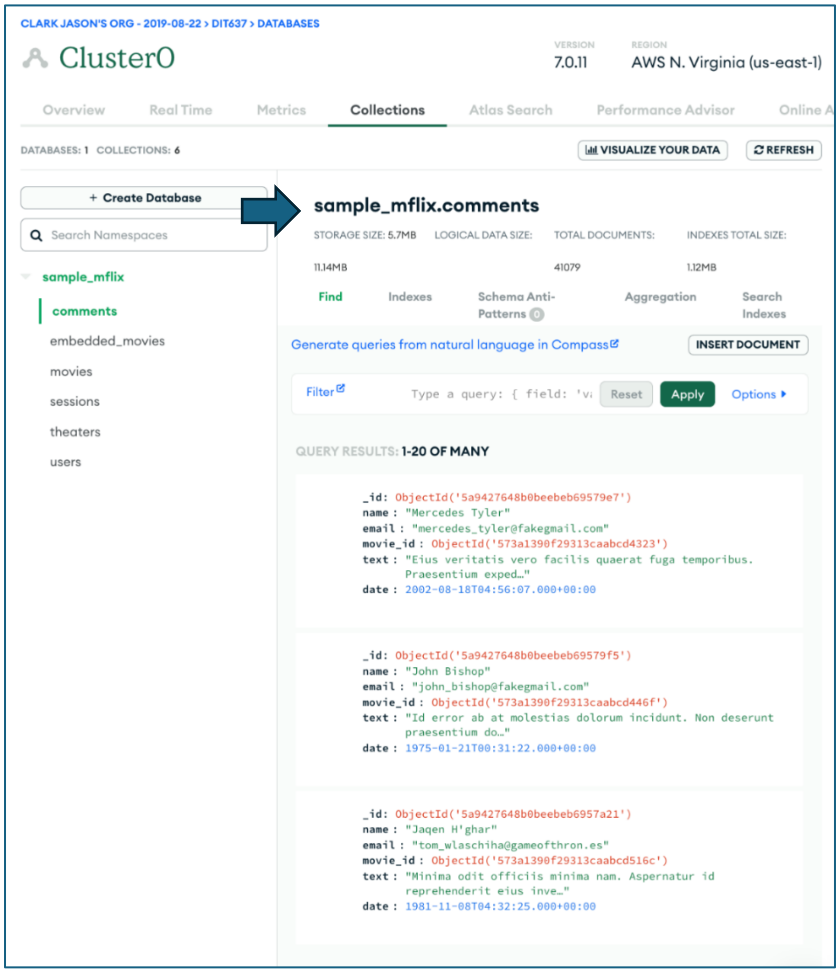
Get started with the Node.js Driver
Node.js Starter Sample App
Access your Database Users
Troubleshoot Connections
Go Back
Done

9. Click the 'Browse Collection.'



Sample Dataset successfully loaded! Browse this collection.

It should have a preloaded sample database: 'sample_mflix'



VERSION 7.0.11 REGION AWS N. Virginia (us-east-1)

DATABASES: 1 COLLECTIONS: 6

sample_mflix.comments

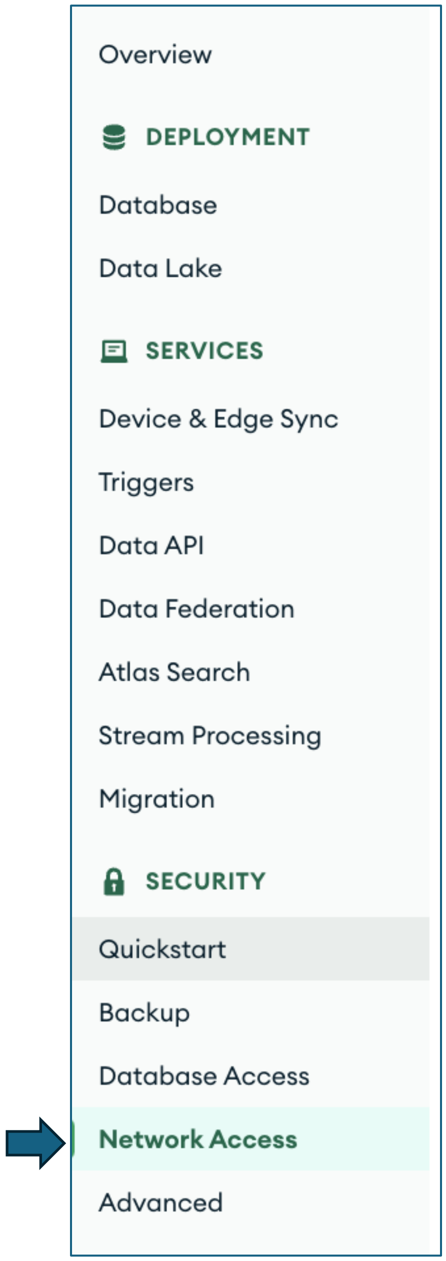
STORAGE SIZE: 5.7MB	LOGICAL DATA SIZE:	TOTAL DOCUMENTS:	INDEXES TOTAL SIZE:
	11.14MB	41079	1.12MB

```
Type a query: { field: 'v
```

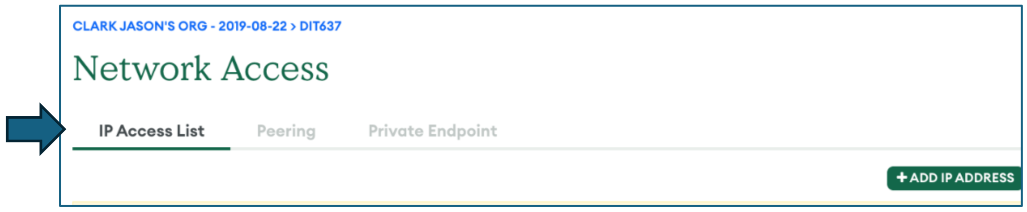
QUERY RESULTS: 1-20 OF MANY

```
_id: ObjectId('5a9427648b0beebeb69579e7')
name : "Mercedes Tyler"
email : "mercedes_tyler@fakegmail.com"
movie_id : ObjectId('573a1390f29313caabcd4323')
text : "Eius veritatis vero facilis quaerat fuga temporibus.
       Praesentium exped…"
date : 2002-08-18T04:56:07.000+00:00

_id: ObjectId('5a9427648b0beebeb69579f5')
name : "John Bishop"
email : "john_bishop@fakegmail.com"
movie_id : ObjectId('573a1390f29313caabcd446f')
text : "Id error ab at molestias dolorum incidunt. Non deserunt
       praesentium do…"
date : 1975-01-21T00:31:22.000+00:00

_id: ObjectId('5a9427648b0beebeb6957a21')
name : "Jaqen H'ghar"
email : "tom_wlaschiha@gameofthron.es"
movie_id : ObjectId('573a1390f29313caabcd516c')
text : "Minima odit officiis minima nam. Aspernatur id
       reprehenderit eius inve…"
date : 1981-11-08T04:32:25.000+00:00
```

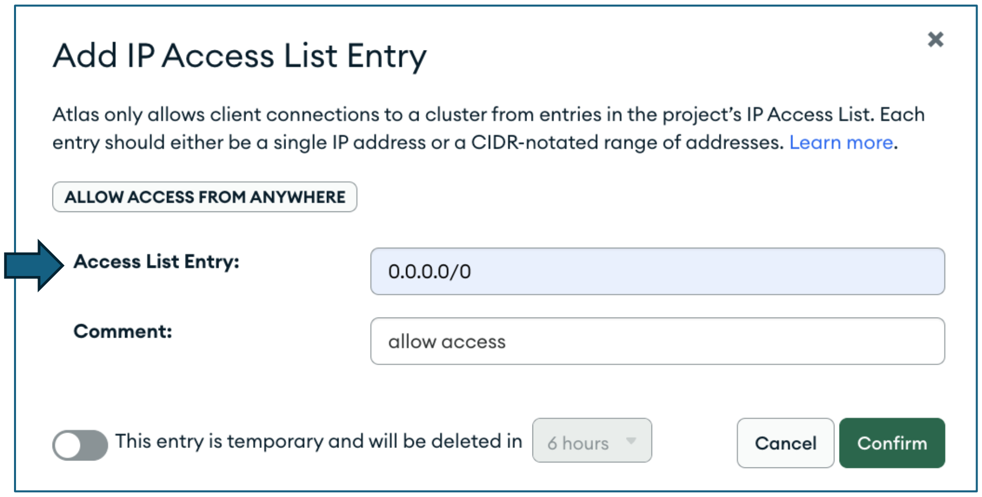
10. Allow Network access. Go to Network Access under Security.



11. Click the 'ADD IP ADDRESS.'



12. Add '0.0.0.0/0'



Add IP Access List Entry

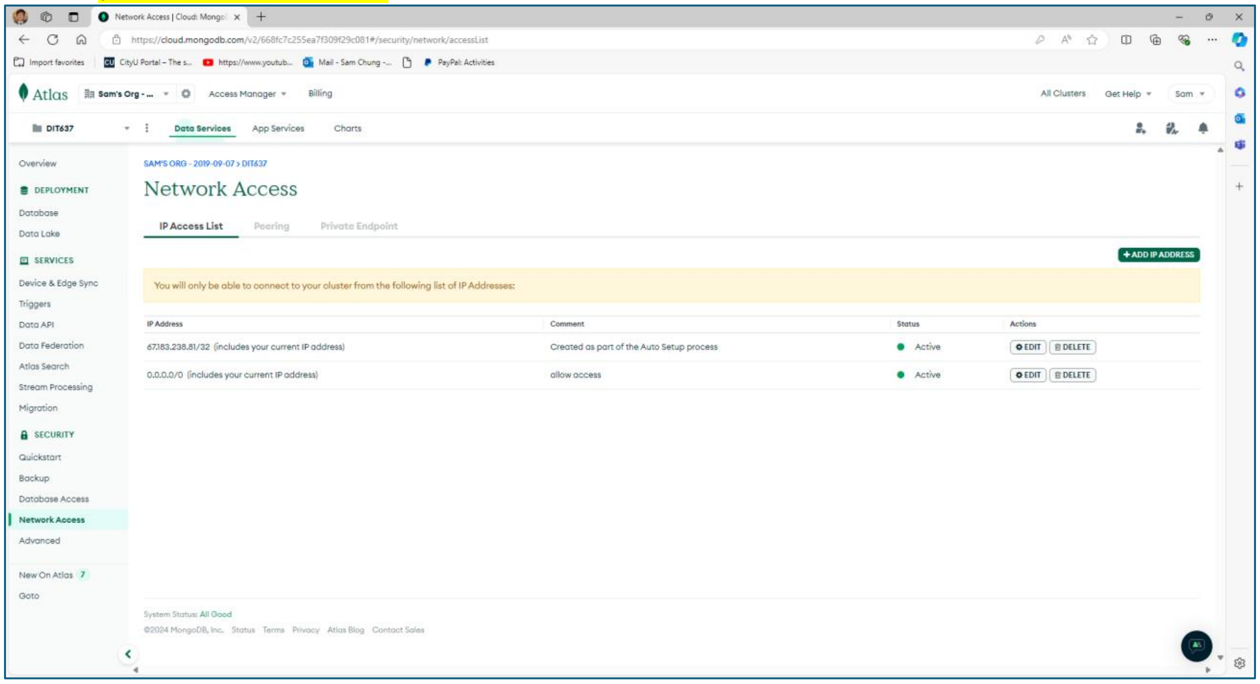
Atlas only allows client connections to a cluster from entries in the project's IP Access List. Each entry should either be a single IP address or a CIDR-notated range of addresses. Learn more.

Access List Entry: 0.0.0.0/0

Comment: allow access

This entry is temporary and will be deleted in 6 hours

13. Have the screenshot of your 'Network Access' as 'sam_chung_network_access.png' by using your first and last name.



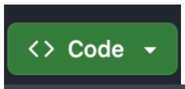
Network Access

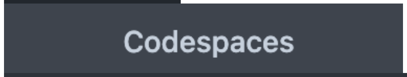
You will only be able to connect to your cluster from the following list of IP Addresses:

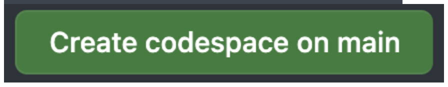
IP Address	Comment	Status	Actions
67.183.238.81/32 (includes your current IP address)	Created as part of the Auto Setup process	● Active	EDIT DELETE
0.0.0.0/0 (includes your current IP address)	allow access	● Active	EDIT DELETE

System Status: All Good
©2024 MongoDB, Inc. Status Terms Privacy Atlas Blog Contact Sales

3) Accessing our development environment

1. Open the project in GitHub.
2. Create a cloud-based development project with GitHub Codespaces:
   a. 

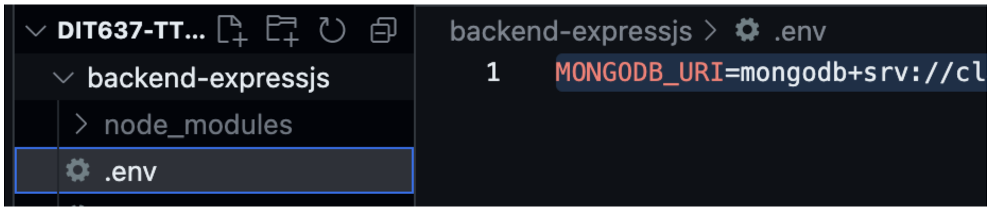
   b. 

   c. 

Connecting our database to our backend and running the backend server

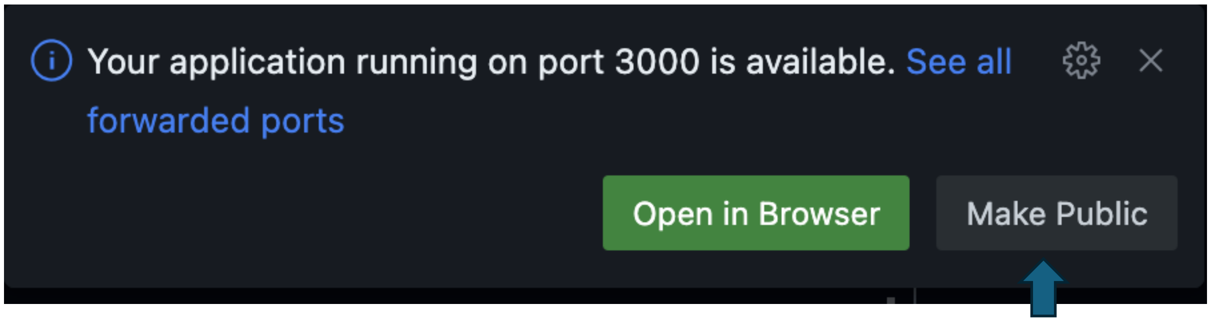
ExpressJS Backend

1. Connect MongoDB:
   a. cd backend-expressjs
   b. Inside 'backend-expressjs' folder, create **'.env**' file (use the 'example.env' as a reference) and type the following:
      i. MONGODB_URI=mongodb+srv://<username>:<password>@<cluster-url>/<database-name>
      Note: you should have copy pasted the mongodb connection string. If not, go back to previous steps.



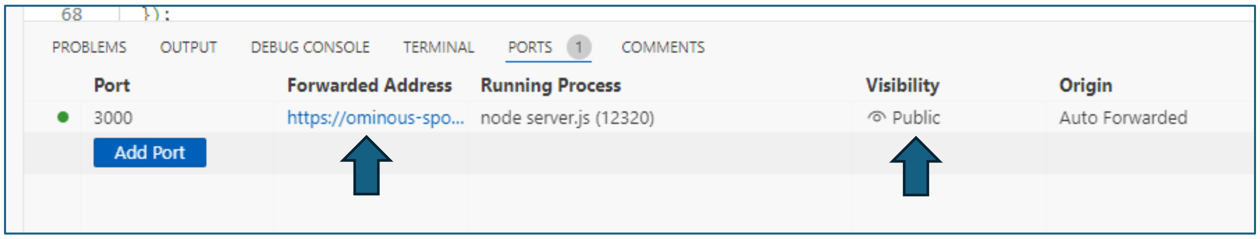
```
MONGODB_URI=mongodb+srv://cl
```

2. In the terminal type:
   a. npm install
   b. npm start
   c. Click 'Make Public'



Your application running on port 3000 is available. See all forwarded ports

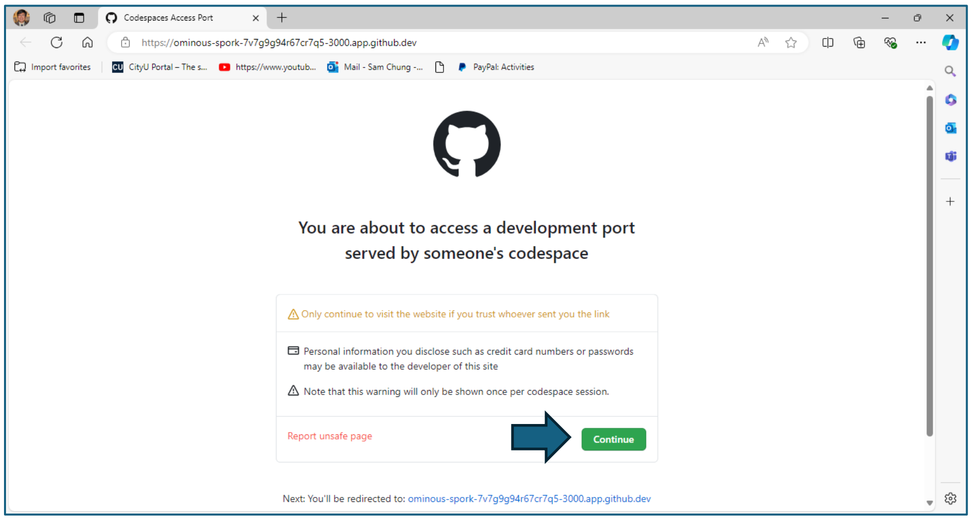
3. Go to the port and visit the website. If the visibility is not 'Public,' change it by right-clicking. If your server port's visibility is private, your mobile app will show the following error message: ***"Error fetching movies: [SyntaxError: JSON Parse error: Unexpected character: <]"***



Port	Forwarded Address	Running Process	Visibility	Origin
3000	https://ominous-spo...	node server.js (12320)	Public	Auto Forwarded

4. You may see the screen below. But your URL may be different.

5. Open the server-side web page in your browser.
If you see the following screen, press the 'Continue' button.



You are about to access a development port served by someone's codespace

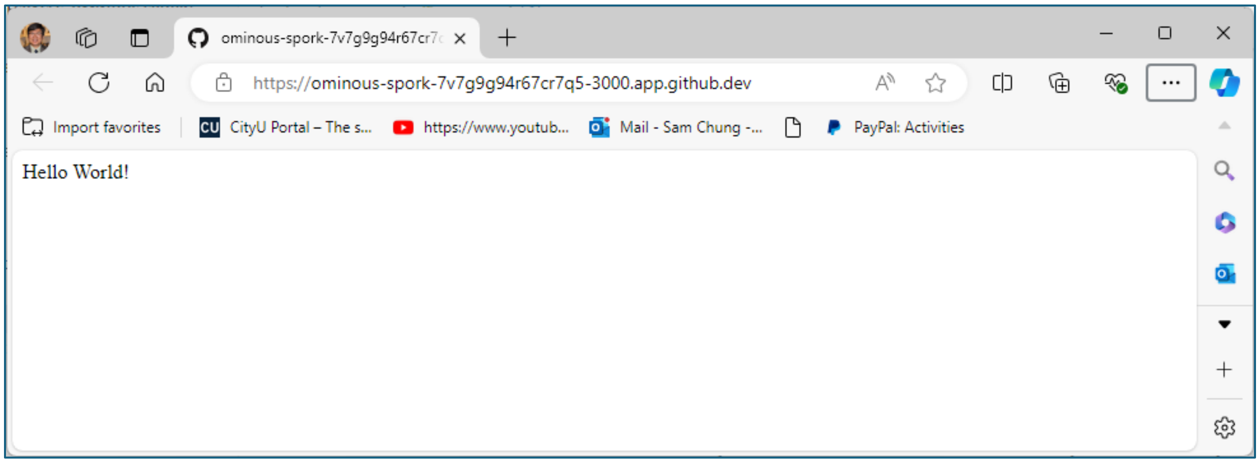
Only continue to visit the website if you trust whoever sent you the link

Personal information you disclose such as credit card numbers or passwords may be available to the developer of this site

Note that this warning will only be shown once per codespace session.

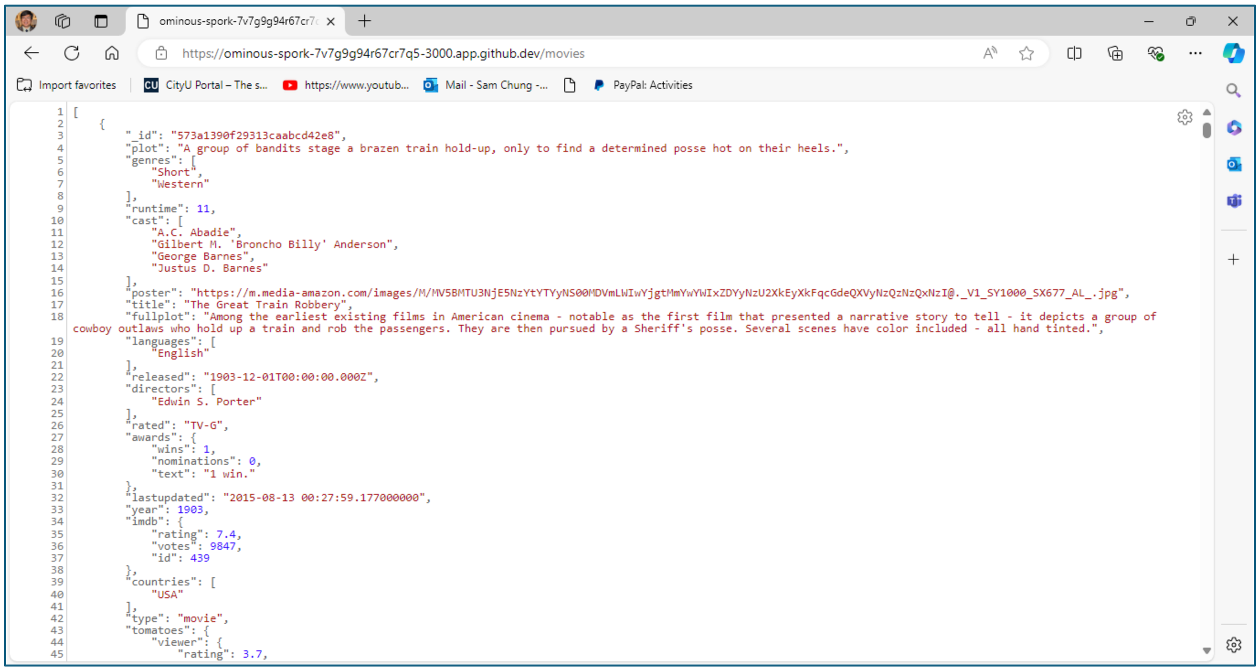
Next: You'll be redirected to: ominous-spork-7v7g9g94r67cr7q5-3000.app.github.dev

Have the screenshot of your backend Express web application as 'sam_chung_backend.png' by using your first and last name.



Hello World!

6. Let’s test the list of movies. After the URL, type ‘/movies’ and watch the displayed list. https://ominous-spork-7v7g9g94r67cr7q5-3000.app.github.dev/movies



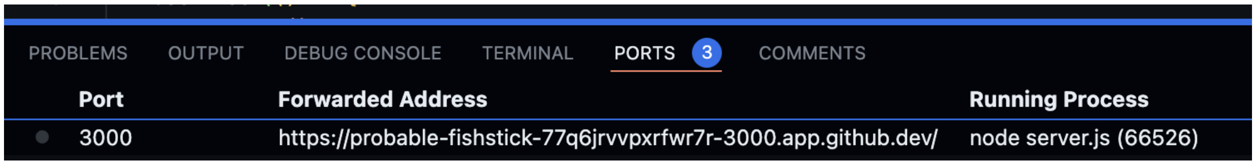
```
[
    {
        "_id": "573a1390f29313caabcd42e8",
        "plot": "A group of bandits stage a brazen train hold-up, only to find a determined posse hot on their heels.",
        "genres": [
            "Short",
            "Western"
        ],
        "runtime": 11,
        "cast": [
            "A.C. Abadie",
            "Gilbert M. 'Broncho Billy' Anderson",
            "George Barnes",
            "Justus D. Barnes"
        ],
        "poster": "https://m.media-amazon.com/images/M/MV5BMTU3NjE5NzYtYTYyNS00MDVmLWIwYjgtMmYwYWIxZDYyNzU2XkEyXkFqcGdeQXVyNzQzNzQxNzI@._V1_SY1000_SX677_AL_.jpg",
        "title": "The Great Train Robbery",
        "fullplot": "Among the earliest existing films in American cinema - notable as the first film that presented a narrative story to tell - it depicts a group of
cowboy outlaws who hold up a train and rob the passengers. They are then pursued by a Sheriff's posse. Several scenes have color included - all hand tinted.",
        "languages": [
            "English"
        ],
        "released": "1903-12-01T00:00:00.000Z",
        "directors": [
            "Edwin S. Porter"
        ],
        "rated": "TV-G",
        "awards": {
            "wins": 1,
            "nominations": 0,
            "text": "1 win."
        },
        "lastupdated": "2015-08-13 00:27:59.177000000",
        "year": 1903,
        "imdb": {
            "rating": 7.4,
            "votes": 9847,
            "id": 439
        },
        "countries": [
            "USA"
        ],
        "type": "movie",
        "tomatoes": {
            "viewer": {
                "rating": 3.7,
```

Connecting our backend to our frontend and running the frontend server

React Native Frontend

1. Open a new terminal.
2. cd frontend-reactive
3. Create your own **.env** inside the 'frontend-reactive' folder. You can follow the example in **example.env** file.

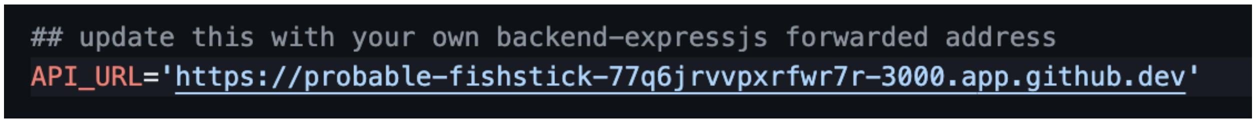
4. Copy the backend URL in the Ports tab.



PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS 3 COMMENTS

```
Port    Forwarded Address                                                Running Process
3000    https://probable-fishstick-77q6jrvvpxrfwr7r-3000.app.github.dev/  node server.js (66526)
```

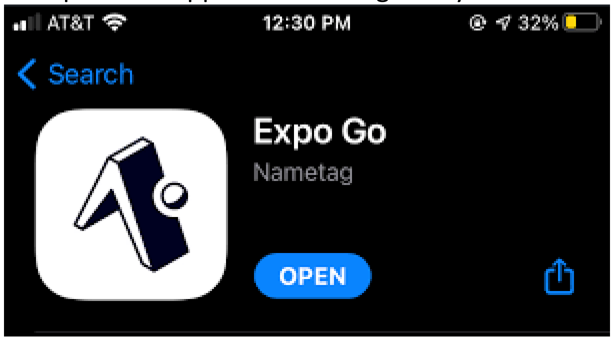
5. In your **.env** file, you have **API_URL** and your own 'backend-expressjs' address from GitHub codespaces.



```
## update this with your own backend-expressjs forwarded address
API_URL='https://probable-fishstick-77q6jrvvpxrfwr7r-3000.app.github.dev'
```

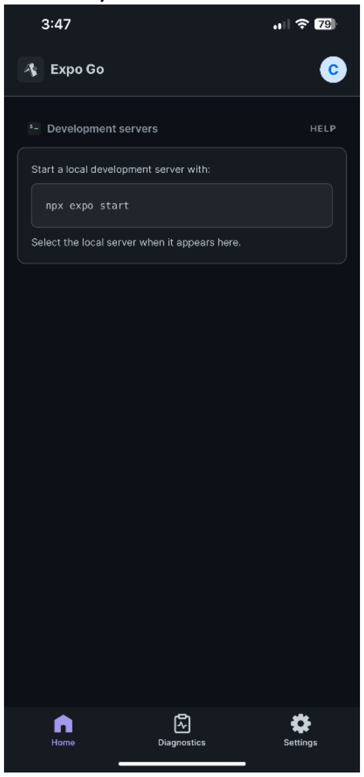
Note: the URL endpoint should not have a "**/**" at the end.

6. In the terminal, type the following:
   a. npm install
   b. npx expo login
      i. Note: you need to create an account in https://expo.dev/go
   c. npx expo start --tunnel

7. Download Expo Go in App Store or Google Play Store
   a. 

   b. Open then log in

Screen showing no local development server yet.

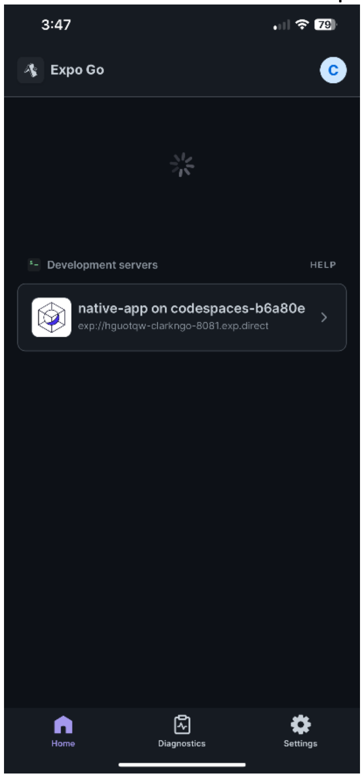


Start a local development server with:

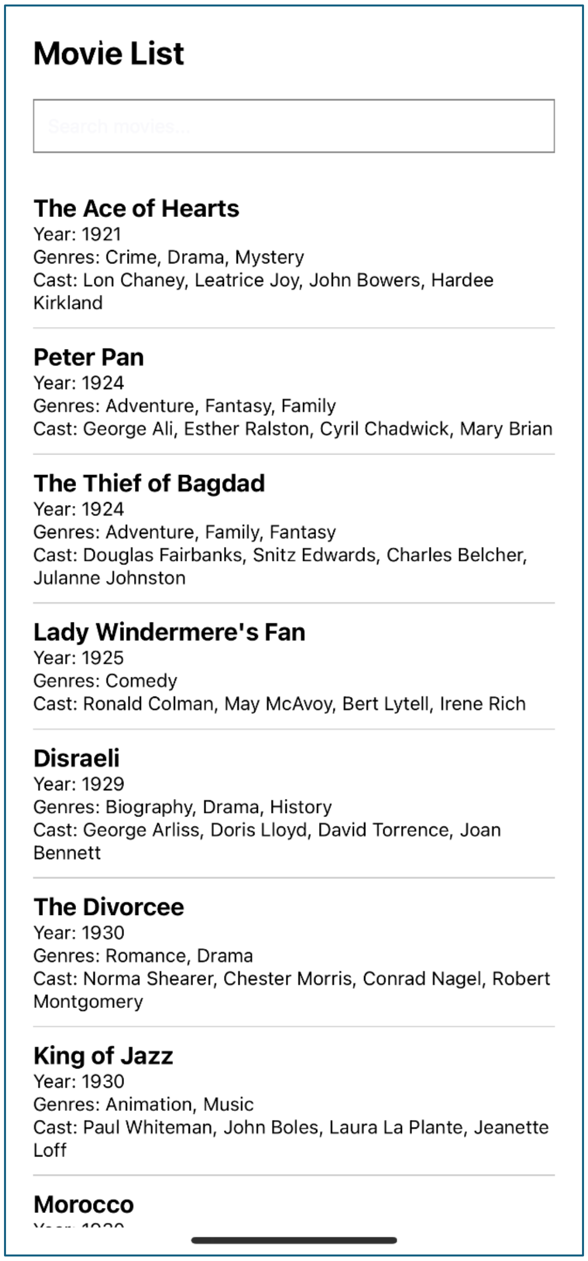
```
npx expo start
```

Select the local server when it appears here.

You can touch and drag down to refresh. You should see a development server like below:



native-app on codespaces-b6a80e
exp://hguotqw-clarkngo-8081.exp.direct



Movie List

The Ace of Hearts
Year: 1921
Genres: Crime, Drama, Mystery
Cast: Lon Chaney, Leatrice Joy, John Bowers, Hardee Kirkland

Peter Pan
Year: 1924
Genres: Adventure, Fantasy, Family
Cast: George Ali, Esther Ralston, Cyril Chadwick, Mary Brian

The Thief of Bagdad
Year: 1924
Genres: Adventure, Family, Fantasy
Cast: Douglas Fairbanks, Snitz Edwards, Charles Belcher, Julanne Johnston

Lady Windermere's Fan
Year: 1925
Genres: Comedy
Cast: Ronald Colman, May McAvoy, Bert Lytell, Irene Rich

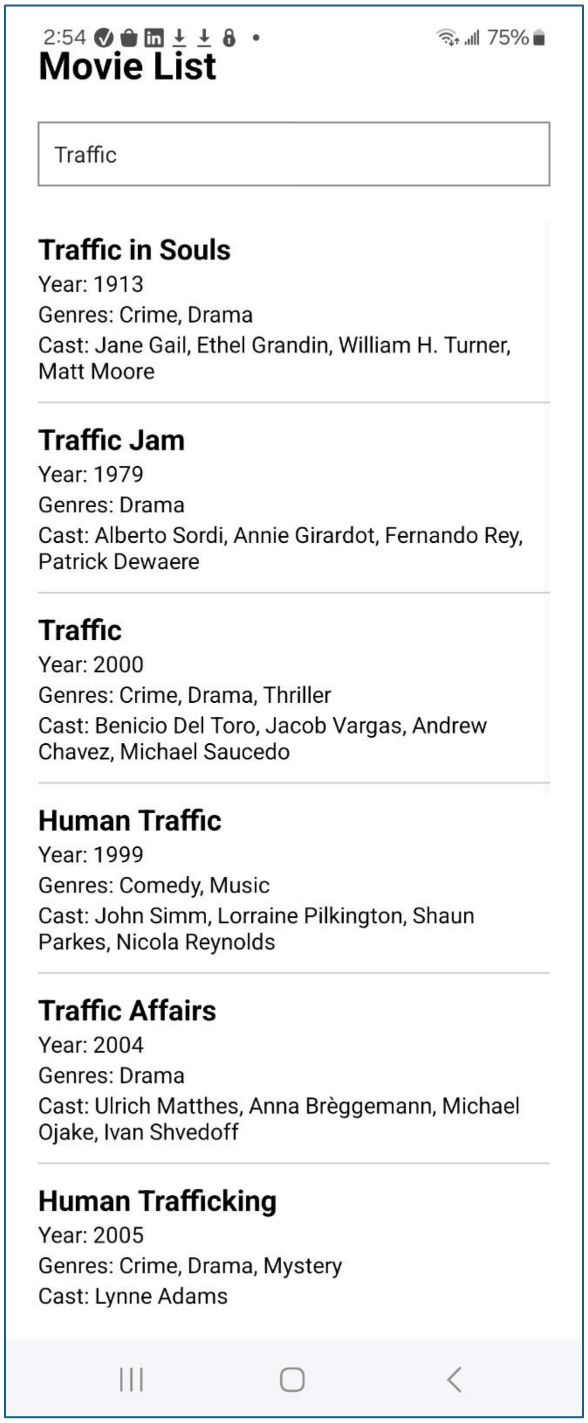
Disraeli
Year: 1929
Genres: Biography, Drama, History
Cast: George Arliss, Doris Lloyd, David Torrence, Joan Bennett

The Divorcee
Year: 1930
Genres: Romance, Drama
Cast: Norma Shearer, Chester Morris, Conrad Nagel, Robert Montgomery

King of Jazz
Year: 1930
Genres: Animation, Music
Cast: Paul Whiteman, John Boles, Laura La Plante, Jeanette Loff

Morocco

8. Each smartphone provides a feature to take a screenshot. The captured screenshot is shown below. Have the screenshot of your frontend mobile app as ‘sam_chung_frontend.jpg’ by using your first and last name. The captured screenshot is shown below.



Movie List

Traffic

Traffic in Souls
Year: 1913
Genres: Crime, Drama
Cast: Jane Gail, Ethel Grandin, William H. Turner, Matt Moore

Traffic Jam
Year: 1979
Genres: Drama
Cast: Alberto Sordi, Annie Girardot, Fernando Rey, Patrick Dewaere

Traffic
Year: 2000
Genres: Crime, Drama, Thriller
Cast: Benicio Del Toro, Jacob Vargas, Andrew Chavez, Michael Saucedo

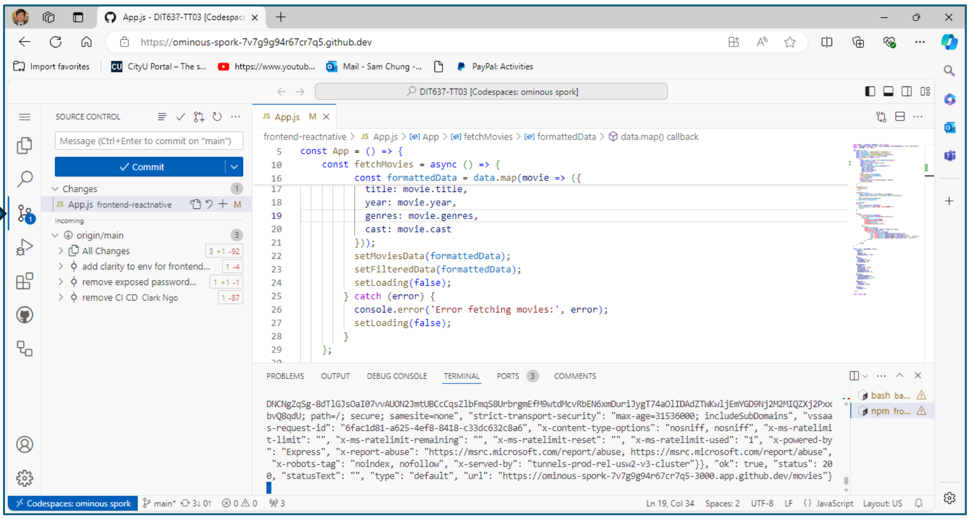
Human Traffic
Year: 1999
Genres: Comedy, Music
Cast: John Simm, Lorraine Pilkington, Shaun Parkes, Nicola Reynolds

Traffic Affairs
Year: 2004
Genres: Drama
Cast: Ulrich Matthes, Anna Brèggemann, Michael Ojake, Ivan Shvedoff

Human Trafficking
Year: 2005
Genres: Crime, Drama, Mystery
Cast: Lynne Adams

4) Pushing your work to GitHub

1) Go to Source Control on your GitHub codespaces and observe the pending changes.


SOURCE CONTROL
Message (Ctrl+Enter to commit on "main")
Commit
Changes
App.js frontend-reactnative
Incoming
origin/main
All Changes
add clarity to env for frontend...
remove exposed password...
remove CI CD Clark Ngo

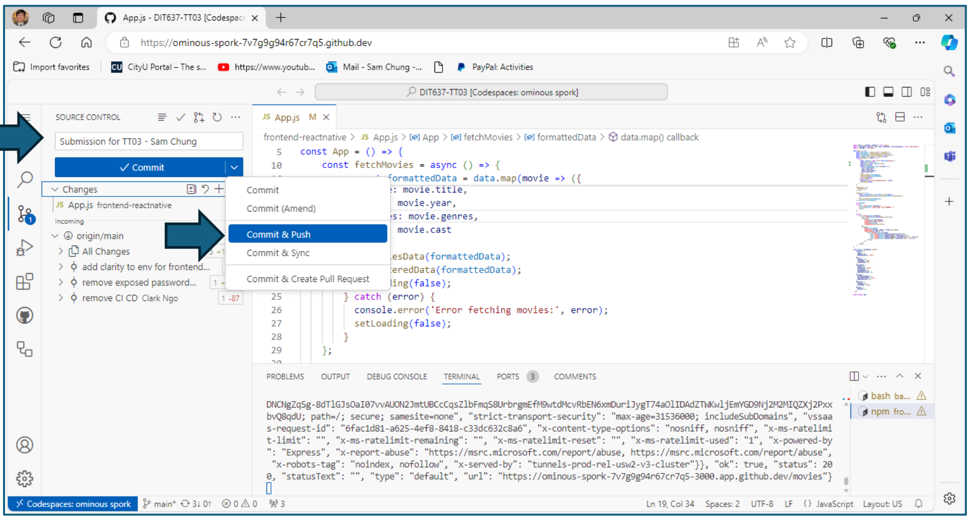
```
const App = () => {
    const fetchMovies = async () => {
          const formattedData = data.map(movie => ({
            title: movie.title,
            year: movie.year,
            genres: movie.genres,
            cast: movie.cast
          }));
          setMoviesData(formattedData);
          setFilteredData(formattedData);
          setLoading(false);
        } catch (error) {
          console.error('Error fetching movies:', error);
          setLoading(false);
        }
    };
```

```
DNCNgZqSg-8dTlGJsOaI07vvAUON2JmtUBCcCqsZlbFmqS8UrbrgmEfM9wtdMcvRbEN6xmDuriJygT74aOlIDAdZTWKwljEmYGD9Nj2M2MIQZXj2Pxx
bvQ8qdU; path=/; secure; samesite=none", "strict-transport-security": "max-age=31536000; includeSubDomains", "vssaa
s-request-id": "6fac1d81-a625-4ef8-8418-c33dc632c8a6", "x-content-type-options": "nosniff, nosniff", "x-ms-ratelimi
t-limit": "", "x-ms-ratelimit-remaining": "", "x-ms-ratelimit-reset": "", "x-ms-ratelimit-used": "1", "x-powered-by
": "Express", "x-report-abuse": "https://msrc.microsoft.com/report/abuse, https://msrc.microsoft.com/report/abuse",
 "x-robots-tag": "noindex, nofollow", "x-served-by": "tunnels-prod-rel-usw2-v3-cluster"}}, "ok": true, "status": 20
0, "statusText": "", "type": "default", "url": "https://ominous-spork-7v7g9g94r67cr7q5-3000.app.github.dev/movies"}
```

2) Type the Message for your changes in the Message box on the top. For example,” **Submission for TT03 – Your Name**”

3) Click on the dropdown beside the commit button and select **Commit & Push** to update the changes to your repository main branch.

4) Select **Yes** when prompted.

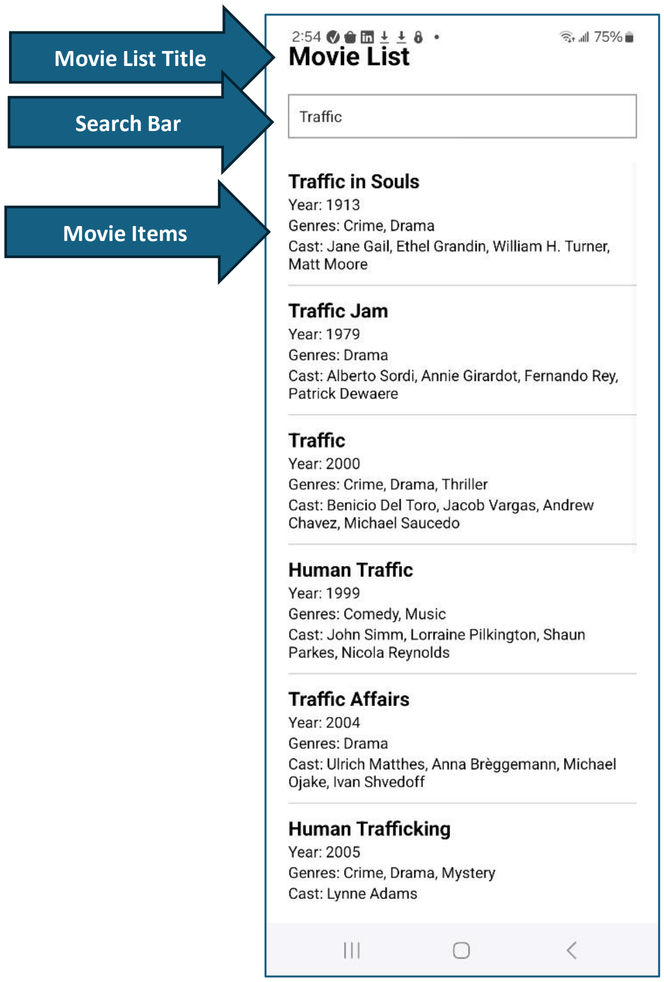


5) Screenshot Summary

In the provided screenshot, we see:

1. **Movie List Title**: Displayed using a Text component with a large, bold font style to indicate the screen's main purpose.
2. **Search Bar**: A 'TextInput' component at the top allows users to type in their search queries, dynamically filtering the movie list as they type.
3. **Movie Items**: Each movie is displayed within a 'View' styled as a list item, showing the title in bold, along with the genre and year in smaller text beneath it.

Sample Data for Movies: Provides a predefined list of movies with their titles, casts, genres, and release years, used to populate the initial movie list, and demonstrate search functionality.



Movie List

Traffic

Traffic in Souls
Year: 1913
Genres: Crime, Drama
Cast: Jane Gail, Ethel Grandin, William H. Turner, Matt Moore

Traffic Jam
Year: 1979
Genres: Drama
Cast: Alberto Sordi, Annie Girardot, Fernando Rey, Patrick Dewaere

Traffic
Year: 2000
Genres: Crime, Drama, Thriller
Cast: Benicio Del Toro, Jacob Vargas, Andrew Chavez, Michael Saucedo

Human Traffic
Year: 1999
Genres: Comedy, Music
Cast: John Simm, Lorraine Pilkington, Shaun Parkes, Nicola Reynolds

Traffic Affairs
Year: 2004
Genres: Drama
Cast: Ulrich Matthes, Anna Brèggemann, Michael Ojake, Ivan Shvedoff

Human Trafficking
Year: 2005
Genres: Crime, Drama, Mystery
Cast: Lynne Adams

6) Breakdown of Frontend code

React Native code sets up a simple mobile application to search and browse a list of movies. It fetches movie data from an API, filters the data based on user input, and displays the movies in a list. The application includes a loading indicator for data fetching and uses hooks for managing state and side effects. The styles are defined using ‘StyleSheet.create’ to ensure a consistent look and feel.

Importing Modules

```
import React, { useState, useEffect } from 'react';
import { TextInput, FlatList, Text, View, StyleSheet, ActivityIndicator } from 'react-native';
import { API_URL } from '@env';
```

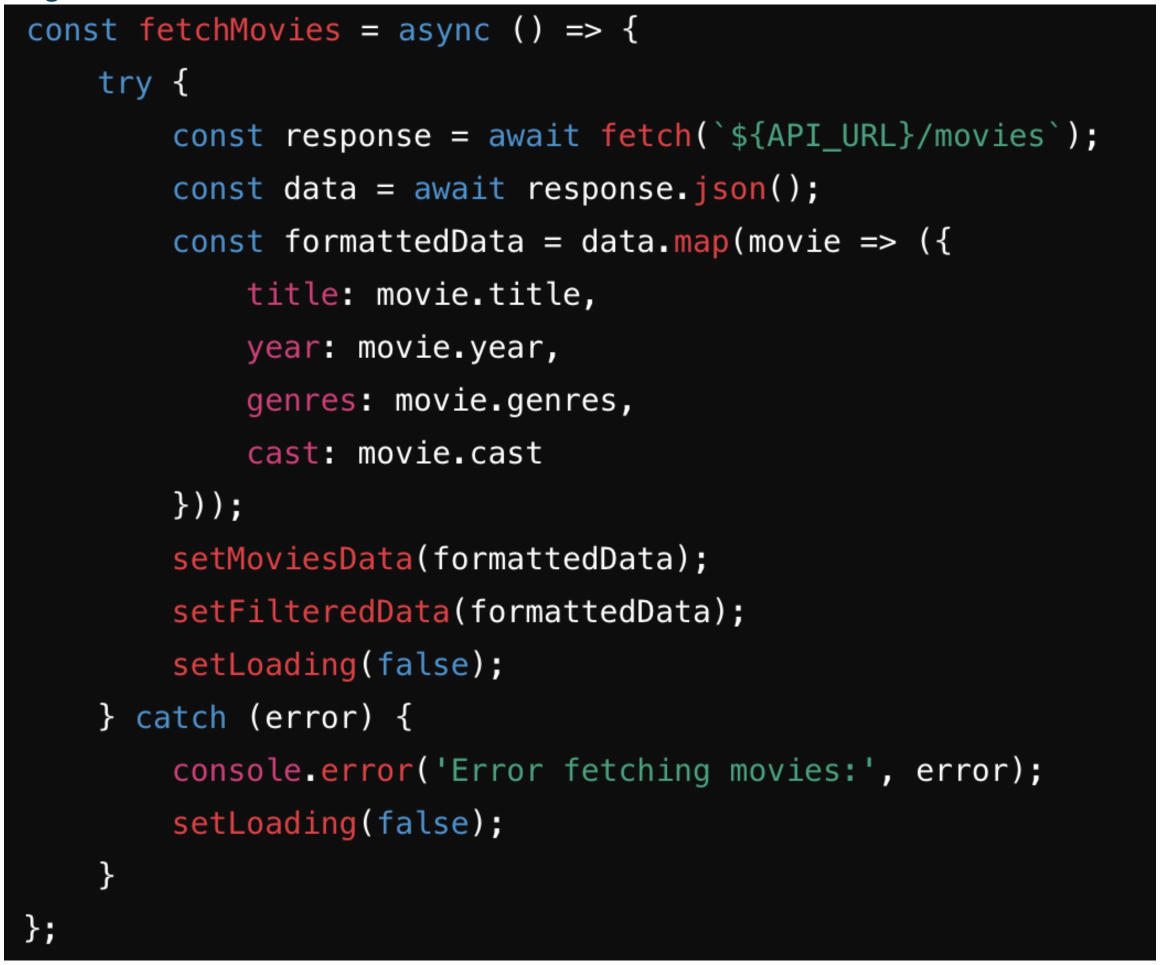
- **React**: A JavaScript library for building user interfaces.
- **useState**: A hook that lets you add React state to function components.
- **useEffect**: A hook that lets you perform side effects in function components (e.g., data fetching).
- **TextInput, FlatList, Text, View, StyleSheet, ActivityIndicator**: React Native components for building mobile UIs.
- **API_URL**: An environment variable for the API endpoint, imported using the @env module.

Component and State Initialization

```
const App = () => {
    const [searchTerm, setSearchTerm] = useState('');
    const [moviesData, setMoviesData] = useState([]);
    const [filteredData, setFilteredData] = useState([]);
    const [loading, setLoading] = useState(true);
```

- **App**: A functional component representing the main application.
- **searchTerm**: State to hold the search query input by the user.
- **moviesData**: State to store the raw movie data fetched from the API.
- **filteredData**: State to store the filtered list of movies based on the search term.
- **loading**: State to manage the loading state of the application.

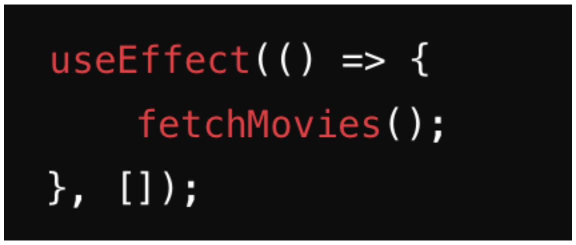
Fetching Movies Data



```javascript
const fetchMovies = async () => {
    try {
        const response = await fetch(`${API_URL}/movies`);
        const data = await response.json();
        const formattedData = data.map(movie => ({
            title: movie.title,
            year: movie.year,
            genres: movie.genres,
            cast: movie.cast
        }));
        setMoviesData(formattedData);
        setFilteredData(formattedData);
        setLoading(false);
    } catch (error) {
        console.error('Error fetching movies:', error);
        setLoading(false);
    }
};
```

- **fetchMovies**: An asynchronous function that fetches movie data from the API.
- **response**: The response object from the fetch call.
- **data**: The JSON data parsed from the response.
- **formattedData**: An array of formatted movie objects to store only the required fields.
- **setMoviesData**: Updates the moviesData state with the fetched data.
- **setFilteredData**: Initializes the filteredData state with the fetched data.
- **setLoading(false)**: Sets the loading state to false after data is fetched.

Fetching Data on Component Mount



```javascript
useEffect(() => {
    fetchMovies();
}, []);
```

- **useEffect(() => { fetchMovies(); }, [])**: Calls the fetchMovies function once when the component mounts.

Filtering Data Based on Search Term

```
useEffect(() => {
    const filteredMovies = moviesData.filter(movie =>
        movie.title.toLowerCase().includes(searchTerm.toLowerCase())
    );
    setFilteredData(filteredMovies);
}, [searchTerm, moviesData]);
```

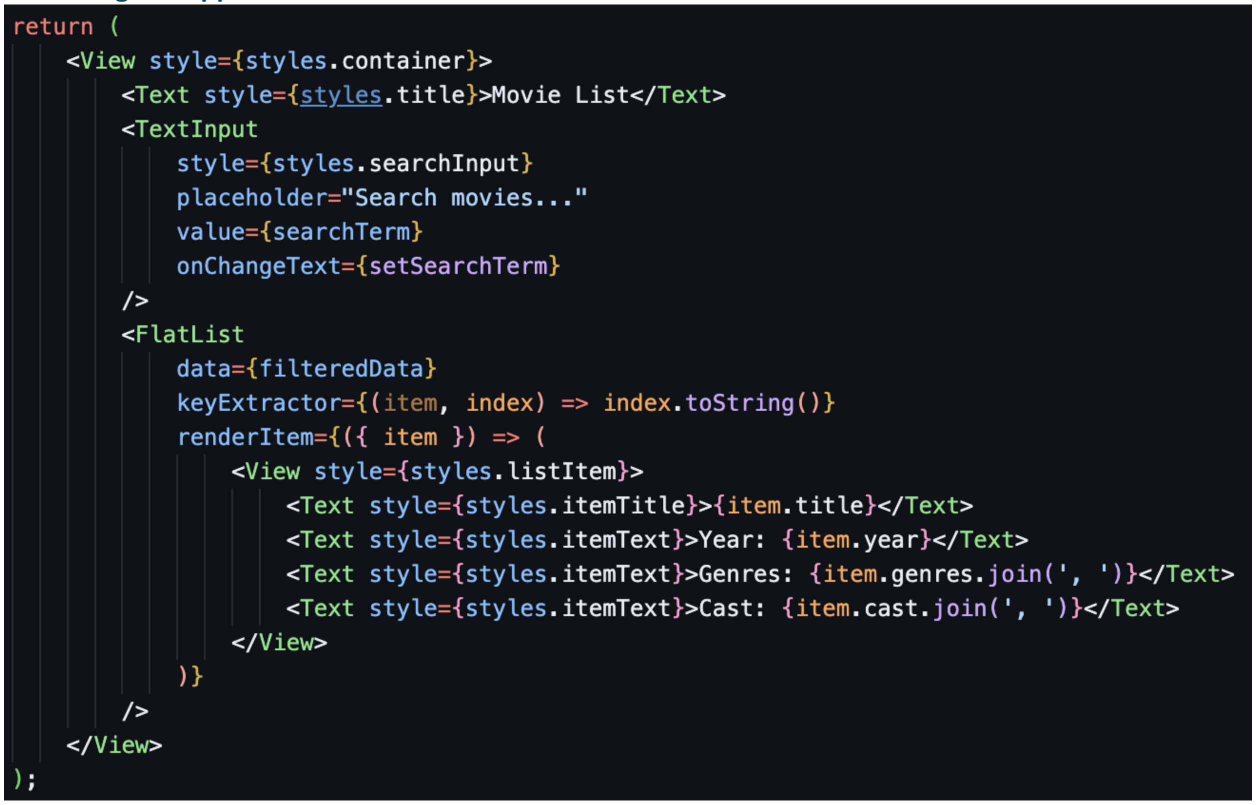
- **useEffect(() => { ... }, [searchTerm, moviesData])**: Filters the movie data whenever searchTerm or moviesData changes.
- **filteredMovies**: An array of movies that match the search term.

Loading Indicator

```
if (loading) {
    return (
        <View style={styles.container}>
            <ActivityIndicator size="large" color="#0000ff" />
        </View>
    );
}
```

- **if (loading)**: Shows a loading spinner if the data is still being fetched.

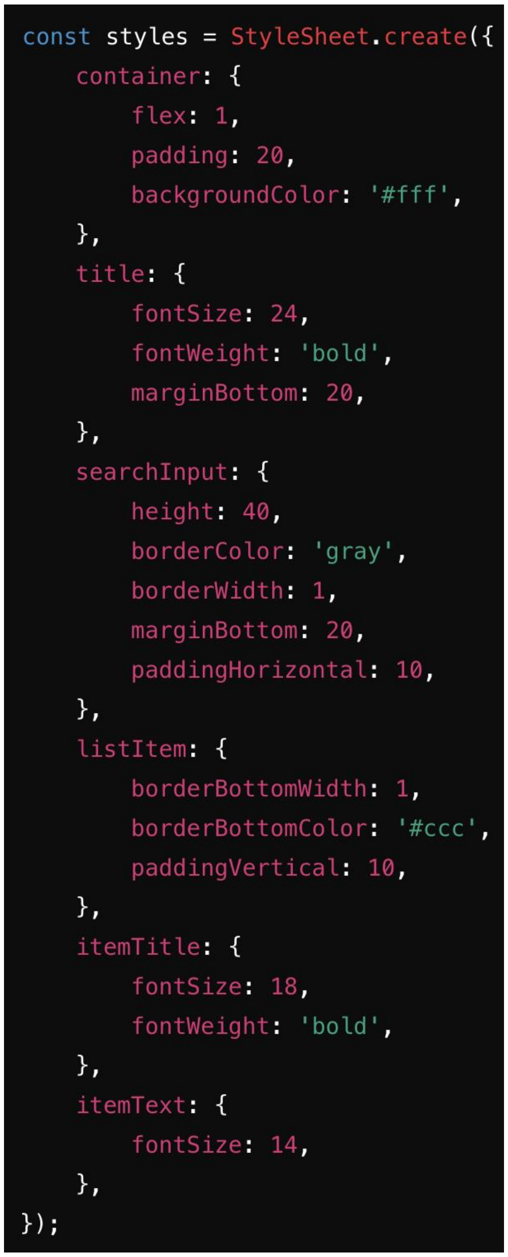
Rendering the App



```
return (
    <View style={styles.container}>
        <Text style={styles.title}>Movie List</Text>
        <TextInput
            style={styles.searchInput}
            placeholder="Search movies..."
            value={searchTerm}
            onChangeText={setSearchTerm}
        />
        <FlatList
            data={filteredData}
            keyExtractor={(item, index) => index.toString()}
            renderItem={({ item }) => (
                <View style={styles.listItem}>
                    <Text style={styles.itemTitle}>{item.title}</Text>
                    <Text style={styles.itemText}>Year: {item.year}</Text>
                    <Text style={styles.itemText}>Genres: {item.genres.join(', ')}</Text>
                    <Text style={styles.itemText}>Cast: {item.cast.join(', ')}</Text>
                </View>
            )}
        />
    </View>
);
```

- **View**: Container component for laying out child components.
- **Text**: Component for displaying text.
- **TextInput**: Component for user input.
- **FlatList**: Component for rendering a list of items.
- **styles.container**: Style for the main container.
- **styles.title**: Style for the title text.
- **styles.searchInput**: Style for the search input.
- **styles.listItem**: Style for each list item.
- **styles.itemTitle**: Style for the title of each movie.
- **styles.itemText**: Style for the text displaying year, genres, and cast.

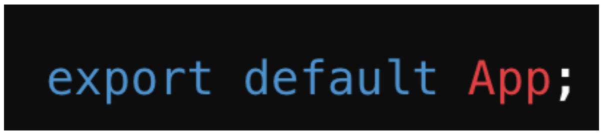
Styles



```
const styles = StyleSheet.create({
    container: {
        flex: 1,
        padding: 20,
        backgroundColor: '#fff',
    },
    title: {
        fontSize: 24,
        fontWeight: 'bold',
        marginBottom: 20,
    },
    searchInput: {
        height: 40,
        borderColor: 'gray',
        borderWidth: 1,
        marginBottom: 20,
        paddingHorizontal: 10,
    },
    listItem: {
        borderBottomWidth: 1,
        borderBottomColor: '#ccc',
        paddingVertical: 10,
    },
    itemTitle: {
        fontSize: 18,
        fontWeight: 'bold',
    },
    itemText: {
        fontSize: 14,
    },
});
```

- **StyleSheet.create**: Method for creating styles in React Native.

Exporting the App Component



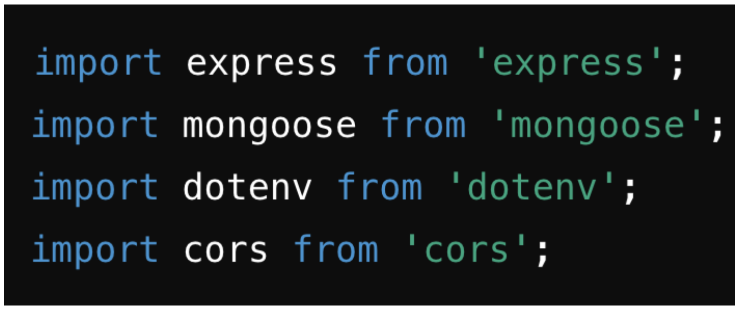
```
export default App;
```

- **export default App**: Exports the App component as the default export of the module.

7) Breakdown of Backend code

The backend code sets up an Express.js server with MongoDB integration using Mongoose. It includes environment variable management with dotenv, CORS handling, and a middleware that connects to MongoDB on demand. The server has routes to fetch movie data from MongoDB and responds with a simple message for the root route. The server is conditionally started based on the environment, and the app instance is exported for testing.

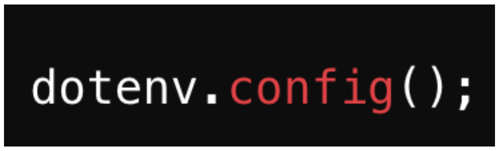
Importing Modules



```
import express from 'express';
import mongoose from 'mongoose';
import dotenv from 'dotenv';
import cors from 'cors';
```

- **express**: A web framework for Node.js, used to build web applications and APIs.
- **mongoose**: An ODM (Object Data Modeling) library for MongoDB and Node.js. It provides a schema-based solution to model application data.
- **dotenv**: A module that loads environment variables from a .env file into process.env. This is useful for keeping sensitive information, such as database connection strings, outside the source code.
- **cors**: A middleware that allows your server to handle requests from different origins, enabling Cross-Origin Resource Sharing (CORS).

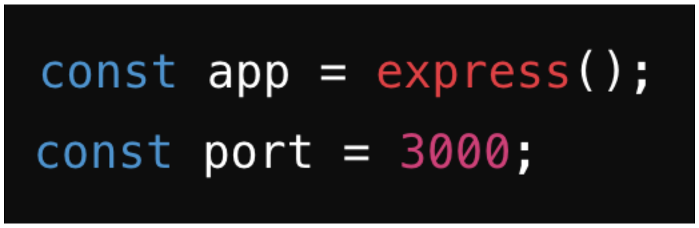
Configuration



```
dotenv.config();
```

- **dotenv.config()**: Loads environment variables from a .env file into process.env.

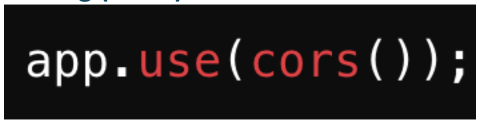
Creating Express Application



```
const app = express();
const port = 3000;
```

- **app**: An instance of an Express application.
- **port**: The port number where the application will run.

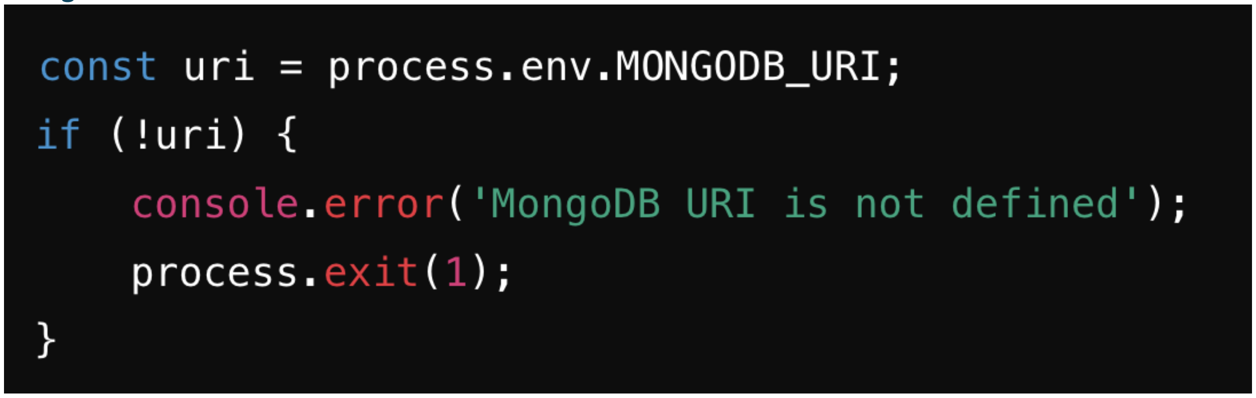
Enabling Cross-Origin Resource Sharing (CORS)



```
app.use(cors());
```

- **app.use(cors())**: Enables CORS for all routes, allowing your application to accept requests from different origins.

MongoDB URI



```
const uri = process.env.MONGODB_URI;
if (!uri) {
    console.error('MongoDB URI is not defined');
    process.exit(1);
}
```

- **uri**: Retrieves the MongoDB URI from environment variables.
- **if (!uri)**: Checks if the URI is not defined and exits the application if it's missing.

MongoDB Connection Middleware

```
let isConnected = false;

const connectToMongoDB = async (req, res, next) => {
  if (!isConnected) {
    try {
      await mongoose.connect(uri, {
        dbName: 'sample_mflix' // Set the database name
      });
      isConnected = true;
      console.log('Connected to MongoDB Atlas');
    } catch (error) {
      console.error('Error connecting to MongoDB Atlas:', error);
      return res.status(500).json({ error: 'Internal Server Error' });
    }
  }
  next();
};
```

- **isConnected**: A flag to track the connection status to MongoDB.
- **connectToMongoDB**: Middleware that connects to MongoDB if not already connected. It sets the isConnected flag to true once the connection is established. If the connection fails, it responds with a 500 status code.

Movie Schema and Model

```
const movieSchema = new mongoose.Schema({
  title: String,
  genres: [String],
  cast: [String],
  year: Number
}, { collection: 'movies' });

const Movie = mongoose.model('Movie', movieSchema);
```

- **movieSchema**: Defines the structure of the movie documents in MongoDB.
- **Movie**: A model based on the movieSchema, representing the movies collection in MongoDB.

Routes

```
app.get('/movies', connectToMongoDB, async (req, res) => {
  try {
    const movies = await Movie.find();
    res.json(movies);
  } catch (error) {
    console.error('Error retrieving movies:', error);
    res.status(500).json({ error: 'Internal Server Error' });
  }
});

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

- **/movies**: A route that retrieves all movies from the database. It uses the connectToMongoDB middleware to ensure a connection to MongoDB before querying.
- **/**: A simple route that responds with 'Hello World!'.

Starting the Server

```
if (process.env.NODE_ENV !== 'test') {
  app.listen(port, () => {
    console.log(`Server is running on http://localhost:${port}`);
  });
}
```

- **app.listen(port, ...)**: Starts the server on the specified port, but only if the environment is not set to 'test'. This allows for conditional server starting, useful for testing purposes.

Exporting the App

```
export default app;
```

- **export default app**: Exports the app instance for use in testing or other modules.

FAQs

What environment variables should I have for backend?

Sample:

```
MONGODB_URI=mongodb+srv://<username>:<password>@<cluster-url>/<database-name>
```

What environment variables should I have for frontend?

Sample:

```
## update this with your own backend-expressjs forwarded address
API_URL=https://probable-fishstick-77q6jrvvpxrfwr7r-3000.app.github.dev
```

How to run my frontend code?

Inside the frontend-reactnative folder

- npx expo login
- npm expo start --tunnel

How to run my backend code?

Inside the backend-expressjs folder

- npm start