

**Lesson 5-Building RESTful APIs with MERN Stack and Redux Toolkit**

**Topics**

1. Redux Thunk Middleware in Redux Toolkit for Asynchronous API calls with Axios
   1. extrareducers
2. Consume REST APIs using Axios
3. MongoDb Database
4. Creating REST API Routes
5. Testing API Routes using Thunder Client
6. User Login Authentication
   1. Bcrypt
   2. UseNavigate Hook
   3. useParams Hook

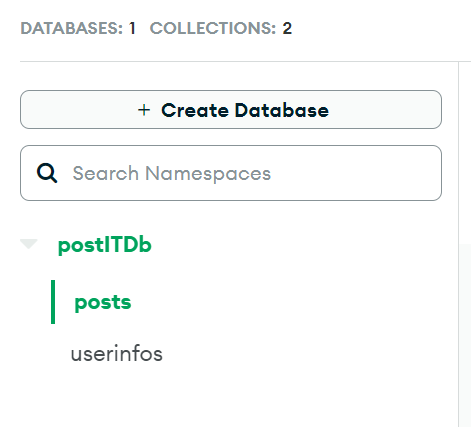
**Activity 5 – RestFul API & Registration-Login**

The objectives of this activitiy are to:

1. Design and implement RESTful APIs using the MERN stack (MongoDB, Express, Node.js) to perform CRUD operations.
2. Integrate Redux Toolkit with a React front-end to manage asynchronous actions and handle API requests.

**PART 1 – MongoDb Setup**

Before starting the activity, ensure that you have created the MongoDb database in

<https://www.mongodb.com/atlas/database>.

The project details are as follows:

|  |  |
| --- | --- |
| **Project Name** | PostITApp |
| **Cluster Name** | PostITCluster |
| **Database Name** | postITDb |
| **Collections** | userInfos, posts |
| **Database Username** | *You provide your own* |
| **Database Password** | *You provide your own* |

**PART 2-SERVER-SIDE DEVELOPMENT USING NodeJS and Express**

1. Open a new terminal in VSCode and navigate to the server folder.
   1. Execute the command to initialize the server.

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* 1. Accept the default server settings by pressing Enter.

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1. Install the libraries.
   1. **npm install express mongoose cors**
2. In the server folder. Create a file index.js. This file in is the entry point for your server.

import express from "express";

import mongoose from "mongoose";

import cors from "cors";

const app = express();

app.use(express.json());

app.use(cors());

//Database connection

const connectString ="";

mongoose.connect(connectString);

app.listen(3001, () => {

  console.log("You are connected");

});

1. Open your package.json and add the following after the main…

**"type":"module",**

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1. Run your server by executing the command: **node index.js**

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1. However, every time you have changes in your index.js, you need to run again the server. This can be cumbersome to do. In order to solve this, we can use **nodemon**.
   1. Install nodemon.

**npm install nodemon**

* 1. Update **package.json** and write script for executing nodemon.

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* 1. Run your **nodemon** using the script. In this way, there is no need to explicitly stop and restart the server when there are changes in index.js.

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**PART 3-CONNECTING TO MONGODB**

1. Login to your MongoDb Atlas account. Go to the specific project. Click the Clusters menu.

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1. Select the Connect to you Connect to your Application.

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1. Follow the steps provided.

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1. In **index.js**, provide the value for your database connection string. Example connection string:

**mongodb+srv://jasminetumulak:<db\_password>@cluster0.lvic91v.mongodb.net/name of database?retryWrites=true&w=majority&appName=Cluster0**

import express from "express";

import mongoose from "mongoose";

const app = express();

//Database connection

const connectString ="";

mongoose.connect(connectString);

app.listen(3001, () => {

  console.log("You are connected");

});

**PART 4-CREATING MODELS**

1. In your **server** folder, create a folder: **Models**. In that folder, create a new file: **UserModel**.js.

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1. In the file UserModel.js, write the code to create the **UserModel**.

import mongoose from "mongoose";

const UserSchema = mongoose.Schema({

  name: {

    type: String,

    required: true,

  },

  email: {

    type: String,

    required: true,

    unique: true,

  },

  password: {

    type: String,

    required: true,

  },

  profilePic: {

    type: String,

default: "user.png",

  },

});

const UserModel = mongoose.model("userInfos", UserSchema);

export default UserModel;

1. Import the UserModel in index.js

import UserModel from "./Models/UserModel.js";

**PART 5-CREATING EXPRESS ROUTES**

1. In **index.js**, setup an Express API route that will handle the request from the client to register the user.
   1. We will use the function **bcrypt** which is a library used to hash and securely store passwords. When a user registers on a website, instead of storing the raw password in the database (which is highly insecure), you hash it using bcrypt to protect it.
   2. Install the bcrypt library:

**npm install bcrypt**

* 1. Import the **bcrypt** library in index.js.

import bcrypt from "bcrypt";

import UserModel from "./Models/UserModel.js";

…..

app.post("/registerUser", async (req, res) => {

  try {

    const name = req.body.name;

    const email = req.body.email;

    const password = req.body.password;

    const hashedpassword = await bcrypt.hash(password, 10);

    const user = new UserModel({

      name: name,

      email: email,

      password: hashedpassword,

    });

    await user.save();

    res.send({ user: user, msg: "Added." });

  } catch (error) {

    res.status(500).json({ error: "An error occurred" });

  }

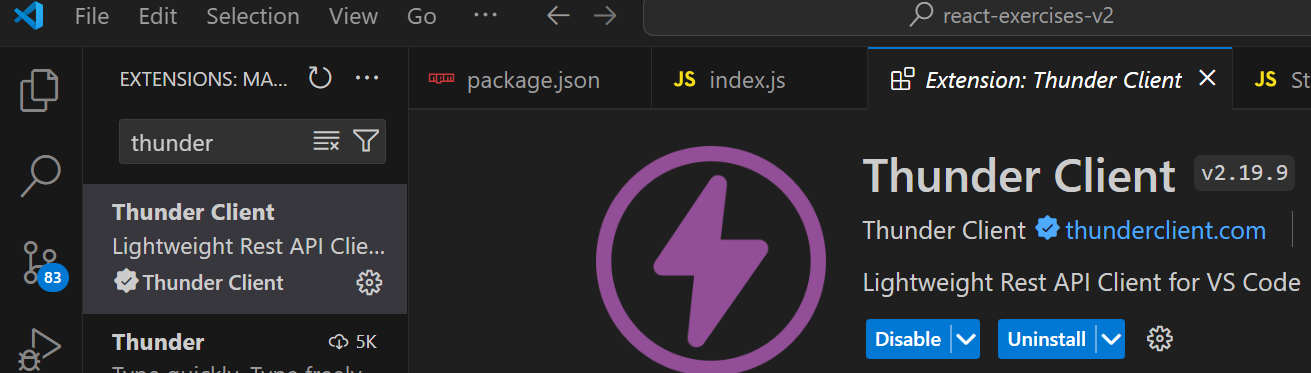
});

app.listen(3001, () => {

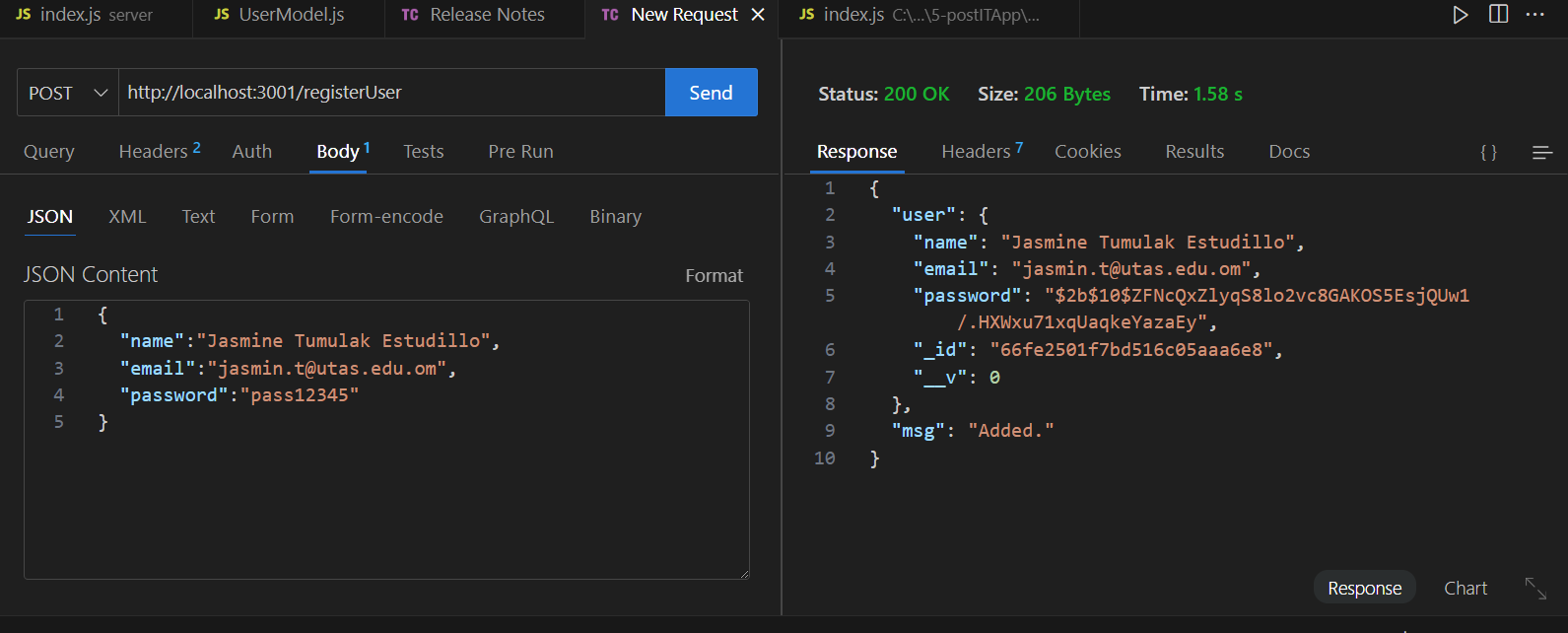
  console.log("You are connected");

});

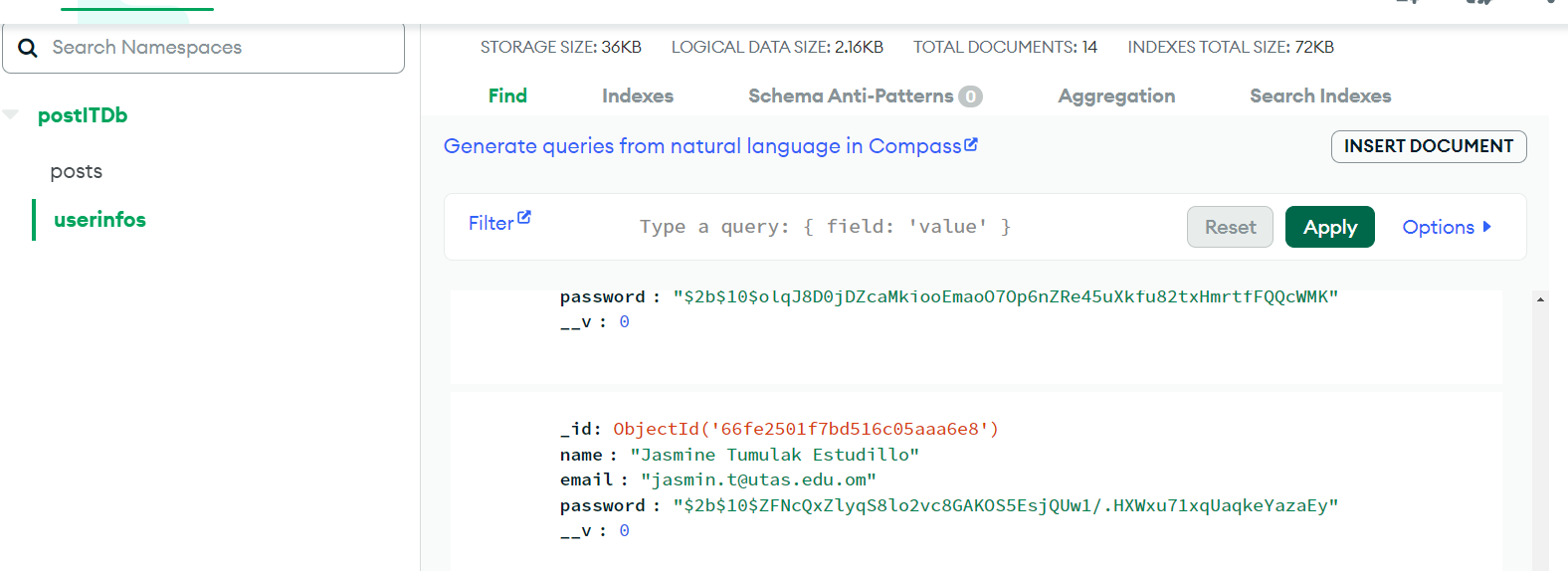
1. Testing the Express routes using Thunder Client. In extensions, install Thunder Client.

****

1. After installing, the Thunder Client icon will be available. Then click on the New Request button. Click the body tab and provide example request values in JSON format.



1. Login to your MongoDb account and check if the new information is saved in the collection.



**Part 6 - Redux toolkit with async API example using createAsyncThunk**

1. In your **client** folder, install the dependencies. First, install Axios which is a popular JavaScript library used for making HTTP requests from the browser or Node.js.

**npm install axios**

1. Let us update our **Components**/**Register.js** file and comment (you may delete if you want to) the table that we used to display the value of our user state we used as test in the previous activity.

 {/\* List of Users

          <table>

.....

          </table> \*/}

1. In **src/Features/UserSlice.js**. Create the **thunk** using the **createAsyncThunk** and make sure to import the **createAsyncThunk** function. Also import Axios.

import { UsersData } from "../ExampleData";

import { createAsyncThunk, createSlice } from "@reduxjs/toolkit";

import axios from "axios";

//const initialState = { value: [] }; //list of user is an object with empty array as initial value

const initialState = { value: UsersData }; //Assign the data from the exampleData

//Create the thunk

export const registerUser = createAsyncThunk();

export const userSlice = createSlice({

…..

});

1. Then provide the parameters to the function: **type** and **payloadcreator**. The code below is a basic format of thunk function. You need to make the callback function as an asynchronous function using the **async**. Also, we are using here the try…catch() block.

//Create the thunk (type and payloadCreator)

export const registerUser = createAsyncThunk("users/registerUser",

  async ()=>{

    try{

    }

    catch (error) {

      console.log(error);

    }

})

**Thunk Name**: registerUser

This is the name of the thunk. It will be used as the action type when dispatching this thunk.

Thunk Action Type: "users/registerUser"

The first argument to createAsyncThunk is a string representing the action type. It usually follows the pattern **"sliceName/actionName**".

**Async Function**: The second argument to **createAsyncThunk** is an asynchronous function that sends a POST request to the server using Axios.

If the request is successful, it extracts the user data from the response and returns it. This returned value will be used as the payload when the thunk completes successfully.

1. Use Axios to send a request to the server and pass along with request the request body.

//Create the thunk (type and payloadCreator)

// Thunk Name : users/registerUser

//Thunk Action Type: "users/registerUser"

export const registerUser = createAsyncThunk(

  "users/registerUser",

  async (userData) => {

    try {

      //sends a POST request to the server along the request body object

      const response = await axios.post("http://localhost:3001/registerUser", {

        name: userData.name,

        email: userData.email,

        password: userData.password,

      });

      console.log(response);

      const user = response.data.user; //retrieve the response from the server

      return user; //return the response from the server as payload to the thunk

    } catch (error) {

      console.log(error);

    }

  }

);

1. Update the initial state of the user state:

const initialState = {

  user: [],

  isLoading: false,

  isSuccess: false,

  isError: false,

};

1. Create the **extraReducers** in the users slice of the Redux store.

export const userSlice = createSlice({

  name: "users", //name of the state

  initialState,

  reducers: {

    // Synchronous actions that update the state directly,

  },

  //builder.addCase(action creator(pending, fulfilled, rejected), reducer)

  extraReducers: (builder) => {

    //Asynchronous actions that update the state directly,

    builder

      .addCase(registerUser.pending, (state) => {

        state.isLoading = true;

      })

      .addCase(registerUser.fulfilled, (state, action) => {

        state.isSuccess = true;

      })

      .addCase(registerUser.rejected, (state) => {

        state.isLoading = false;

      });

  },

}); //end of slice

**Slice Name: "users"**

This is the name of the slice. It will be used to generate action types and selectors associated with this slice.

**Reducers**: For synchronous actions that update the state directly.

**Extra Reducers**: Handle actions that are not simple synchronous actions but are produced by thunks.

**Builder** is an object provided as an argument to the **extraReducers** callback. It is used to define how the state should be updated in response to different actions.

1. In Register.js, import the extrareducer registerUser so we can use this in the Register component.

import { registerUser } from "../Features/UserSlice";

1. Then we can call in the component that needs to invoke the thunk. In this case, the **Register.js,** dispatch an action.

*Note: This function was created in the previous activity. Simply change the function in the invoked by the dispatch hook to* ***registerUser*** *instead of the* ***addUser****.*

  // Handle form submission

  const onSubmit = (data) => {

    try {

      // You can handle the form submission here

      const userData = {

        name: data.name,

        email: data.email,

        password: data.password,

      };

      console.log("Form Data", data);

      alert("Validation all good.");

      dispatch(registerUser(userData)); // Dispatch an action to add a new user by passing the user data to the Redux store

    } catch (error) {

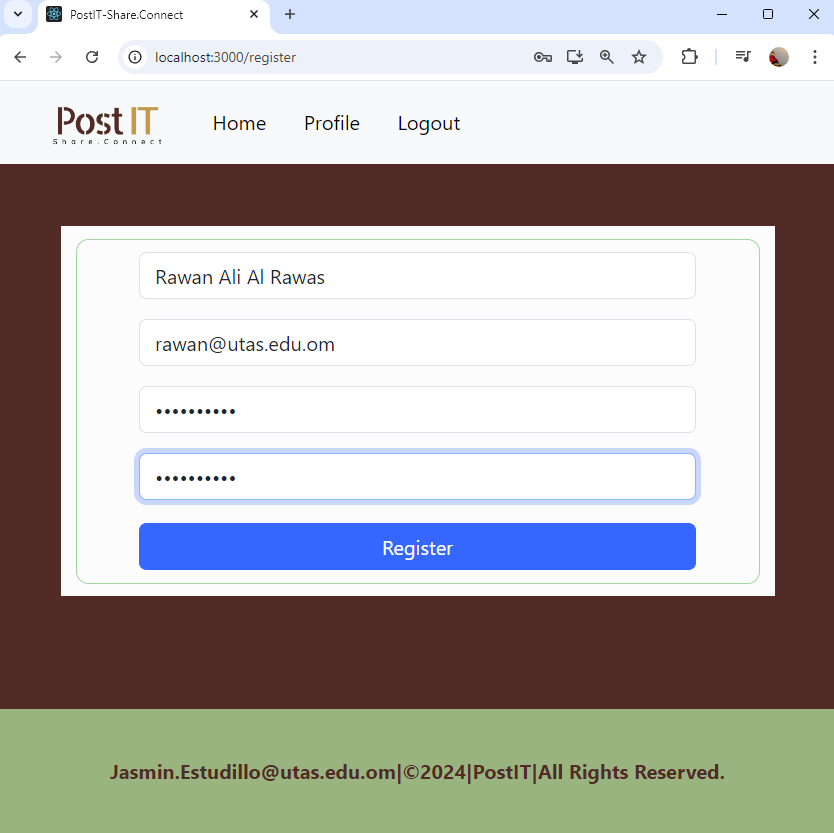
      console.log("Error.");

    }

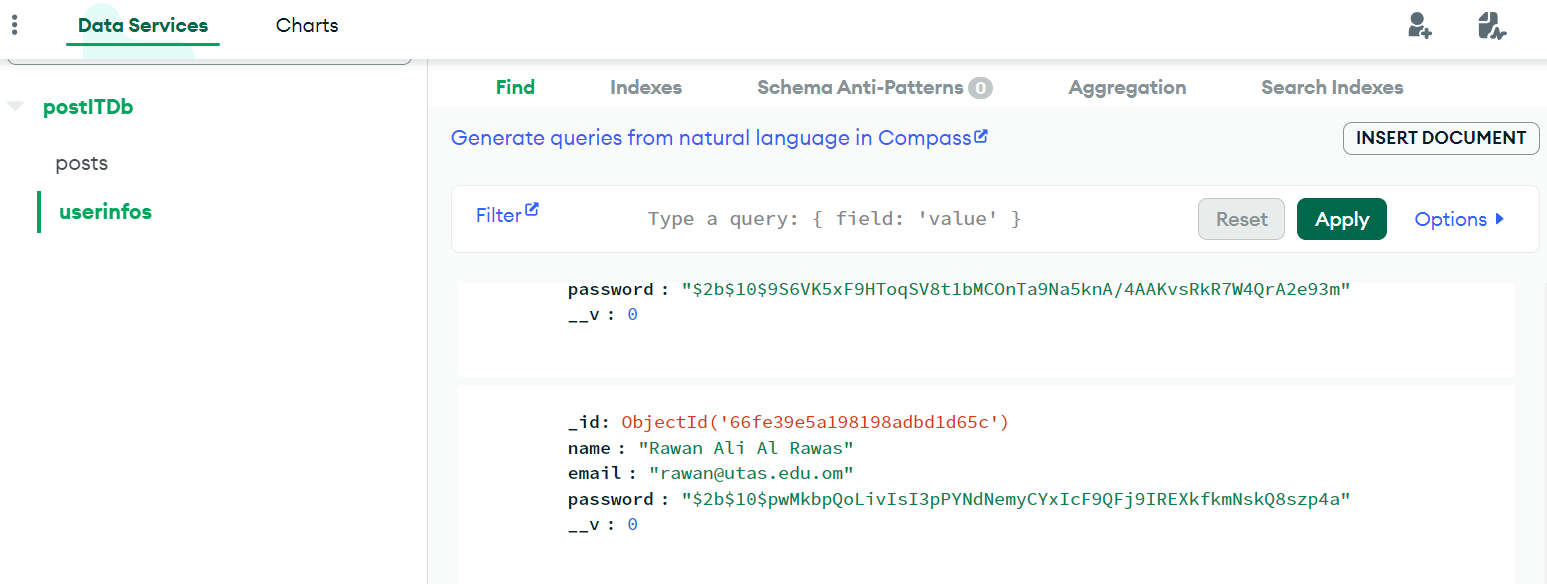
  };

};

1. You can test your code now. Input example data. Check your MongoDb database if it is saved.



1. Check your MongoDb is data is saved.



1. After successfully saving the registration details, we will create the login functionality. So, after the user registration, the user must be redirected to the login page.
   1. In **Register.js**, import the **usenavigate**() hook from react-router-dom.

import { useNavigate } from "react-router-dom";

* 1. Then declare a variable named navigate and assign it the value returned by the useNavigate() hook.

const Register = () => {

…

  const dispatch = useDispatch(); //every time we want to call an action, make an action happen

  const navigate = useNavigate() //declares a constant variable named navigate and assigns it the value returned by the useNavigate() hook.

…

}

* 1. In the **onSubmit()** function, after dispatching the action use the navigate function. The navigate is a function that you can use to control navigation within your React application when using React Router.

  // Handle form submission

  const onSubmit = (data) => {

    try {

      ……

      dispatch(registerUser(userData)); // Dispatch an action to add a new user by passing the user data to the Redux store

      navigate("/login"); //redirect to login component

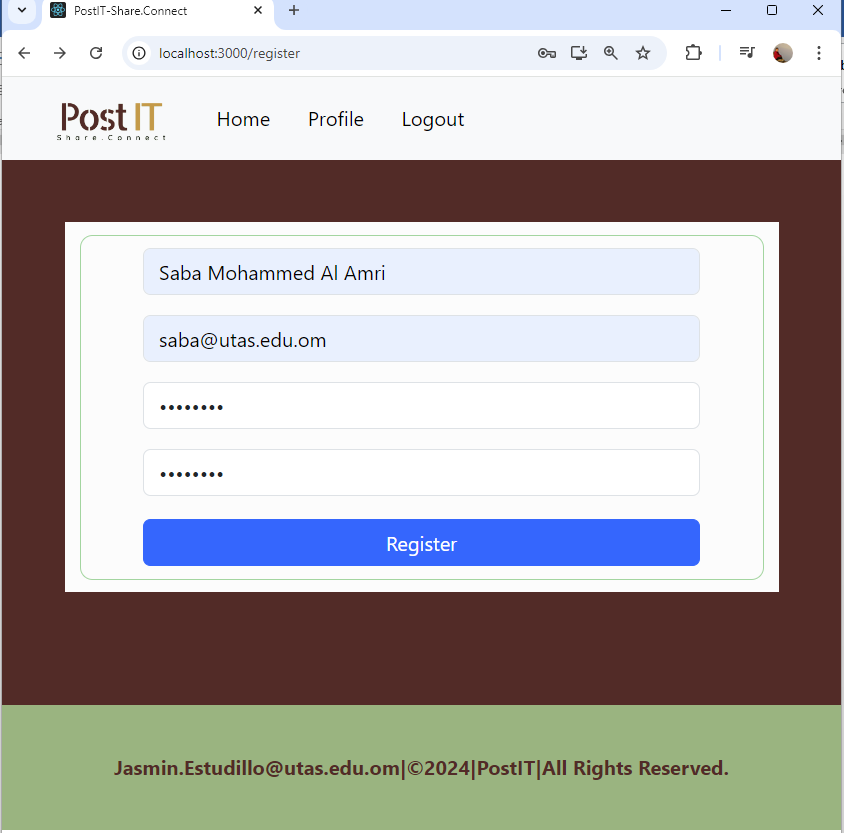
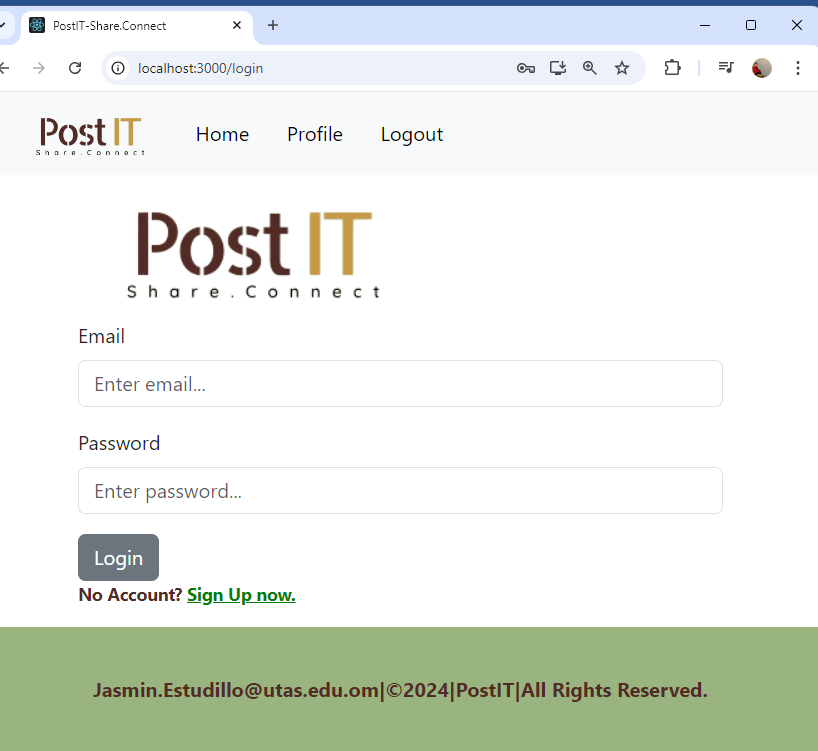
    } catch (error) {

      console.log("Error.");

    }

  };

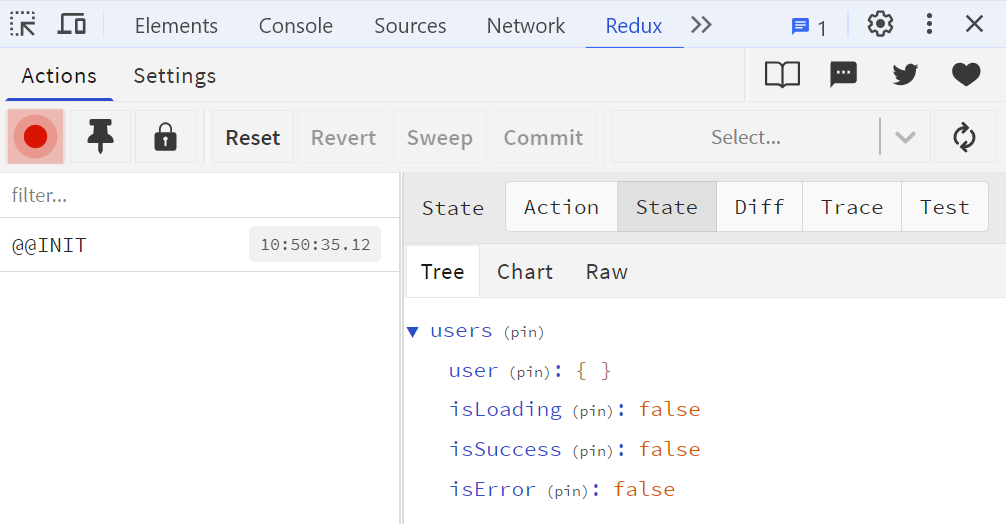
1. Test the navigate hook if the redirection is working. Input new data and click Register. The login component must be automatically rendered.



**Note: We will implement in the next activities how to conditionally render the Header component.**

**PART 7- LOGIN IMPLEMENTATION**

1. First check your store using the Chrome Dev Tools for the state of your application. At this point, the user state is empty.



1. In **server/index.js**, let us create the API for login. The login functionality follows this logic:
   1. Retrieve the login details from the request (email and password)
   2. Query the database for the email, if email does not exist, send error response message to the client.
   3. If email exist, compare the hashed password from the database with the hashed password from the user input.
   4. If the same, send a response to the client. Include in the response user details and a successful message.

app.post("/login", async (req, res) => {

  try {

    const { email, password } = req.body; //using destructuring

    //search the user

    const user = await UserModel.findOne({ email: email });

    //if not found

    if (!user) {

      return res.status(500).json({ error: "User not found." });

    }

    console.log(user);

    const passwordMatch = await bcrypt.compare(password, user.password);

    if (!passwordMatch) {

      return res.status(401).json({ error: "Authentication failed" });

    }

    //if everything is ok, send the user and message

    res.status(200).json({ user, message: "Success." });

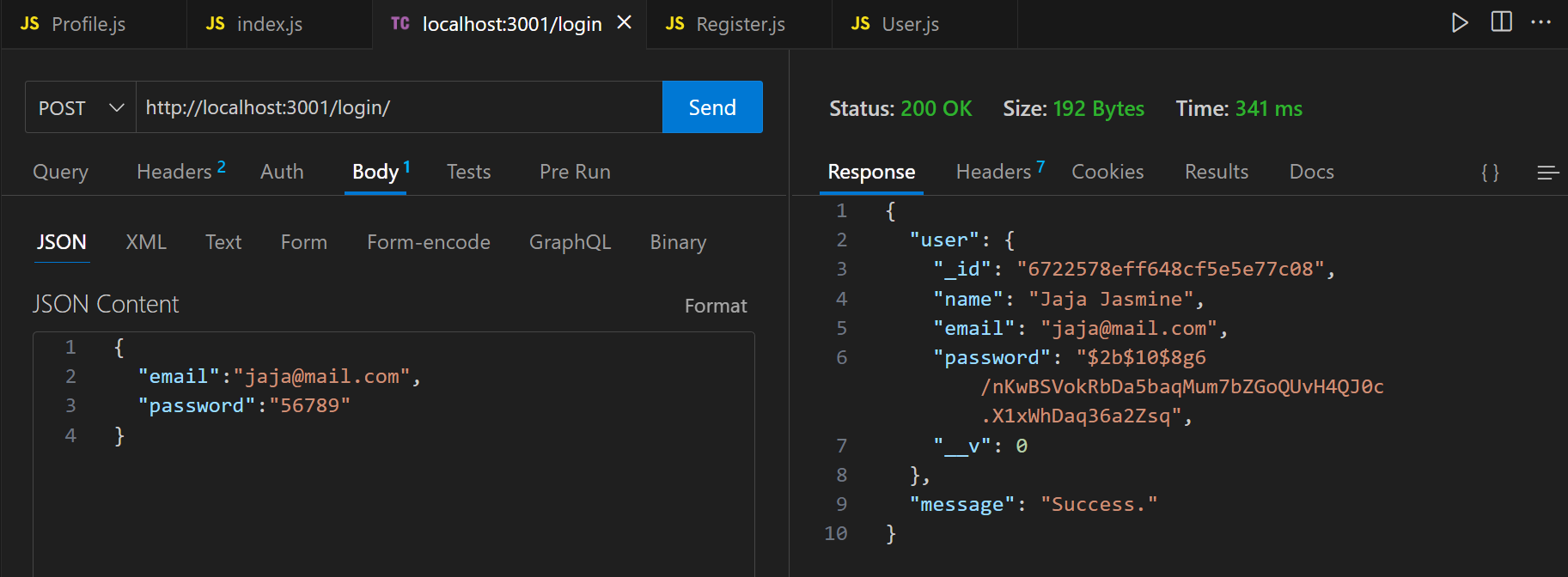
  } catch (err) {

    res.status(500).json({ error: err.message });

  }

});

1. Test the login API using Thunder Client.



1. In src/Components/Login.js, import useState() hook.

import { useState } from "react";

1. Create the state variables for email and password. Create the event handler to assign the value of the input to the state.

…..

const Login = () => {

  const [email, setemail] = useState();

  const [password, setpassword] = useState();

…..

              <Input

                id="email"

                name="email"

                placeholder="Email..."

                type="email"

                onChange={(e) => setemail(e.target.value)}

              />

….

}

1. In Login.js, create a function that will handle the logic of the login. Create an object that will contain the current values of the state variables. Write this function before the return statement.

  //function that will be invoked when the user clicks the login button

  const handleLogin = () => {

    const userData = {

      email,

      password,

    };

  };

1. Call this function when the user clicks the Login button.

              <Button

                color="primary"

                className="button"

                onClick={() => handleLogin()}

              >

                Sign in

              </Button>

1. This time, we need to create a thunk for the login in our user slice in **src/Features/User.js.**

export const login = createAsyncThunk("users/login", async (userData) => {

  try {

    const response = await axios.post("http://localhost:3001/login", {

      email: userData.email,

      password: userData.password,

    });

    const user = response.data.user;

    console.log(response);

    return user;

  } catch (error) {

    //handle the error

    const errorMessage = "Invalid credentials";

    alert(errorMessage);

    throw new Error(errorMessage);

  }

});

1. Then, we need to create extrareducers for the login thunk.

 extraReducers: (builder) => {

    //Asynchronous actions that update the state directly,

    builder

…..

      .addCase(login.pending, (state) => {

        state.isLoading = true;

      })

      .addCase(login.fulfilled, (state, action) => {

        state.user = action.payload; //assign the payload which is the user object return from the server after authentication

        state.isLoading = false;

        state.isSuccess = true;

      })

      .addCase(login.rejected, (state) => {

        state.isLoading = false;

        state.isError = true;

      });

  },

…..

1. In **src/Components/Logins.js**, import the useDispatch and create a variable for which can be used to dispatch actions.

…..

import { useDispatch, useSelector } from "react-redux";

const Login = () => {

  const [email, setemail] = useState();

  const [password, setpassword] = useState();

  const dispatch = useDispatch();

…..

1. Import the login function Login.js.

import { login } from "../Features/UserSlice";

1. Dispatch the login action in the function handleLogin. Pass as argument the userData object.

…..

//function that will be invoked when the user clicks the login button

  const handleLogin = () => {

    const userData = {

      email: email,

      password: password,

    };

  };

    dispatch(login(userData))  //dispatch a login action from the user slice.

  };

…..

**Using the useSelector() Hook**

1. Now in the **src/Components/Login.js** component, we need to know what the status of the user state is so we can identify if login is successful or not. Import the useSelector() Hook.

import { useSelector } from "react-redux";

1. Use the **useSelector** Hook to retrieve the current value of the state from the store.

…..

const Login = () => {

  const [email, setemail] = useState();

  const [password, setpassword] = useState();

  const dispatch = useDispatch();

//Retrieve the current value of the state from the store, name of state is users with a property user

  const user = useSelector((state) => state.users.user);

  const isSuccess = useSelector((state) => state.users.isSuccess);

  const isError = useSelector((state) => state.users.isError);

…..

1. In **src/Components/Login.js**, import the useEffect Hook and the useNavigate Hook. Declare a variable for the

import { useEffect } from "react";

import { useNavigate } from "react-router-dom";

const Login = () => {

…..

  const dispatch = useDispatch();

  const navigate = useNavigate();

…..

1. Use the useEffect hook to determine which page to navigate based on the state of the application. Write this code before the return statement.

  useEffect(() => {

    if (isError) {

      navigate("/login");

    }

    if (isSuccess) {

      navigate("/");

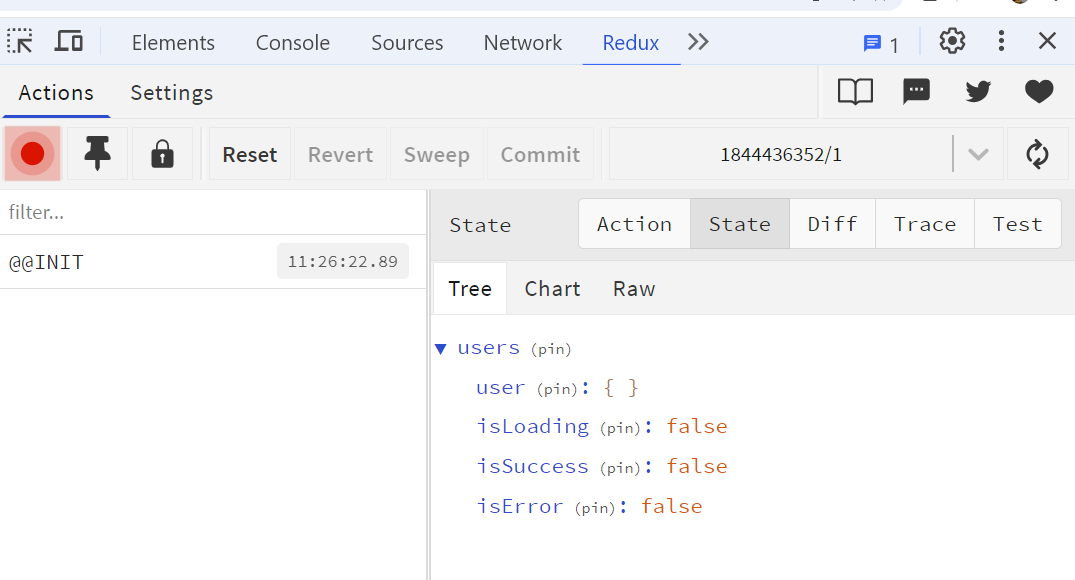
    } else {

      navigate("/login");

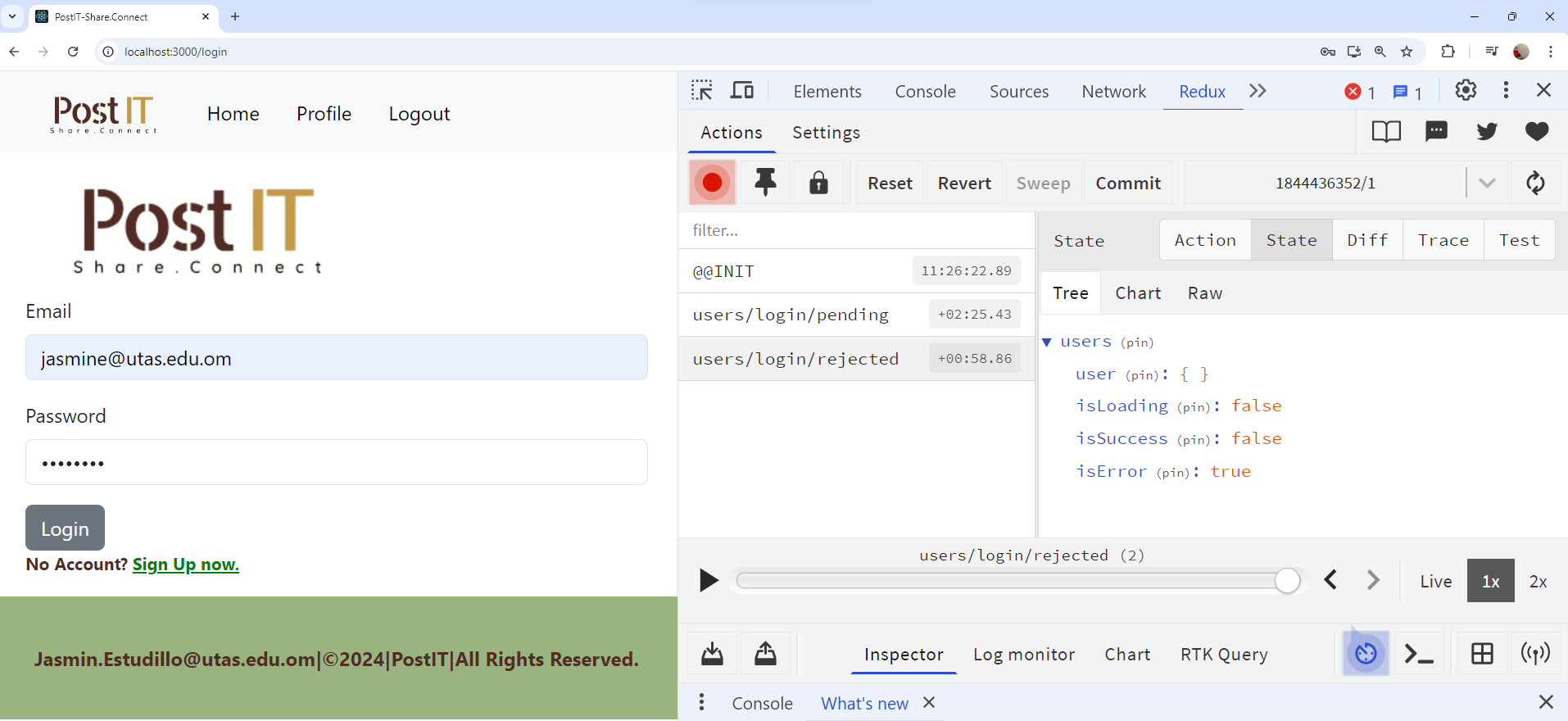
    }

  }, [user, isError, isSuccess]);

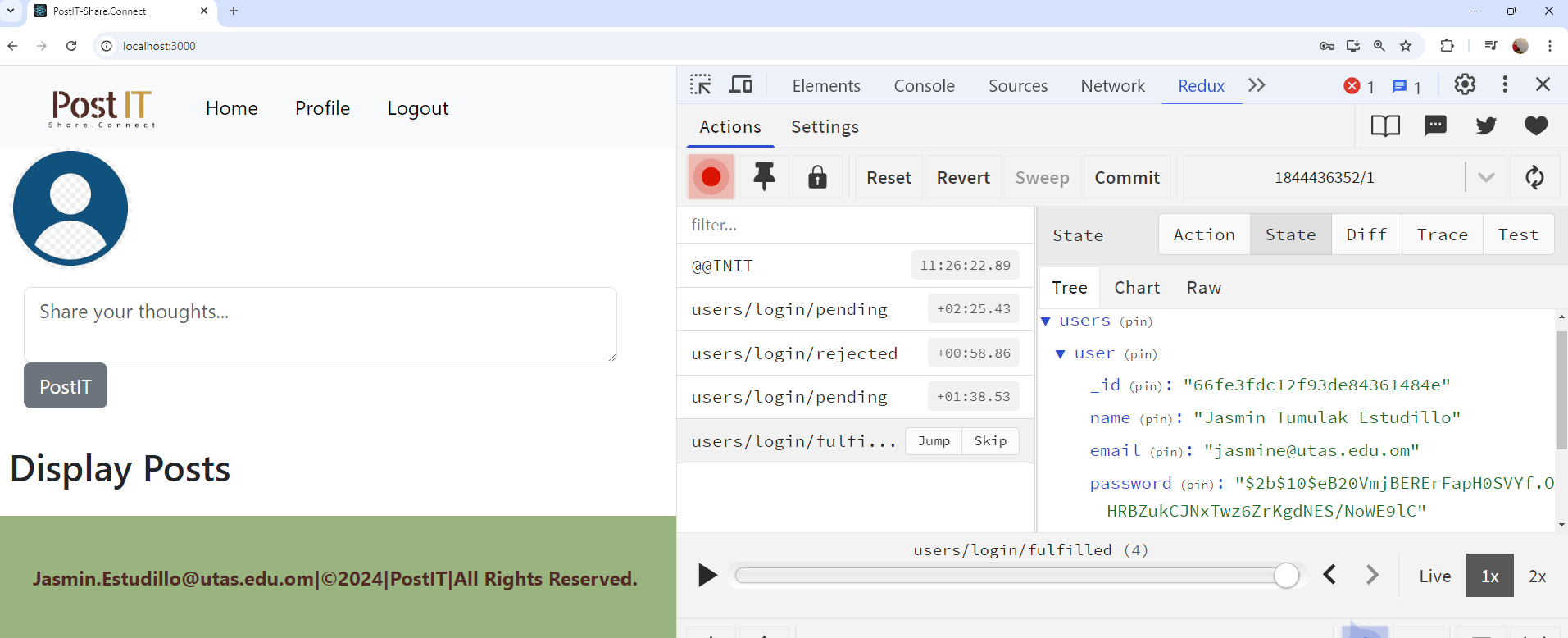
1. Testing the login. In your Login page open your Redux Dev tools. Notice the values of the state users.



Input incorrect credentials and observe the values of the state.



Input correct credentials for a registered user and the page should be redirected to the Home page. Also observed the value in the Redux store. Notice that the user property has been updated with the details of the user.

****

**PART 8 - LOGOUT Implementation**

1. In **server/index.js**, we will make API for logout.

//POST API-logout

app.post("/logout", async (req, res) => {

  res.status(200).json({ message: "Logged out successfully" });

});

1. In **client/src/Features/Users.js**, create a logout thunk.

export const logout = createAsyncThunk("/users/logout", async () => {

  try {

    // Send a request to your server to log the user out

    const response = await axios.post("http://localhost:3001/logout");

  } catch (error) {}

});

1. In the **UserSlice.js**, add the extraducers for the logout.

 extraReducers: (builder) => {

    //Asynchronous actions that update the state directly,

…..

      .addCase(logout.pending, (state) => {

        state.isLoading = true;

      })

      .addCase(logout.fulfilled, (state) => {

        // Clear user data or perform additional cleanup if needed

        state.user = {};

        state.isLoading = false;

        state.isSuccess = false;

      })

      .addCase(logout.rejected, (state) => {

        state.isLoading = false;

        state.isError = true;

      });

…..

1. **In src/Components/Header.js**, import useDispatch() and useNavigate from react-router-dom. Also import the logout function.

import { useDispatch } from "react-redux";

import { Link, useNavigate } from "react-router-dom";

import { logout } from "../Features/UserSlice";

1. In src/Components/Header.js, make a new function **handlelogout().** This will be invoked when the user clicks the logout link. Declare also dispatch and navigate variables.

  const dispatch = useDispatch();

  const navigate = useNavigate();

  const handlelogout = async () => {

    dispatch(logout());

    //ensure that the state update from the logout action has been processed before proceeding to the next step.

    await new Promise((resolve) => setTimeout(resolve, 100));

    navigate("/"); //redirect to login page route.

  };

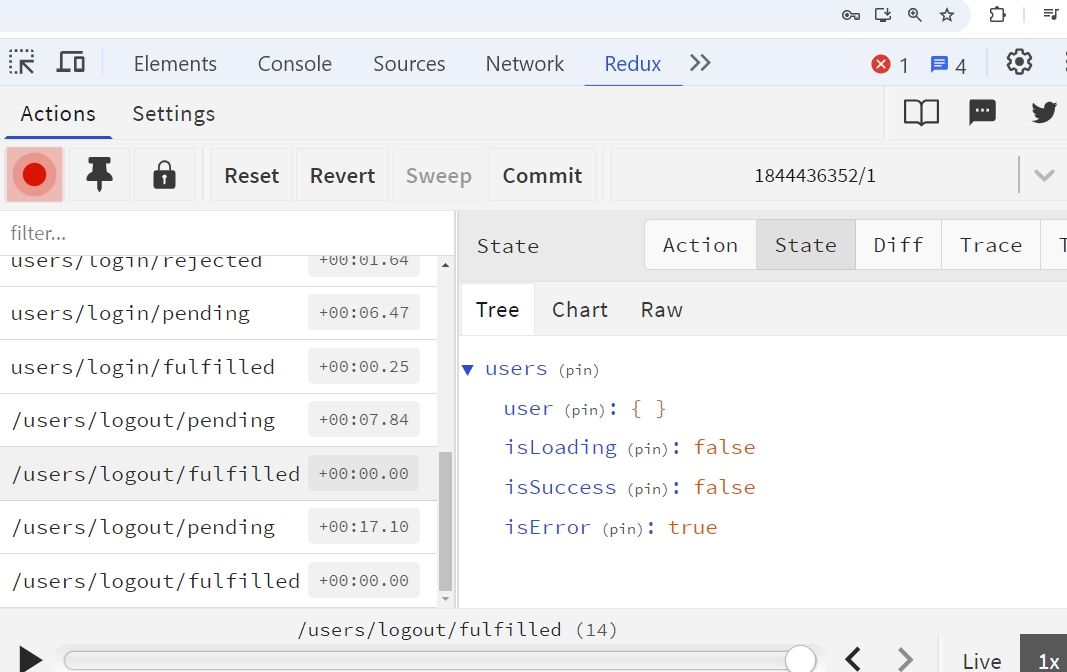
1. In the logout link create an event handler that will call the **handlelogout**() function.

    …

<Link onClick={handlelogout}>Logout</Link>

…

1. Test your logout functionality check your Redux store is the action is dispatch properly and the states are updated. Notice in the actions tab in the fulfilled action type, the user is set to empty object.

****

**PART 9-RETRIEVING THE USER DETAILS FROM THE REDUX STORE**

1. In the component in **src/Components/User.js.** Import the useSelector hook and retrieve the current values of state and display.

import user from "../Images/user.png";

import { useSelector } from "react-redux";

const User = () => {

  const email = useSelector((state) => state.users.user.email);

  const name = useSelector((state) => state.users.user.name);

  return (

    <div>

      <img src={user} className="userImage" />

      <p>

        {name}

        <br />

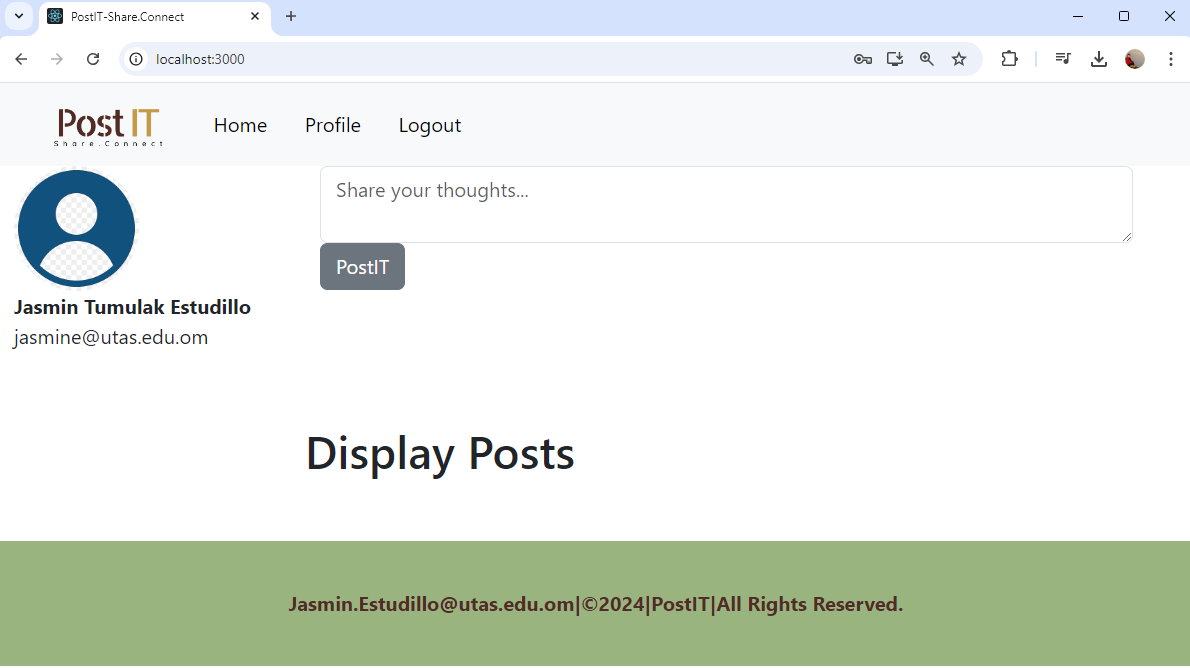
      </p>

    </div>

  );

};

export default User;



1. Do the same in the Prolife Component.

**PART 10 – Conditional Rendering of the Header and Footer Component**

1. We will the code to conditionally render the Header component. This means that the component will only be rendered or displayed when the user is successfully logged in to the system and thus, the Redux state has been updated. In App.js, import the **useSelector** hook.

import { useSelector } from "react-redux";

1. Declare the variable to retrieve the email of the user from the Redux store.

const App = () => {

  const email = useSelector((state) => state.users.user.email);

  return (

   ….

};

1. In the first row of the Container component, write the code check if email value has been set, then render the Header component, otherwise display null.

…..

return (

    <Container fluid>

      <Router>

        <Row>

          {email ? (

            <>

              <Header />

            </>

          ) : null}

        </Row>

        …..

    </Container>

  );

};

Also, do the same logic for the Footer.

        <Row>

          {email ? (

            <>

              <Footer />

            </>

          ) : null}

        </Row>

1. Test your application.