How to build a basic CRUD app with Node.js and ReactJS ?

In this article, we will create a basic Student app from scratch.

App functionality:

- Create a new student
- Update an existing student
- Show students list
- Delete a student

REST API in this project:

REST API	URL
GET	http://localhost:4000/students

GET	/students/update-student/id
POST	/students/create-student
PUT	/students/update-student/id
DELETE	/students/delete-student/id

First of all, we will work on the frontend part of our application using React.js.

Create React Application and installing modules

Step 1: Let's start building the Front-end part with React. To create a new React App, enter the following code into terminal and hit enter.

```
npx create-react-app mern-stack-crud
```

Step 2: Move into the React project folder.

```
cd mern-stack-crud
```

Step 3: To run the React App, run the following command:

```
npm start
```

This command opens the React App to the browser on the following URL: http://localhost:3000/

Step 4: To build the React App we need to install some external modules.

NPM	Detail
React-Bootstrap	React-Bootstrap has evolved and grown alongside React, making it an excellent choice for your UI.

React-Router-Dom	React Router DOM enables you to implement routing in a React App.
Axios	It is a promise base HTTP Client and use for network request.
Formik	A great library to build form in React.
Yup	Yup is a JavaScript schema builder for form validation.

To install, run the following code on the terminal.

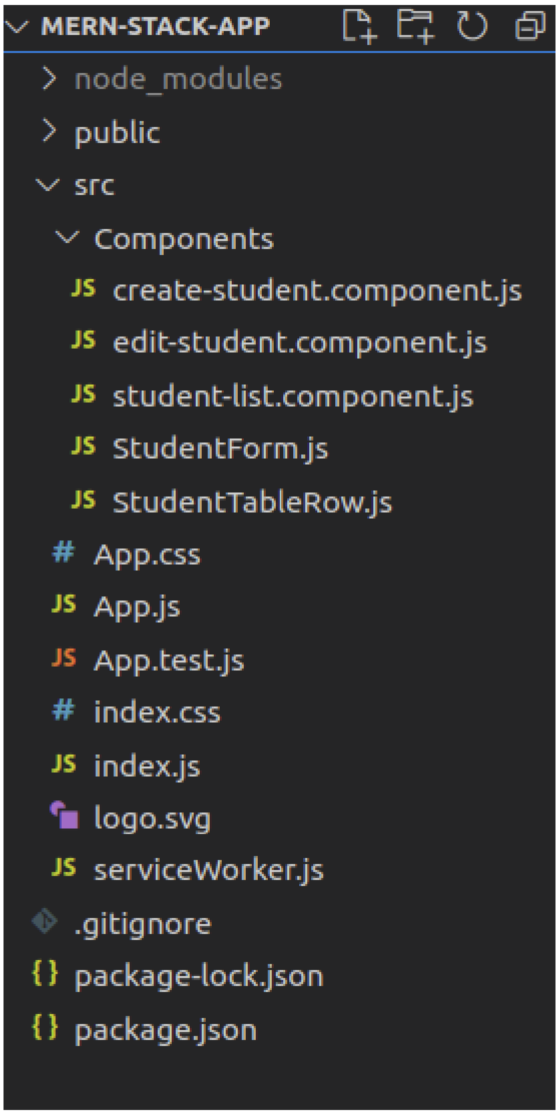
```
npm i react-bootstrap@next bootstrap@5.1.0 react-router-dom axios formik yup
```

Step 5: Creating Simple React Components – In this step we will create some React Components to manage student data.

Head over to ***src*** folder, make a folder and name it ***Components*** and within that directory create the following components.

- **StudentForm.js** – Reusable Student form
- **create-student.component.js** – Responsible for create new student
- **edit-student.component.js** – Responsible for update student data
- **student-list.component.js** – Responsible for display all student
- ***StudentTableRow.js*** – Responsible for display a single student

Project Structure: It will look like the following



front-end project structure

Step 6: Create student form – In this step, we will build a reusable student form with Formik and React-Bootstrap. This form has all the necessary fields to enter student details. We have also made client-side form validation with Yup. In the future, we will use this component for creating and update a student. Go to ***src/Components/StudentForm.js*** and write the following code.

StudentForm.js

```
import React from "react";
import * as Yup from "yup";
import { Formik, Form, Field, ErrorMessage } from "formik";
import { FormGroup, FormControl, Button } from "react-bootstrap";

const StudentForm = (props) => {
  const validationSchema = Yup.object().shape({
    name: Yup.string().required("Required"),
    email: Yup.string()
      .email("You have enter an invalid email address")
      .required("Required"),
    rollno: Yup.number()
      .positive("Invalid roll number")
      .integer("Invalid roll number")
      .required("Required"),
  });
  console.log(props);
  return (
    <div className="form-wrapper">
      <Formik {...props} validationSchema={validationSchema}>
        <Form>
          <FormGroup>
            <Field name="name" type="text"
                className="form-control" />
            <ErrorMessage
              name="name"
              className="d-block invalid-feedback"
              component="span"
            />
          </FormGroup>
          <FormGroup>
            <Field name="email" type="text"
                className="form-control" />
            <ErrorMessage
              name="email"
              className="d-block invalid-feedback"
              component="span"
            />
          </FormGroup>
          <FormGroup>
            <Field name="rollno" type="number"
                className="form-control" />
            <ErrorMessage
              name="rollno"
              className="d-block invalid-feedback"
              component="span"
            />
          </FormGroup>
          <Button variant="danger" size="lg"
            block="block" type="submit">
            {props.children}
          </Button>
        </Form>
      </Formik>
    </div>
  );
```

```
};

export default StudentForm;
```

Step 7: Create a new student: In this step, we will create a component to add a new student. We have already created a ***StudentForm*** component to enter student details. Now, it's time to use this component. Go to ***src/Components/create-student.component.js*** and write the following code.

create-student.component.js

```
// CreateStudent Component for add new student

// Import Modules
import React, { useState, useEffect } from "react";
import axios from 'axios';
import StudentForm from "./StudentForm";

// CreateStudent Component
const CreateStudent = () => {
  const [formValues, setFormValues] =
    useState({ name: '', email: '', rollno: '' })
  // onSubmit handler
  const onSubmit = studentObject => {
    axios.post(
'http://localhost:4000/students/create-student',
    studentObject)
      .then(res => {
        if (res.status === 200)
          alert('Student successfully created')
        else
          Promise.reject()
      })
      .catch(err => alert('Something went wrong'))
  }

  // Return student form
  return(
    <StudentForm initialValues={formValues}
      onSubmit={onSubmit}
      enableReinitialize>
      Create Student
    </StudentForm>
  )
}
```

```
// Export CreateStudent Component
export default CreateStudent
```

Step 8: Update student's details: In this section, we will create a component to update details. We have reusable ***StudentForm*** component, let's use it again. We will fetch student details to reinitialise form. Go to ***src/Components/edit-student.component.js*** and write the following code.

edit-student.component.js

```
// EditStudent Component for update student data

// Import Modules
import React, { useState, useEffect } from "react";
import axios from "axios";
import StudentForm from "./StudentForm";

// EditStudent Component
const EditStudent = (props) => {
  const [formValues, setFormValues] = useState({
    name: "",
    email: "",
    rollno: "",
  });

  //onSubmit handler
  const onSubmit = (studentObject) => {
    axios
      .put(
        "http://localhost:4000/students/update-student/" +
          props.match.params.id,
        studentObject
      )
      .then((res) => {
        if (res.status === 200) {
          alert("Student successfully updated");
          props.history.push("/student-list");
        } else Promise.reject();
      })
      .catch((err) => alert("Something went wrong"));
  };

  // Load data from server and reinitialize student form
  useEffect(() => {
    axios
      .get(
        "http://localhost:4000/students/update-student/"
        + props.match.params.id
      )
      .then((res) => {
        const { name, email, rollno } = res.data;
        setFormValues({ name, email, rollno });
      })
      .catch((err) => console.log(err));
  }, []);

  // Return student form
  return (
    <StudentForm
      initialValues={formValues}
      onSubmit={onSubmit}
      enableReinitialize
    >
      Update Student
    </StudentForm>
  );
};

// Export EditStudent Component
export default EditStudent;
```

Step 9: Display list of students: In this step, we will build a component to display the student details in a table. We will fetch student's data and iterate over it to create table row for every student. Go to ***src/Components/student-list.component.js*** and write the following code.

student-list.component.js

```
import React, { useState, useEffect } from "react";
import axios from "axios";
import { Table } from "react-bootstrap";
import StudentTableRow from "./StudentTableRow";

const StudentList = () => {
  const [students, setStudents] = useState([]);

  useEffect(() => {
    axios
      .get("http://localhost:4000/students/")
      .then(({ data }) => {
        setStudents(data);
      })
      .catch((error) => {
        console.log(error);
      });
  }, []);

  const DataTable = () => {
    return students.map((res, i) => {
      return <StudentTableRow obj={res} key={i} />;
    });
  };

  return (
    <div className="table-wrapper">
      <Table striped bordered hover>
        <thead>
          <tr>
            <th>Name</th>
            <th>Email</th>
            <th>Roll No</th>
            <th>Action</th>
          </tr>
        </thead>
        <tbody>{DataTable()}</tbody>
      </Table>
    </div>
  );
};

export default StudentList;
```

Step 10: Display a single student: In this step, we will return table row which is responsible to display student data. Go to ***src/Components/StudentTableRow.js*** and write the following code.

StudentTableRow.js

```
import React from "react";
import { Button } from "react-bootstrap";
import { Link } from "react-router-dom";
import axios from "axios";

const StudentTableRow = (props) => {
  const { _id, name, email, rollno } = props.obj;
  const deleteStudent = () => {
    axios
      .delete(
"http://localhost:4000/students/delete-student/" + _id)
      .then((res) => {
        if (res.status === 200) {
          alert("Student successfully deleted");
          window.location.reload();
        } else Promise.reject();
      })
      .catch((err) => alert("Something went wrong"));
  };

  return (
    <tr>
      <td>{name}</td>
      <td>{email}</td>
      <td>{rollno}</td>
      <td>
        <Link className="edit-link"
          to={"/edit-student/" + _id}>
          Edit
        </Link>
        <Button onClick={deleteStudent}
          size="sm" variant="danger">
          Delete
        </Button>
      </td>
    </tr>
  );
};

export default StudentTableRow;
```

Step 11: Edit App.js: Finally, include the menu to make routing in our MERN Stack CRUD app. Go to ***src/App.js*** and write the following code.

App.js

```
// Import React
import React from "react";

// Import Bootstrap
import { Nav, Navbar, Container, Row, Col }
        from "react-bootstrap";
import "bootstrap/dist/css/bootstrap.css";
```

```
// Import Custom CSS
import "./App.css";

// Import from react-router-dom
import { BrowserRouter as Router, Switch,
    Route, Link } from "react-router-dom";

// Import other React Component
import CreateStudent from
    "./Components/create-student.component";
import EditStudent from
    "./Components/edit-student.component";
import StudentList from
    "./Components/student-list.component";

// App Component
const App = () => {
  return (
    <Router>
      <div className="App">
        <header className="App-header">
          <Navbar bg="dark" variant="dark">
            <Container>
              <Navbar.Brand>
                <Link to={"/create-student"}
                  className="nav-link">
                  React MERN Stack App
                </Link>
              </Navbar.Brand>

              <Nav className="justify-content-end">
                <Nav>
                  <Link to={"/create-student"}
                    className="nav-link">
                    Create Student
                  </Link>
                </Nav>

                <Nav>
                  <Link to={"/student-list"}
                    className="nav-link">
                    Student List
                  </Link>
                </Nav>
              </Nav>
            </Container>
          </Navbar>
        </header>
```

```
          <Container>
            <Row>
              <Col md={12}>
                <div className="wrapper">
                  <Switch>
                    <Route exact path="/"
                      component={CreateStudent} />
                    <Route path="/create-student"
                      component={CreateStudent} />
                    <Route path="/edit-student/:id"
                      component={EditStudent} />
                    <Route path="/student-list"
                      component={StudentList} />
                  </Switch>
                </div>
              </Col>
            </Row>
          </Container>
        </div>
      </Router>
    );
};

export default App;
```

Step 12: Add style – Go to ***src/App.css*** and write the following code.

App.css

```
.wrapper {
  padding-top: 30px;
}

body h3 {
  margin-bottom: 25px;
}

.navbar-brand a {
  color: #ffffff;
}

.form-wrapper,
.table-wrapper {
  max-width: 500px;
  margin: 0 auto;
}
```

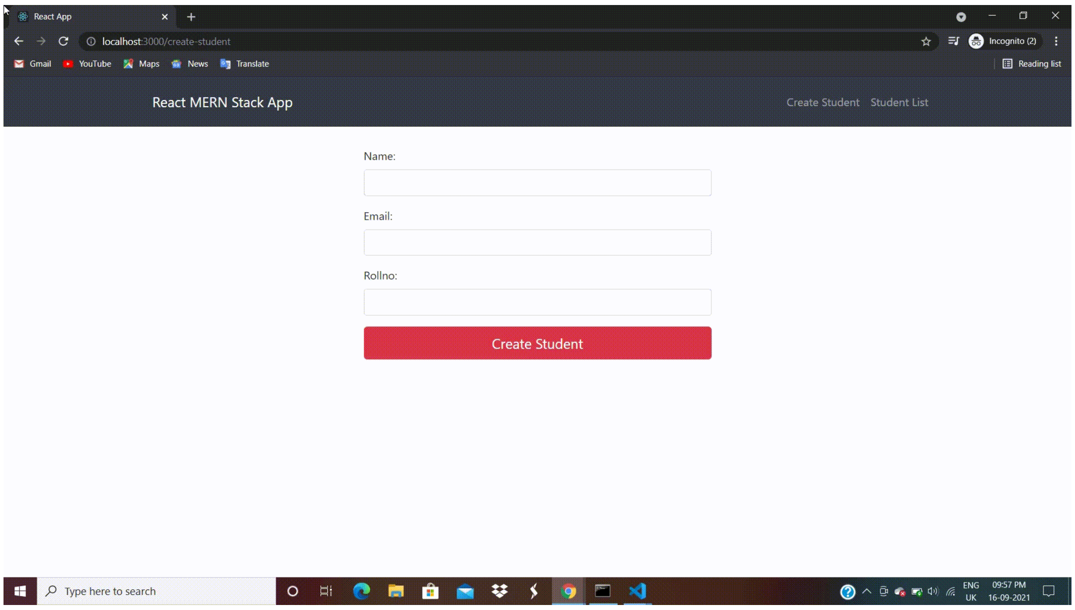
```css
.table-wrapper {
  max-width: 700px;
}

.edit-link {
  padding: 7px 10px;
  font-size: 0.875rem;
  line-height: normal;
  border-radius: 0.2rem;
  color: #fff;
  background-color: #28a745;
  border-color: #28a745;
  margin-right: 10px;
  position: relative;
  top: 1px;
}

.edit-link:hover {
  text-decoration: none;
  color: #ffffff;
}

/* Chrome, Safari, Edge, Opera */
input::-webkit-outer-spin-button,
input::-webkit-inner-spin-button {
  -webkit-appearance: none;
  margin: 0;
}

/* Firefox */
input[type=number] {
  -moz-appearance: textfield;
}
```

Now, we have successfully created the frontend for our ***mern-stack-app***. Let's build the backend part. Before, jumping to next section take a look how the frontend part working without backend.

Step to run the application: Open the terminal and type the following command.

```
npm start
```

Output:



Now we will work on the backend part of our application. We will create a folder inside our ***mern-stack-crud*** to manage the server services such as database, models, schema, routes and APIs, name this folder ***backend***.

Step 1: Run command to create ***backend*** folder for server and get inside of it.

```
mkdir backend && cd backend
```

Step 2: Create package.json – Next, we need to create a separate ***package.json*** file for managing the server of our ***mern-stack-crud*** app.

```
npm init -y
```

Go to ***backend/package.json*** file will look like the following. Replace the ***test*** property like:

```
~~"test": "echo \"Error: no test specified\" && exit 1"~~
"start": "nodemon server.js"
```

Step 3: Install Node Dependencies – Install the following Node dependencies.

NPM	Detail
Express	Node.js framework that helps in creating powerful REST APIs.
body-parser	Extracts the entire body portion of a request stream and exposes it on req.body.
cors	It’s a Node.js package that helps in enabling Access-Control-Allow-Origin CORS header.
mongoose	It’s a NoSQL database for creating a robust web application.

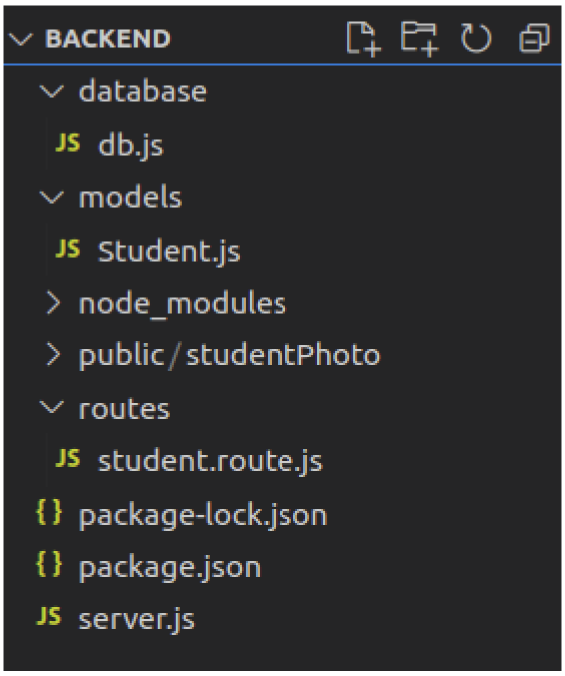
To install the above dependencies, run the following code on the terminal.

```
npm install express body-parser cors mongoose
```

You may install *nodemon* as dev dependency to automate the server restarting process.

```
npm i -D nodemon
```

Back-end project structure



```
BACKEND
  database
    db.js
  models
    Student.js
  node_modules
  public/studentPhoto
  routes
    student.route.js
  package-lock.json
  package.json
  server.js
```

back-end project structure

Step 4: Setting up MongoDB Database – In this step, we will set up a MongoDB database for our app. Before, starting make sure you have latest version of MongoDB is installed on your system. Create folder inside the ***backend*** folder and name it ***database***. Create a file by the name of ***db.js*** inside the ***database*** folder. Go to ***backend/database/db.js*** and write the following code.

db.js

```
module.exports = {
  db: 'mongodb://localhost:27017/reactdb'
};
```

We have declared the MongoDB database and name it ***reactdb.***

Step 5: Define Mongoose Schema – Now, create MongoDB schema for interacting with MongoDB database. Create a folder called ***models*** inside ***backend*** folder to keep schema related files and create a file ***Student.js*** inside of it to define MongoDB schema. Go to ***backend/models/Student.js*** and write the following code.

Student.js

```
const mongoose = require('mongoose');
const Schema = mongoose.Schema;

let studentSchema = new Schema({
  name: {
    type: String
  },
  email: {
    type: String
  },
  rollno: {
    type: Number
  }
}, {
    collection: 'students'
  })
```

```
module.exports = mongoose.model('Student', studentSchema)
```

We declared name, email, and rollno fields along with their respective data types in student Schema.

Step 6: Create Routes Using ExpressJS – In this step, we are set up some routes (REST APIs) for CREATE, READ, UPDATE and DELETE using Express and Node.js. These routes will help us to manage the data in our ***mern-stack-crud*** app. Create a folder and name it routes inside backend folder. Here we will keep all the routes related files. Also, create a file and name it ***student.routes.js*** inside ***routes*** folder, in this file we will define our routes.

```
mkdir routes && cd routes && touch student.route.js
```

Then, go to ***backend/routes/student.route.js*** file and write the following code.

student.route.js

```
let mongoose = require("mongoose"),
  express = require("express"),
  router = express.Router();

// Student Model
let studentSchema = require("../models/Student");

// CREATE Student
router.post("/create-student", (req, res, next) => {
  studentSchema.create(req.body, (error, data) => {
    if (error) {
      return next(error);
    } else {
      console.log(data);
      res.json(data);
    }
  });
});

// READ Students
router.get("/", (req, res) => {
  studentSchema.find((error, data) => {
    if (error) {
      return next(error);
    } else {
      res.json(data);
    }
  });
});

// UPDATE student
router
  .route("/update-student/:id")
  // Get Single Student
  .get((req, res) => {
    studentSchema.findById(
        req.params.id, (error, data) => {
      if (error) {
        return next(error);
      } else {
        res.json(data);
      }
    });
  })

  // Update Student Data
  .put((req, res, next) => {
    studentSchema.findByIdAndUpdate(
      req.params.id,
      {
        $set: req.body,
      },
      (error, data) => {
        if (error) {
          return next(error);
          console.log(error);
        } else {
          res.json(data);
          console.log("Student updated successfully !");
        }
      }
    );
  });

// Delete Student
router.delete("/delete-student/:id",
(req, res, next) => {
  studentSchema.findByIdAndRemove(
      req.params.id, (error, data) => {
    if (error) {
      return next(error);
    } else {
      res.status(200).json({
```

```
        msg: data,
      });
    }
  });
});

module.exports = router;
```

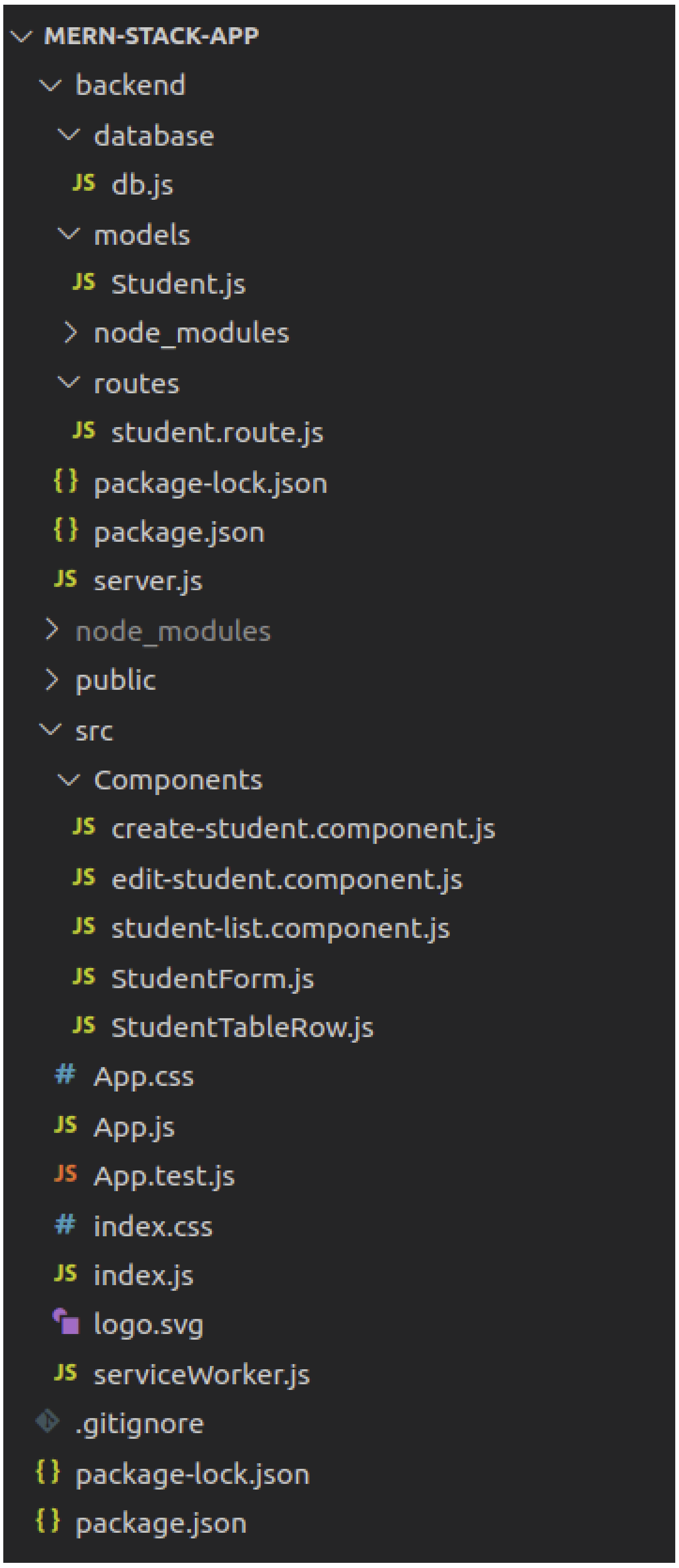
Step 7: Configure server.js – We have almost created everything for our ***mern-stack-crud*** app. Now, create the ***server.js*** file in the root of the ***backend*** folder. Go to ***backend/server.js*** and write the following code.

server.js

```
let express = require('express');
let mongoose = require('mongoose');
let cors = require('cors');
let bodyParser = require('body-parser');
let dbConfig = require('./database/db');

// Express Route
const studentRoute = require('../backend/routes/student.route')

// Configure mongoDB Database
mongoose.set('useNewUrlParser', true);
mongoose.set('useFindAndModify', false);
mongoose.set('useCreateIndex', true);
mongoose.set('useUnifiedTopology', true);

// Connecting MongoDB Database
mongoose.Promise = global.Promise;
mongoose.connect(dbConfig.db).then(() => {
  console.log('Database successfully connected!')
},
  error => {
    console.log('Could not connect to database : ' + error)
  }
)

const app = express();
app.use(bodyParser.json());
app.use(bodyParser.urlencoded({
  extended: true
}));
app.use(cors());
app.use('/students', studentRoute)


// PORT
const port = process.env.PORT || 4000;
const server = app.listen(port, () => {
  console.log('Connected to port ' + port)
})

// 404 Error
app.use((req, res, next) => {
  res.status(404).send('Error 404!')
});

app.use(function (err, req, res, next) {
  console.error(err.message);
  if (!err.statusCode) err.statusCode = 500;
  res.status(err.statusCode).send(err.message);
});
```

Now, we have successfully created the backend for our ***mern-stack-app***.

Our final project directory structure:



```
MERN-STACK-APP
  backend
    database
      db.js
    models
      Student.js
    node_modules
    routes
      student.route.js
    package-lock.json
    package.json
    server.js
  node_modules
  public
  src
    Components
      create-student.component.js
      edit-student.component.js
      student-list.component.js
      StudentForm.js
      StudentTableRow.js
    App.css
    App.js
    App.test.js
    index.css
    index.js
    logo.svg
    serviceWorker.js
  .gitignore
  package-lock.json
  package.json
```

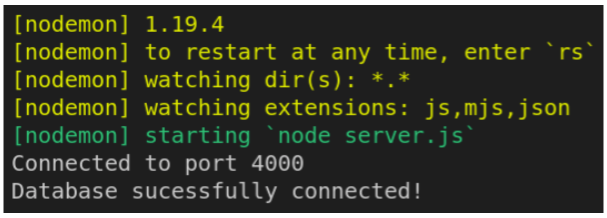
project-directory-structure

Now, start the MongoDB database server to run the server.

Step to run the application: Open a terminal and run the following command to start the Nodemon server by staying in the ***backend*** folder.

```
npm start
```

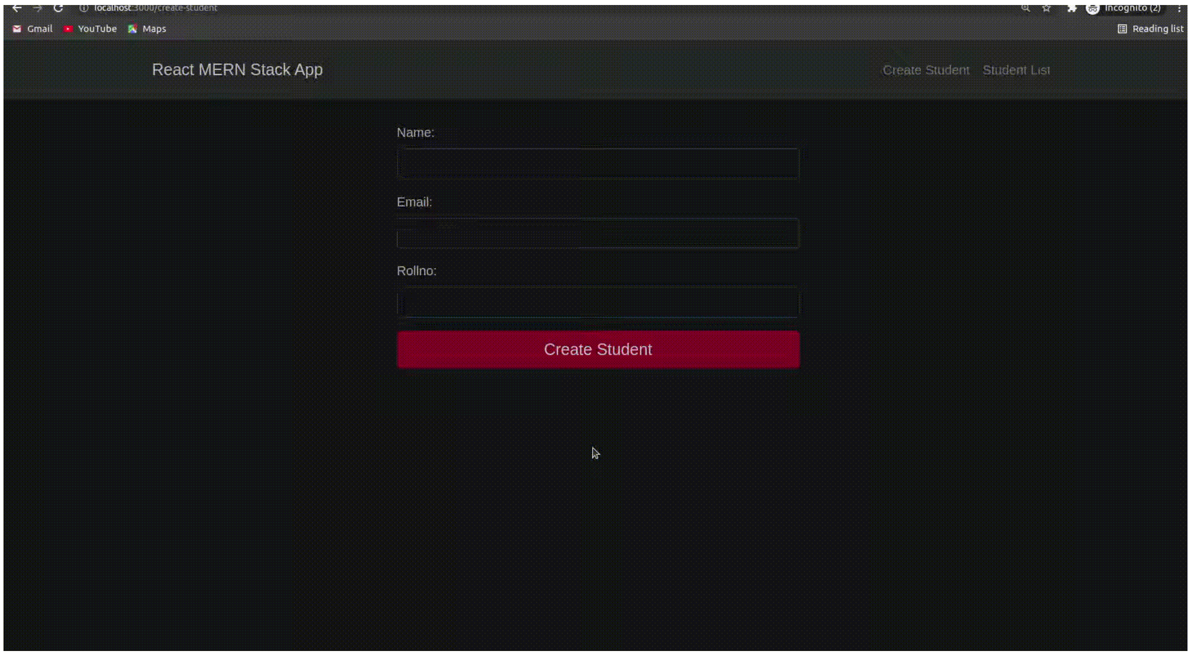
If everything is working well you will see the following output on the terminal screen.



```
[nodemon] 1.19.4
[nodemon] to restart at any time, enter `rs`
[nodemon] watching dir(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting `node server.js`
Connected to port 4000
Database sucessfully connected!
```

mern-stack-crud server-running

Final output:



mern-stack-crud-app

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