MERN Stack CRUD Application

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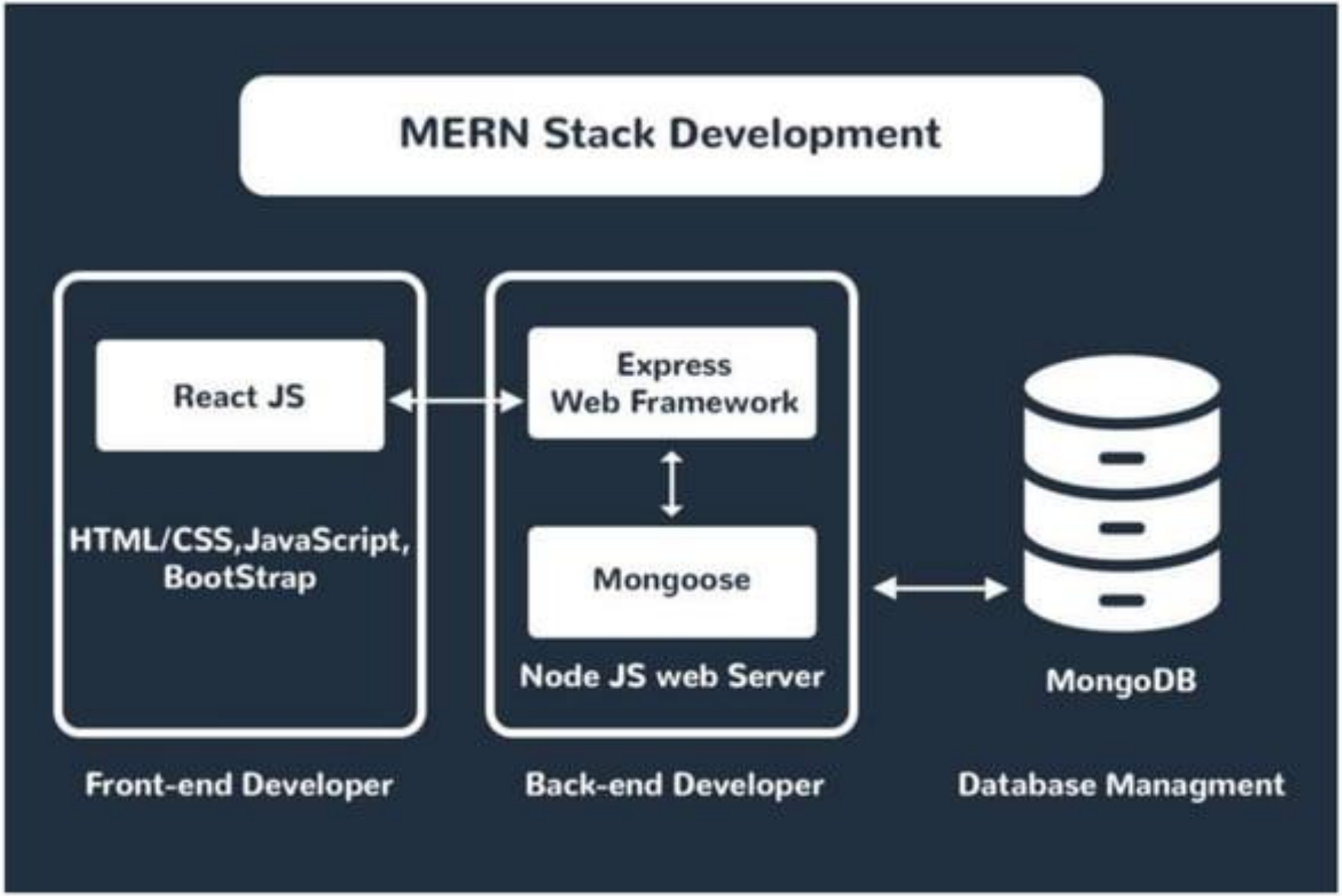
Prerequisites for MERN stack

- HTML
- CSS
- JavaScript
- Knowledge of database.

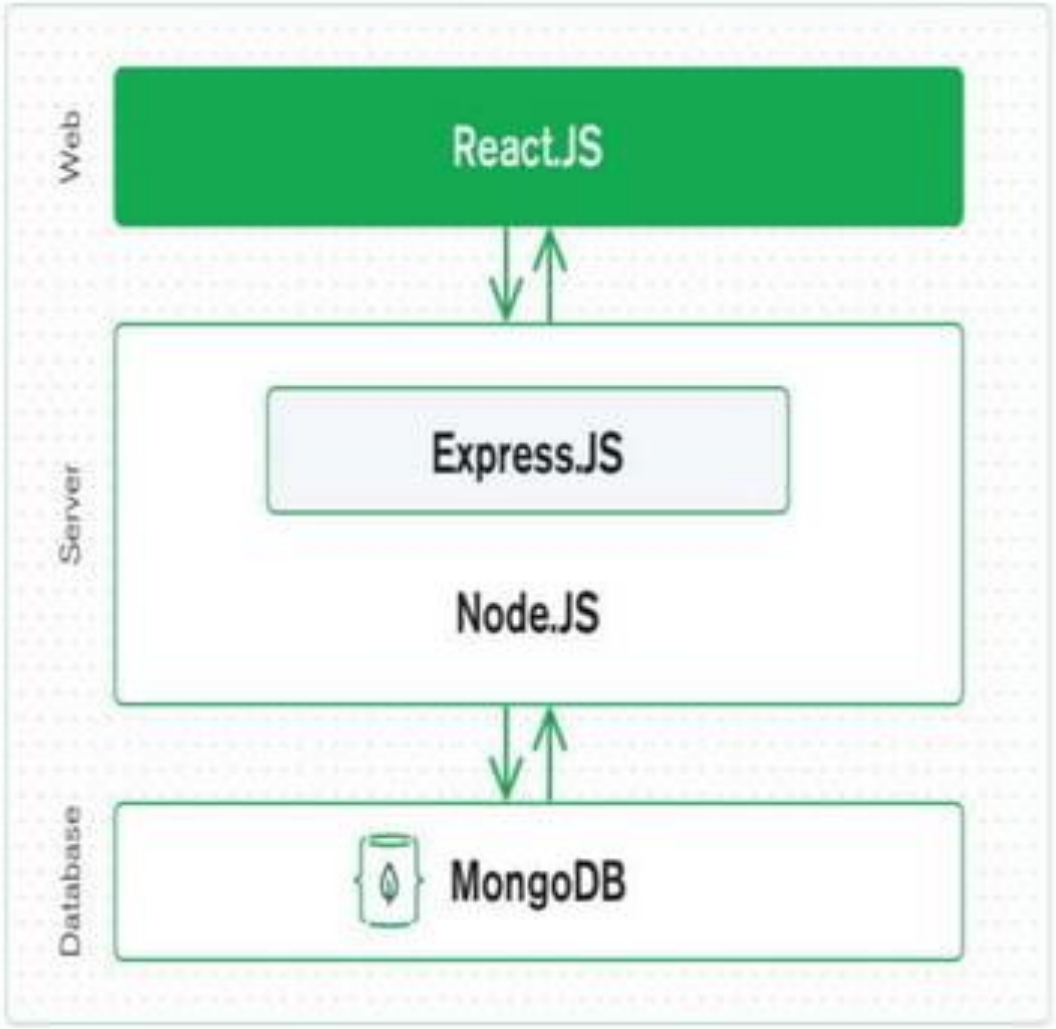
Introduction

- MERN stands for MongoDB, Express, React, Node, after the four key technologies that make up the stack that is used for easier and faster deployment of full-stack web applications.
- MongoDB - document database
- Express(.js) - Node.js web framework
- React(.js) - a client-side JavaScript library
- Node(.js) - the premier JavaScript web server


MERN Stack Development
React JS
HTML/CSS,JavaScript,
BootStrap
Front-end Developer
Express
Web Framework
Mongoose
Node JS web Server
Back-end Developer
MongoDB
Database Managment

How does the MERN Stack work?

- The MERN architecture allows you to easily construct a 3-tier architecture (frontend, backend, database) entirely using JavaScript and JSON.


Web
React.JS
Server
Express.JS
Node.JS
Database
MongoDB

mongoDB®

MongoDB

- NoSQL database used for high-volume data storage.
- Open-source document-oriented database.
- MongoDB is written in C++.
- It stores data in JSON format.
- Can be easily used with Node.
- MongoDB uses BSON to query database.
- Documents containing key-value pairs are the basic units of data in MongoDB.

Database Concepts

Tabular (Relational)	MongoDB
Database	Database
Table	Collection
Row	Document
Index	Index
Join	$lookup
Foreign Key	Reference

Why MongoDB?

- **Fast** – Being a document-oriented database, easy to index documents. Therefore a faster response.
- **Scalability** – Large data can be handled by dividing it into several machines.
- **Use of JavaScript** – MongoDB uses JavaScript which is the biggest advantage.
- **Schema Less** – Any type of data in a separate document.
- Data stored in the form of JSON.
- **Simple Environment Setup** – Its really simple to set up MongoDB.


node
JS

NodeJS

- JavaScript run-time environment built on Chrome's V8 JavaScript.
- Node.js allows you to run JavaScript on the server.
- It is free & open source, written in C++.
- Ryan Dahl developed Node.js in 2009. He embedded C++ code with Chrome's V8 Engine and gave the name as Node.js.
- Node.js runs single-threaded, non-blocking, asynchronous programming, which is very memory efficient.

Where to use NodeJS?

- Back-end services such as APIs.
- Highly scalable, data-intensive and real-time apps.
- I/O bounds applications.
- Single page applications.

Where not to use NodeJS?

Node.js is not used in CPU-intensive apps which requires calculations done by CPU.


Express
JS

ExpressJS

- Flexible Node.js framework that provides robust set of features for web for web and mobile application.
- It provides easy routing of requests based on HTTP methods and URLs.
- It allows to set up middlewares to respond to HTTP Requests.
- Allows to dynamically render HTML Pages based on passing arguments to templates.


React

ReactJS

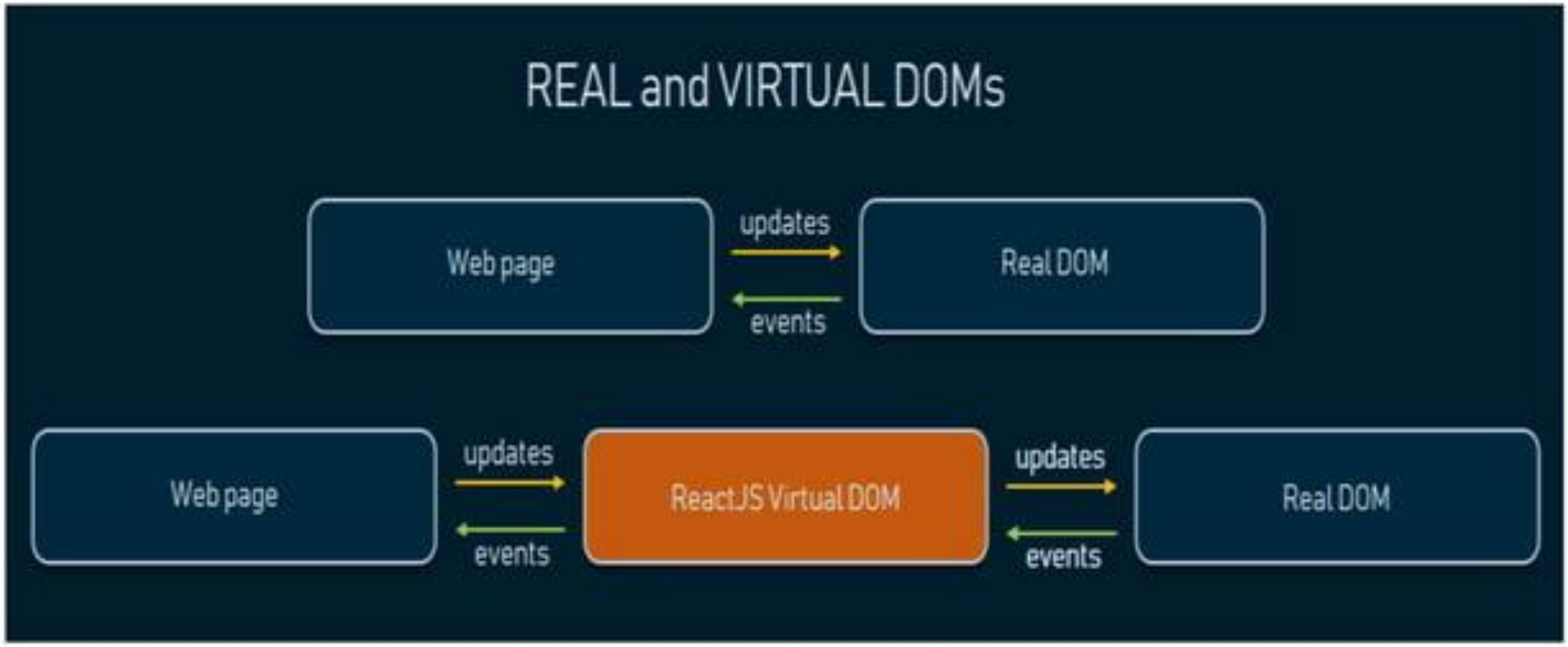
- A JavaScript library for building user interfaces for web and mobile applications.
- React is used to build single-page applications.
- React allows us to create reusable UI components.
- React-router to handle the front-end routing.
- React was created by Jordan Walke, a Software Engineer at Facebook.

Why to use React?

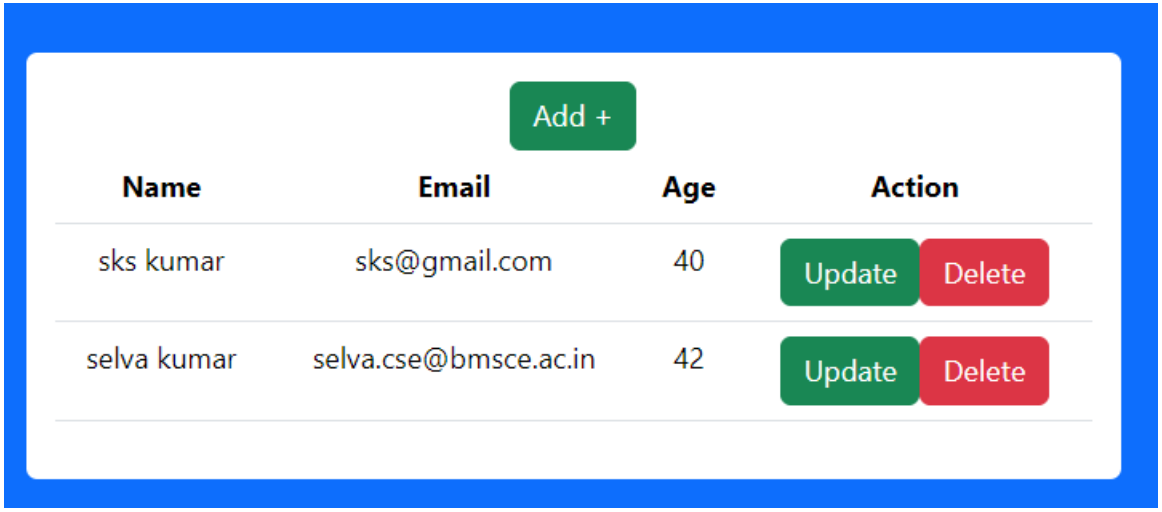
- JSX (JavaScript XML) makes it easier and simpler to write React components.
- ReactJS supports Components. These components also promote code reusability and make the overall web application easier to understand and debug.

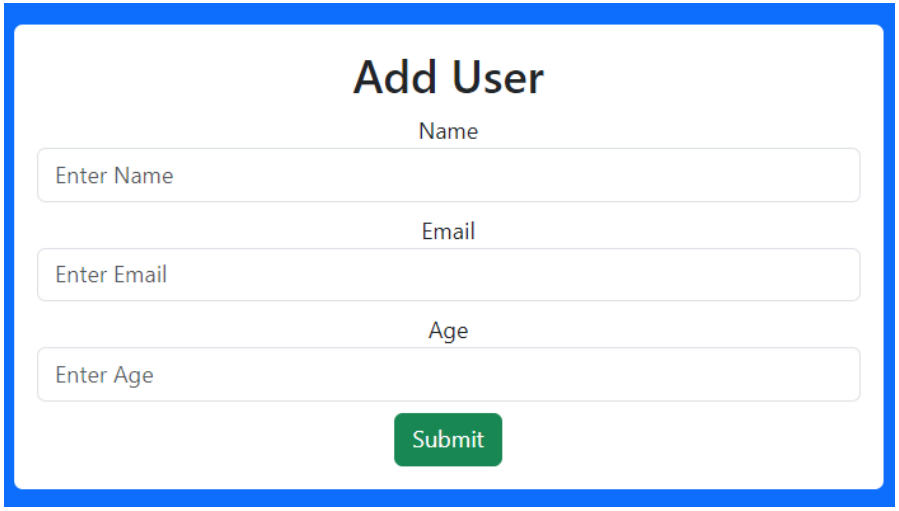
How does React work?

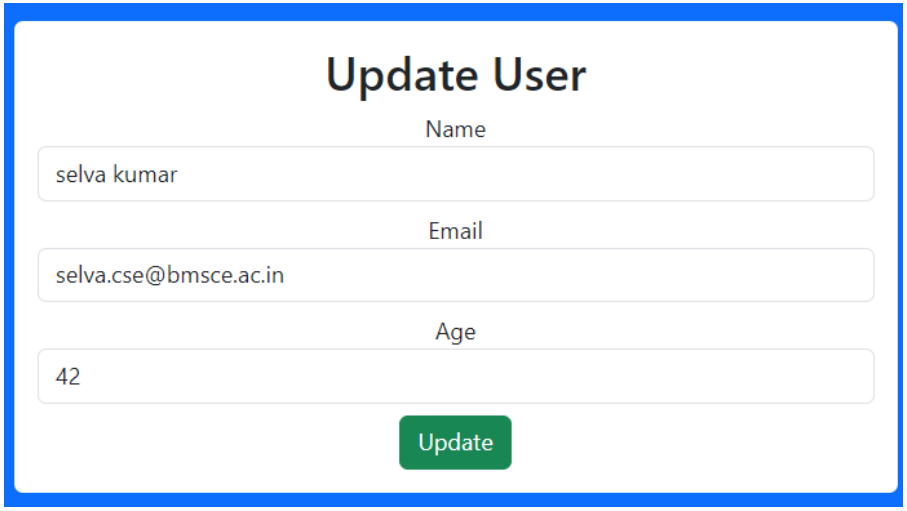
- Instead of manipulating the browser's DOM directly, React creates a Virtual DOM in memory, where it does all the necessary manipulating, before making the changes in the browser DOM.
- React finds out what changes have been made, and changes **only** what needs to be changed.


REAL and VIRTUAL DOMs
Web page
updates
events
Real DOM
Web page
updates
events
ReactJS Virtual DOM
updates
events
Real DOM

IMPLEMENTATION

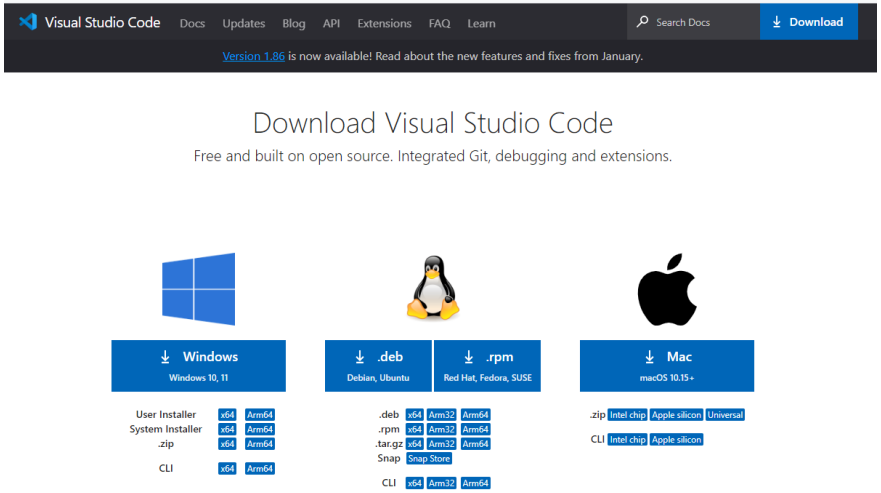

Add +
Name
Email
Age
Action
sks kumar
sks@gmail.com
40
Update
Delete
selva kumar
selva.cse@bmsce.ac.in
42
Update
Delete


Add User
Name
Enter Name
Email
Enter Email
Age
Enter Age
Submit

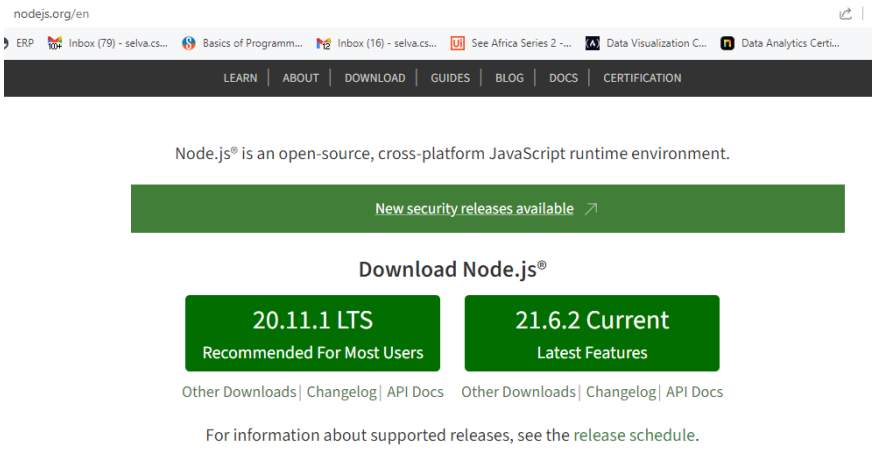

Update User
Name
selva kumar
Email
selva.cse@bmsce.ac.in
Age
42
Update

Setup

- https://code.visualstudio.com/download

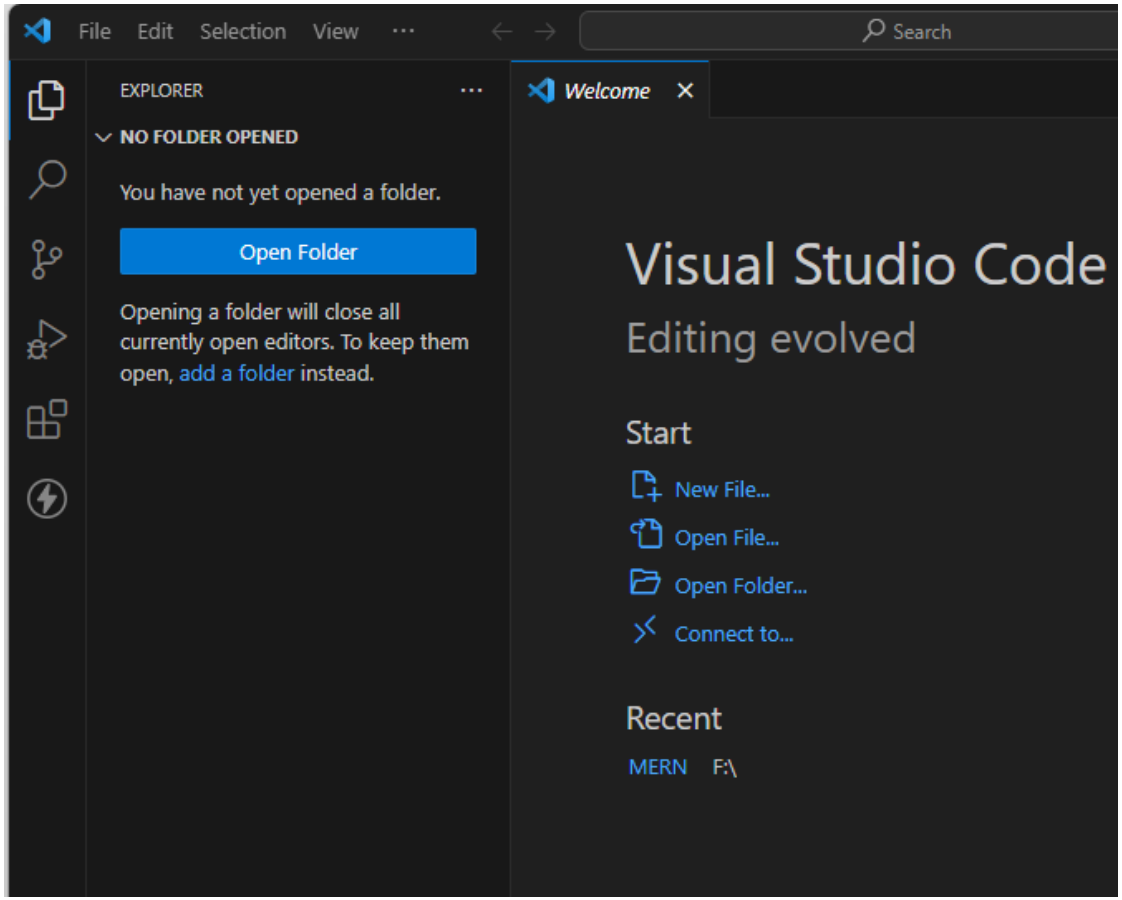


- https://nodejs.org/en



Open VS Code

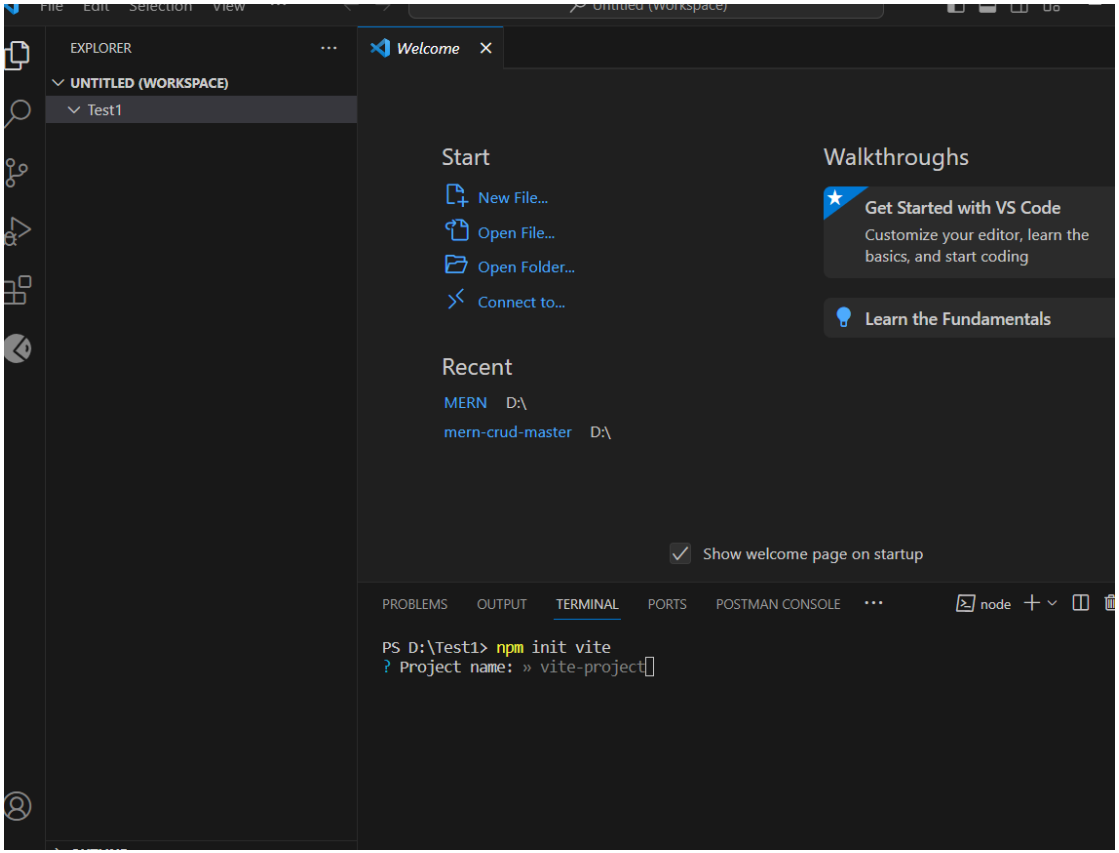
- Add a folder MERN or Open Folder



Create react app

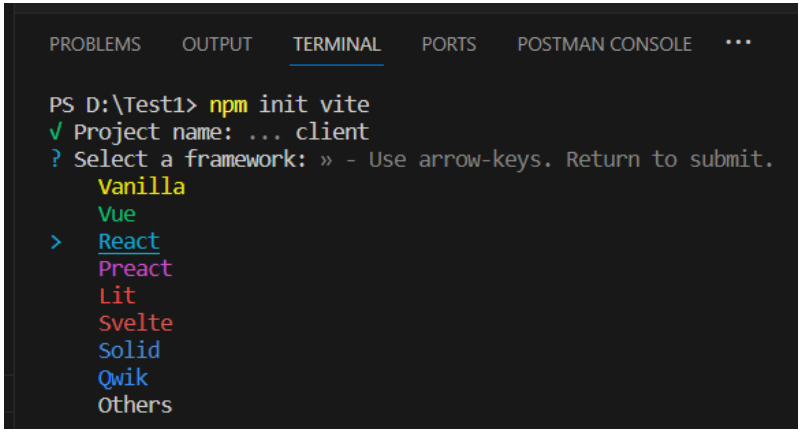
- go to terminal (Cntl + Shift + `)
- Type below command to create react app

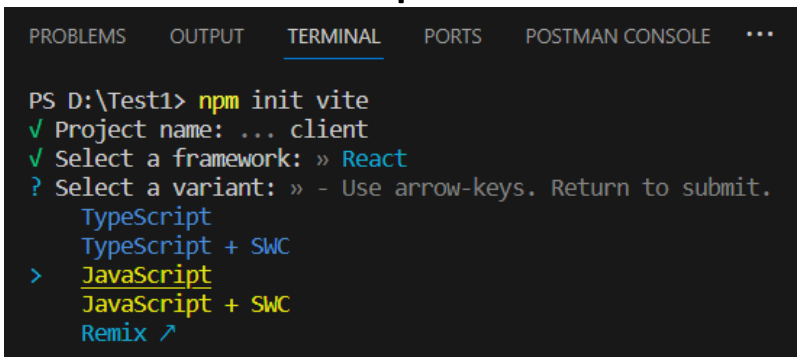
d:\MERN\Demo> npm init vite

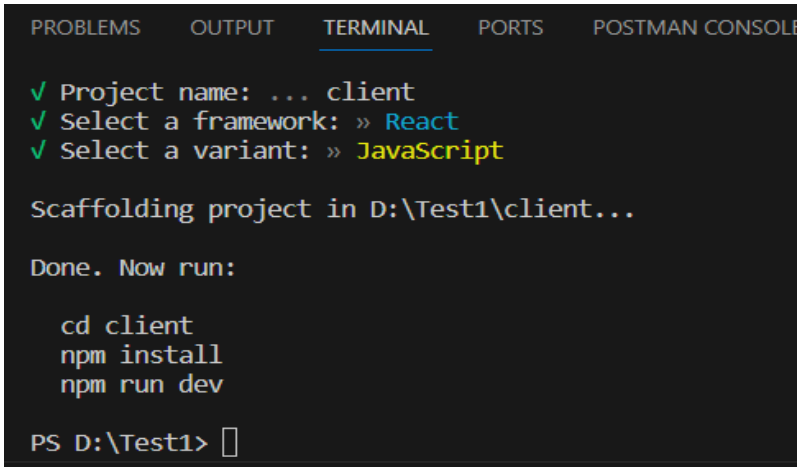


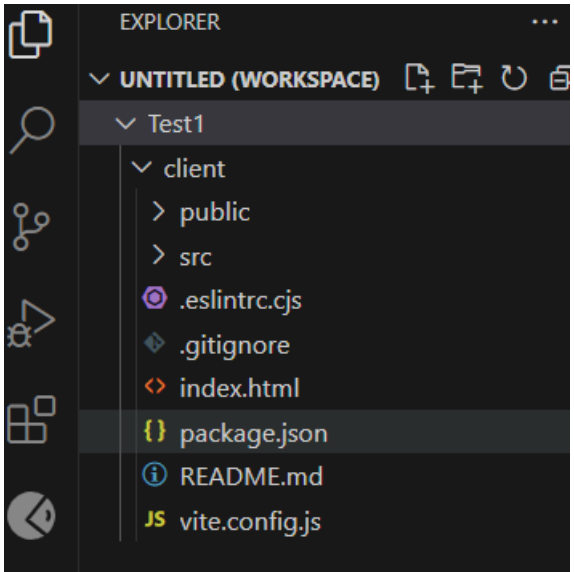
Create react app

- Enter project name : client
- select React
- select JavaScript









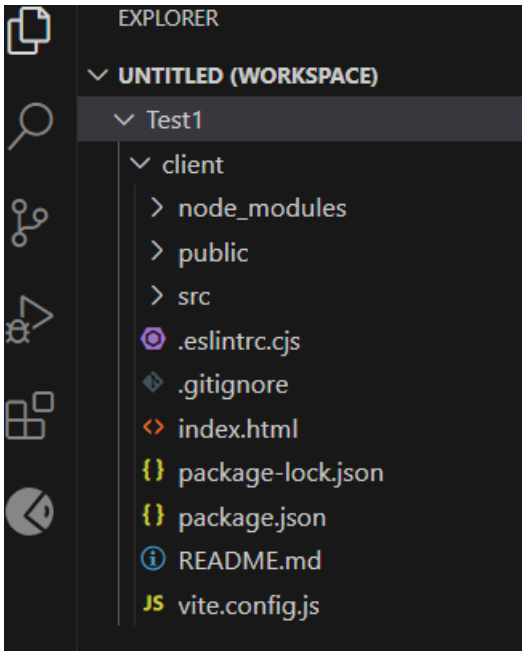
Create react app

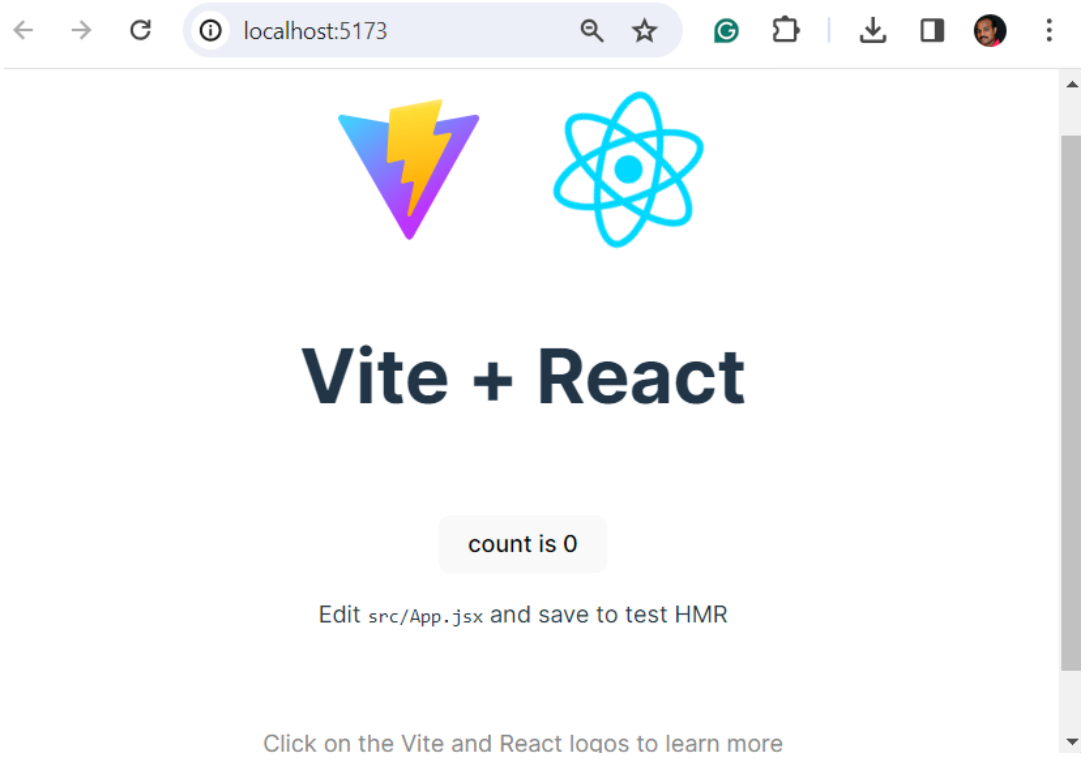
- Now run
  - cd client
  - npm install
  - npm run dev

```
PS D:\Test1> cd client
PS D:\Test1\client> npm install

added 273 packages, and audited 274 packages in 24s

98 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
PS D:\Test1\client> npm run dev
```

PROBLEMS OUTPUT TERMINAL PORTS

```
VITE v5.1.4  ready in 302 ms

➜  Local:   http://localhost:5173/
➜  Network: use --host to expose
➜  press h + enter to show help
```





Install other packages

- npm install bootstrap axios react-router-dom

AXIOS

React Router

FRONT-END DEVELOPMENT

Client page development

- go to client->src folder
  - remove index.css

- go to main.jsx
  - remove the path of index.css

App.jsx

Test2 > client > src > App.jsx > App

```jsx
import { useState } from 'react'
import './App.css'

function App() {
  const [count, setCount] = useState(0)

  return (
    <>
      <div>
      Users
      </div>

    </>
  )
}

export default App

```

localhost:5173

Users

Create pages

- Create the below files in src folder:
  - Users.jsx file
  - CreateUser.jsx file
  - UpdateUser.jsx file

Users.jsx

- Users.jsx file:

```
import React from "react";
function Users () {
    return(
        <div>
            Users
        </div>
    )
}

export default Users
```

CreateUser.jsx

- CreateUser.jsx

```
import React from "react";
function CreateUser () {
   return(
      <div>
         Create Users
      </div>
   )
}

export default CreateUser
```

UpdateUser.jsx

- similary updateuser.jsx

```
import React from "react";
function UpdateUser () {
    return(
        <div>
            Update Users
        </div>
    )
}

export default UpdateUser
```

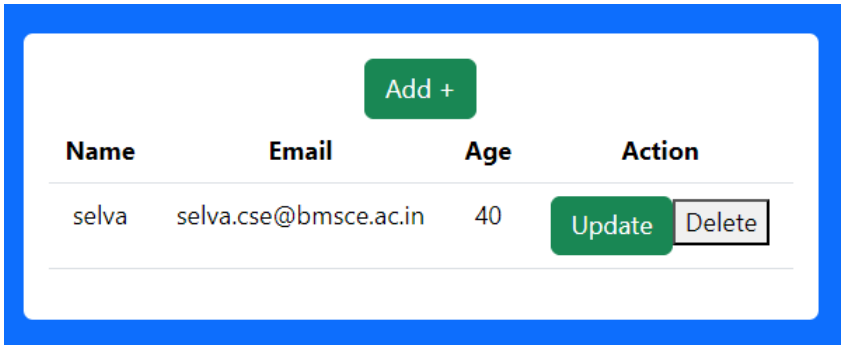
App.jsx

- Add Router details:

```
import { useState } from 'react'
import './App.css'
import {BrowserRouter, Routes, Route} from 'react-router-dom'
import 'bootstrap/dist/css/bootstrap.min.css'
import Users from './Users'
import CreateUsers from './CreateUser'
import UpdateUsers from './UpdateUser'


function App() {
  const [count, setCount] = useState(0)

  return (
    <div>
     <BrowserRouter>
     <Routes>
      <Route path='/' element={<Users />}></Route>
      <Route path='/create' element={<CreateUsers />}></Route>
      <Route path='/update/:id' element={<UpdateUsers />}></Route>
     </Routes>
     </BrowserRouter>
    </div>
  )
}

export default App
```

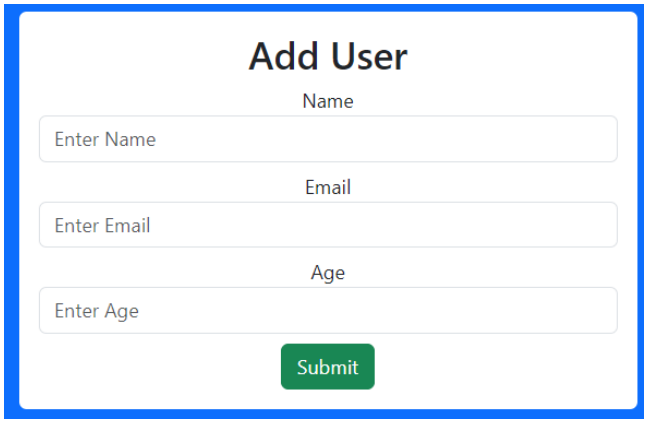
Add html code in Users.jsx

```
import React, { useState } from "react";
import {Link} from "react-router-dom";

function Users () {
 const [users, setUsers] = useState([{Name: "selva", Email: "selva.cse@bmsce.ac.in", Age: 40}])


   return(
     <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
       <div className='w-50 bg-white rounded p-3'>
         <Link to="/create" className='btn btn-success'>Add +</Link>
         <table className='table'>
           <thead>
             <tr>
               <th>Name</th>
               <th>Email</th>
               <th>Age</th>
               <th>Action</th>
             </tr>
           </thead>
           <tbody>
             {
               users.map((user)=>{
                 return <tr>
                   <td>{user.Name}</td>
                   <td>{user.Email}</td>
                   <td>{user.Age}</td>
                   <td>
                   <Link to="/update" className='btn btn-success'>Update</Link>
                   <button>Delete</button>
                   </td>
                 </tr>
               })
             }
           </tbody>
         </table>
       </div>
     </div>
   )
}

export default Users;
```



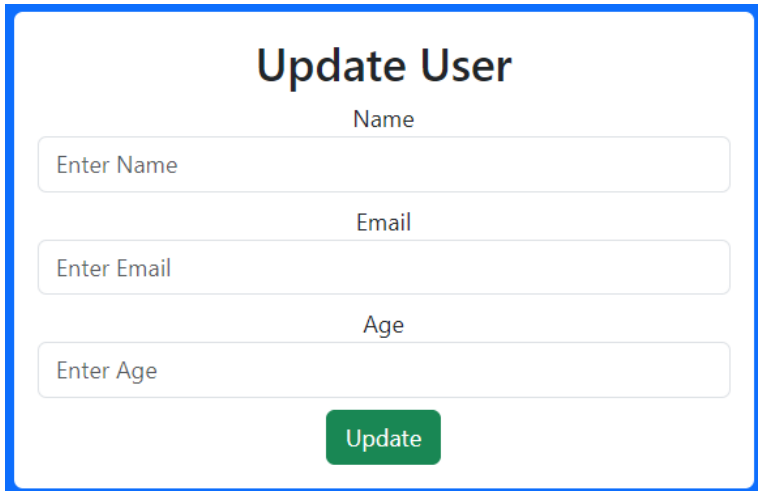
Add html code in the CreateUser.jsx

```
import React from "react";
function CreateUser () {
   return(
      <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
         <div className='w-50 bg-white rounded p-3'>
            <form>
               <h2> Add User</h2>
               <div className="mb-2">
                  <lable htmlFor="">Name</lable>
                  <input type="text" placeholder="Enter Name" className="form-control" />

               </div>
               <div className="mb-2">
                  <lable htmlFor="">Email</lable>
                  <input type="text" placeholder="Enter Email" className="form-control" />

               </div>
               <div className="mb-2">
                  <lable htmlFor="">Age</lable>
                  <input type="text" placeholder="Enter Age" className="form-control" />

               </div>
               <button  className="btn btn-success">Submit</button>
            </form>
      </div>
      </div>
   )
}

export default CreateUser;
```



Add html code in UpdateUser.jsx

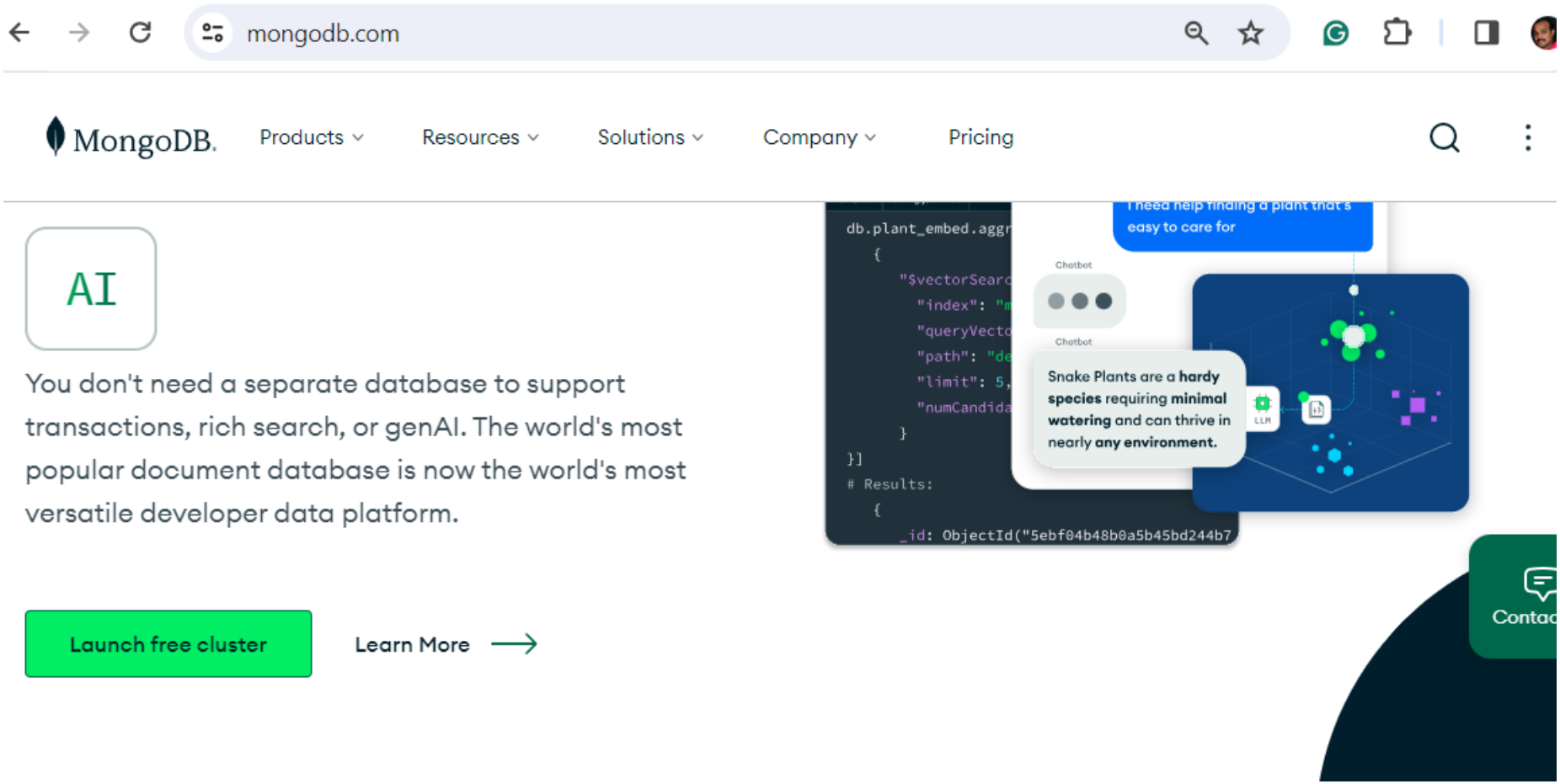
```
import React from "react";
function UpdateUser () {
   return(
      <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
      <div className='w-50 bg-white rounded p-3'>
         <form>
            <h2> Update User</h2>
            <div className="mb-2">
               <lable htmlFor="">Name</lable>
               <input type="text" placeholder="Enter Name" className="form-control" />

            </div>
            <div className="mb-2">
               <lable htmlFor="">Email</lable>
               <input type="text" placeholder="Enter Email" className="form-control" />

            </div>
            <div className="mb-2">
               <lable htmlFor="">Age</lable>
               <input type="text" placeholder="Enter Age" className="form-control" />

            </div>
            <button  className="btn btn-success">Update</button>
         </form>
   </div>
   </div>

   )
}

export default UpdateUser;
```



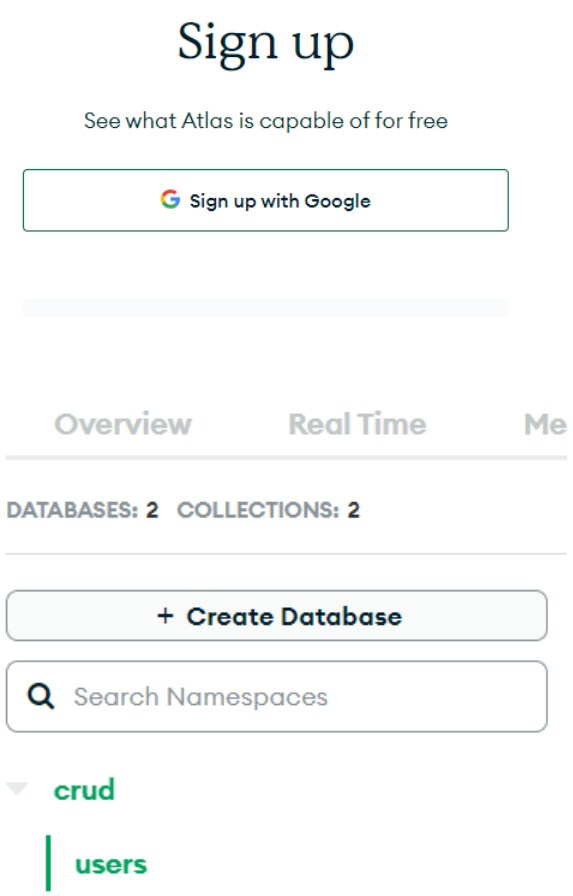
BACK-END

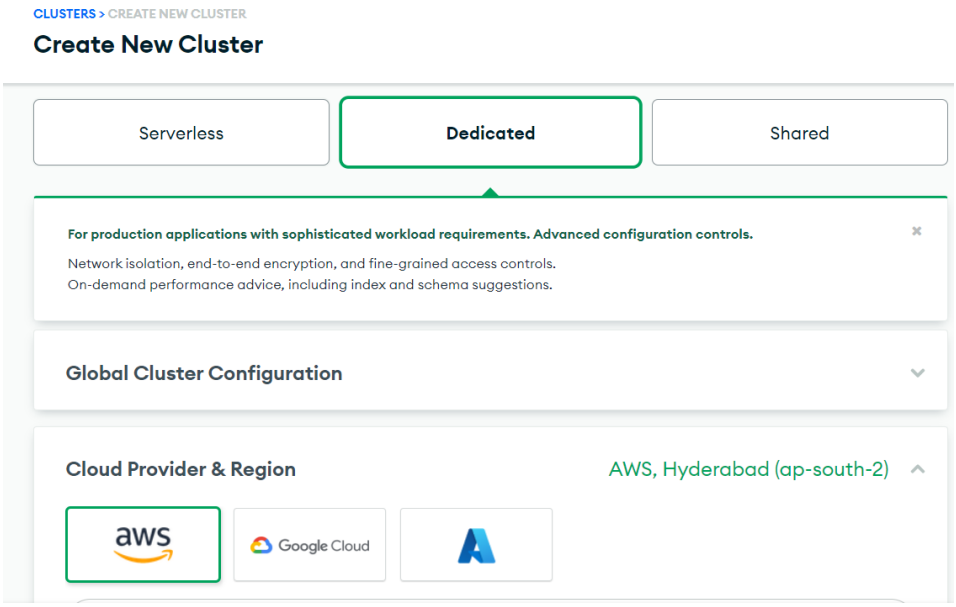
MongoDB. database

- https://www.mongodb.com/



Setup MongoDB





Database Deployments

Find a database deployment...

Cluster0 | Connect | View Monitoring | Browse Collections | ...

SELVA KUMAR'S ORG - 2022-11-02 > PROJECT 0 > DATABASES

Cluster0

VERSION 6.0.13

REGION AWS Mumbai (ap-south-1)

Overview | Real Time | Metrics | Collections | Atlas Search | Profiler | Performance Advisor | Online Archive | Cmd Line Tools

DATABASES: 2 COLLECTIONS: 2

VISUALIZE YOUR DATA | REFRESH

+ Create Database

Search Namespaces

- crud
  - users
- selva-BMS

crud.users

STORAGE SIZE: 36KB | LOGICAL DATA SIZE: 180B | TOTAL DOCUMENTS: 2 | INDEXES TOTAL SIZE: 36KB

Find | Indexes | Schema Anti-Patterns 0 | Aggregation | Search Indexes

INSERT DOCUMENT

Filter | Type a query: { field: 'value' } | Reset | Apply | Options

QUERY RESULTS: 1-2 OF 2

```
_id: ObjectId('65d3081aff91c75b2e32f5bf')
name: "sks kumar"
email: "sks@gmail.com"
age: 40
__v: 0
```

Connect to Cluster0

Set up connection security ✓ — Choose a connection method ✓ — 3 Connect

Connecting with MongoDB Driver

1. Select your driver and version

We recommend installing and using the latest driver version.

Driver Node.js

Version 5.5 or later

2. Install your driver

Run the following on the command line

```
npm install mongodb
```

View MongoDB Node.js Driver installation instructions.

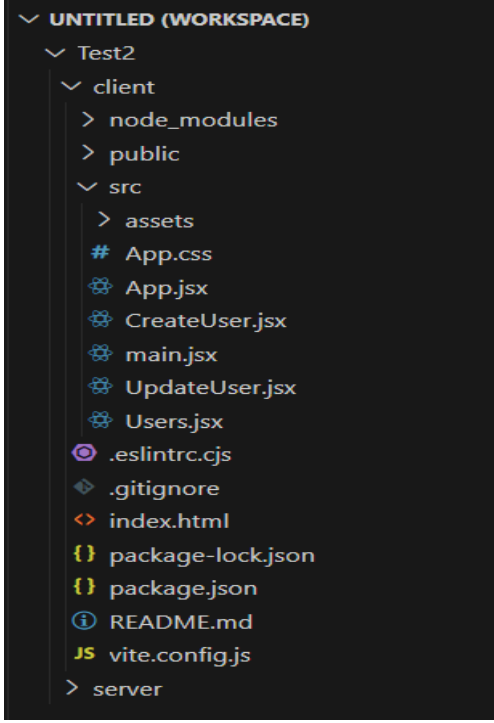
3. Add your connection string into your application code

View full code sample

```
mongodb+srv://selvaBMS:<password>@cluster0.eli2h0j.mongodb.net/?
retryWrites=true&w=majority
```

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

Setup Server

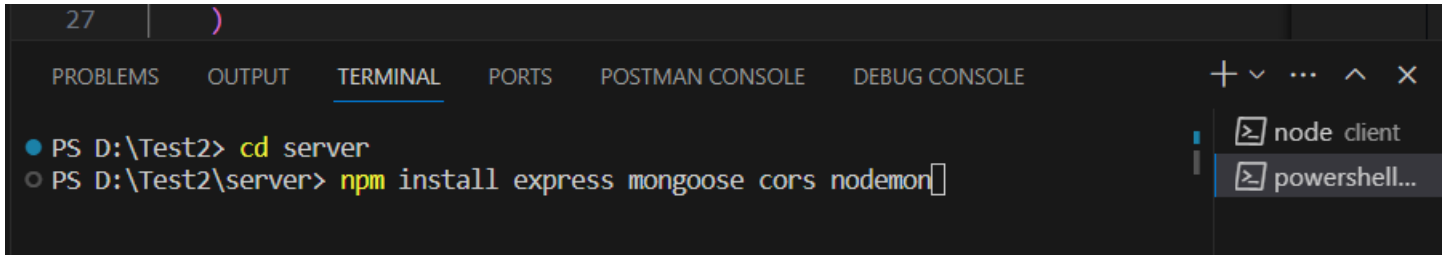


- create server folder
- go to new terminal

  d:\MERN\server> npm init -y

- Install express framework, mongoose database, cors to connect front-end with backend, nodemon to sync.

- d:\MERN\server> npm install express mongoose cors nodemon



Package.json

add the nodemon in package.json

"scripts": {

"test":"echo \"Error:no test specified\" && exit 1",

"start": "nodemon index.js"

}

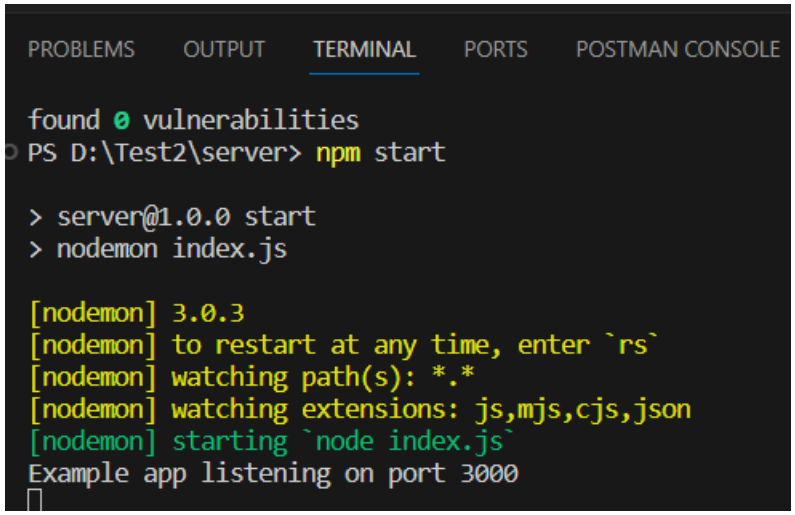
Create index.js

- Create index.js inside the sever folder and setup express server:

```
const express = require('express')
const app = express()
const port = 3000

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

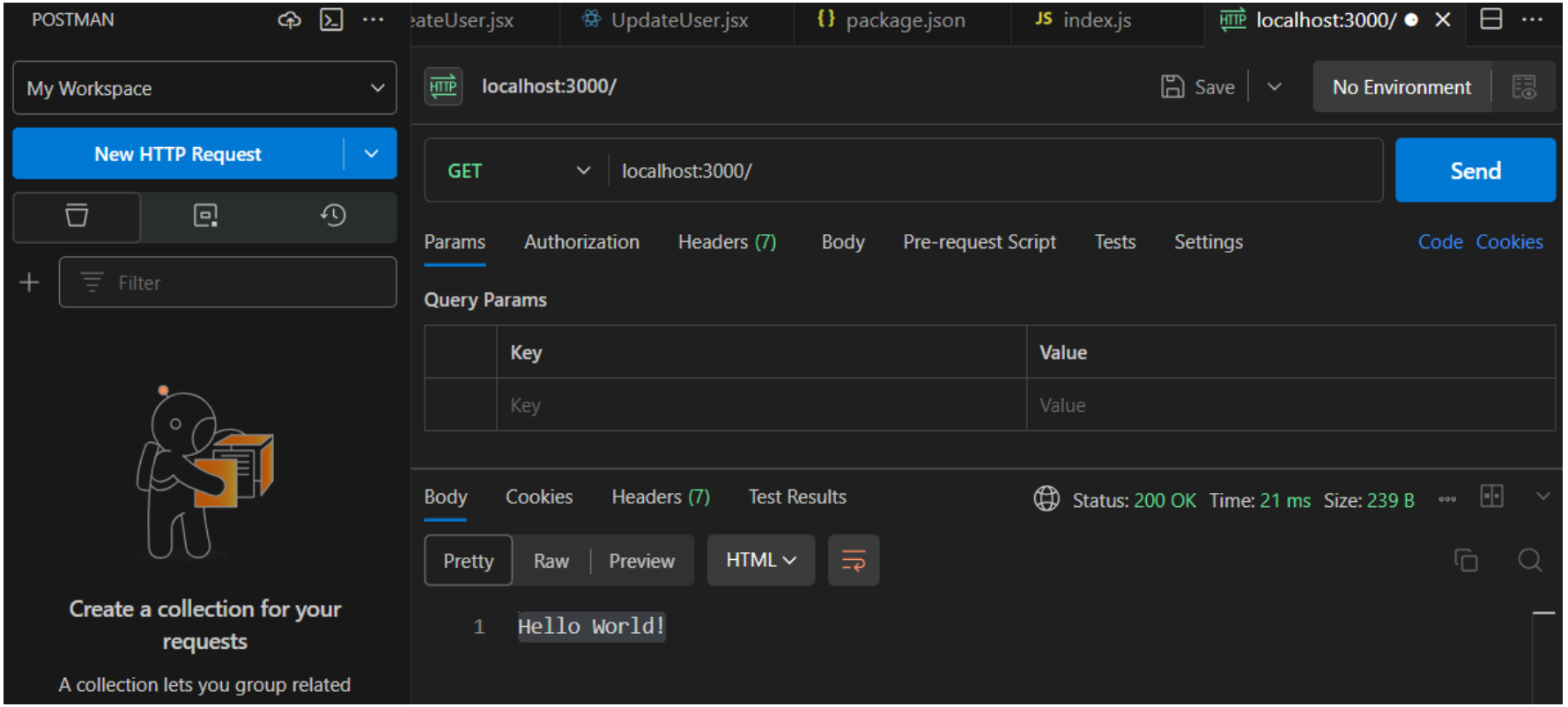
```
app.listen(port, () => {
  console.log(`Example app listening on port ${port}`)
})
```

- Start the server
- d:\MERN\server> npm start



Check the api with Postman

- Install Postman in VS code and test api



Create Model

- Create model folder inside server folder.
- Create new file users.js

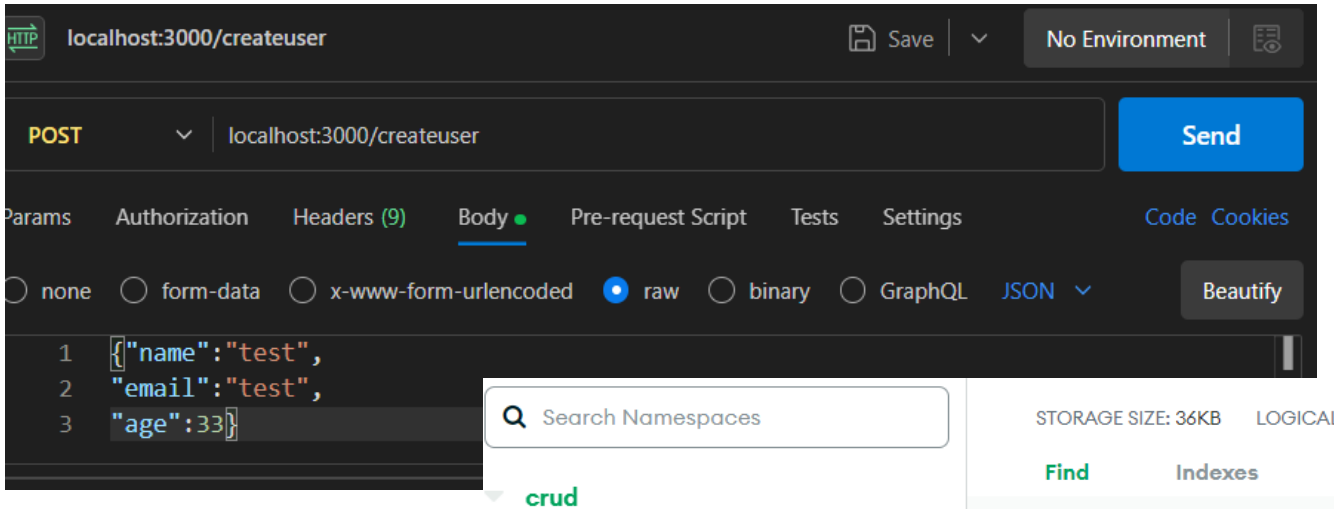
```
const mongoose = require('mongoose')

const UserSchema = new mongoose.Schema({
name: String,
email: String,
age: Number
})

const UserModel = mongoose.model("users",UserSchema)
module.exports = UserModel
```

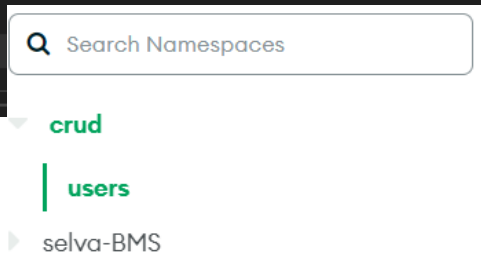
Access mongoDB

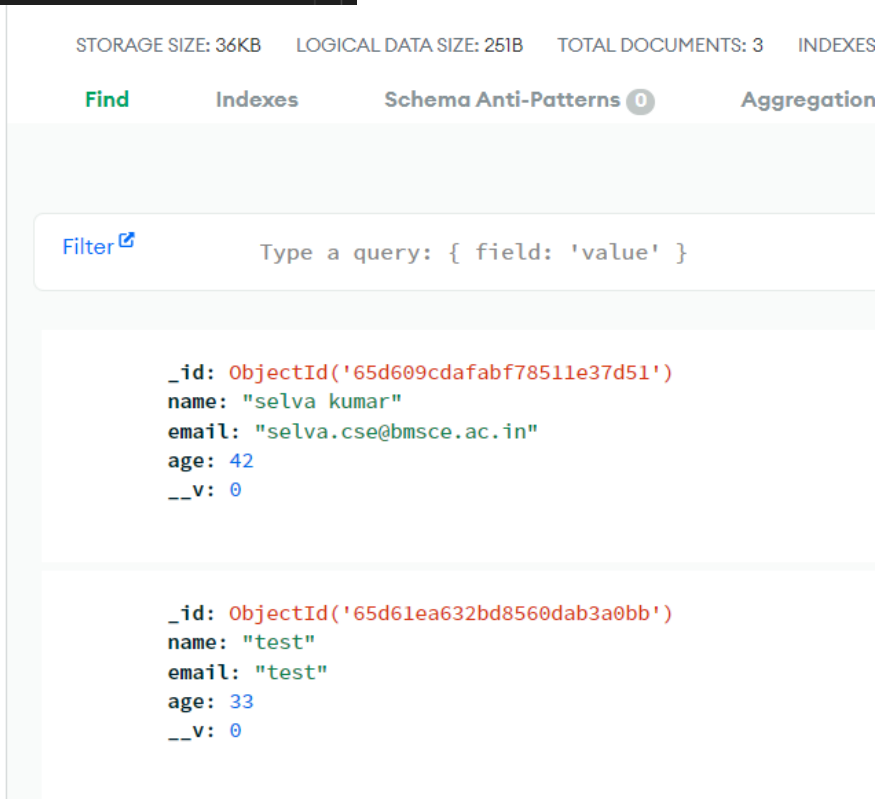
- Modify index.js

```
const express = require('express')
const mongoose = require('mongoose')
const cors = require('cors')
const UserModel = require('./models/Users')

const app = express()
const port = 3000
app.use(cors())
app.use(express.json())
//mongoose.connect("mongodb+srv://selvaBMS:<password>@cluster0.eli2h0j.mongodb.net/<Database name>?retryWrites=true&w=majority")

//mongoose.connect("mongodb+srv://selvaBMS:<password>@cluster0.eli2h0j.mongodb.net/crud?retryWrites=true&w=majority")
mongoose.connect("mongodb://localhost:27017/crud")

app.post("/createuser", (req,res) => {
    UserModel.create(req.body)
    .then(users => res.json(users))
    .catch(err => res.json(err))
})

app.listen(port, () => {
  console.log('Server is running')
})
```

Test api through postman



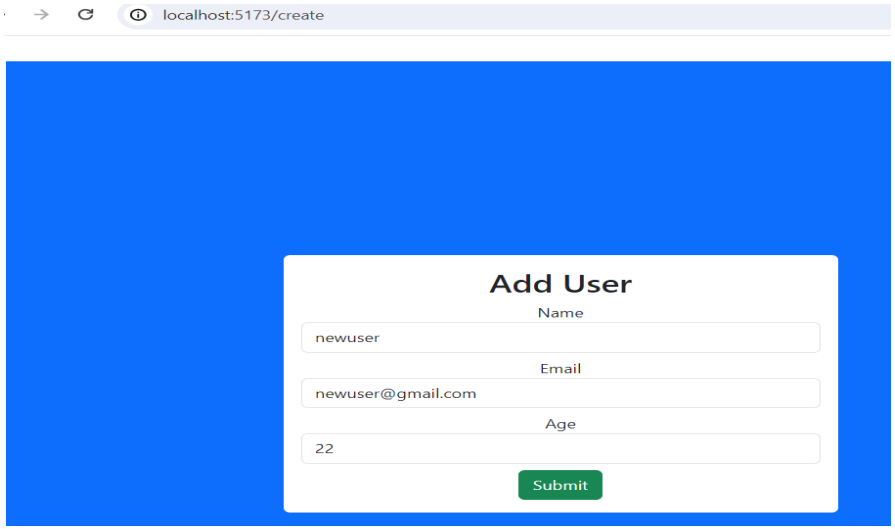


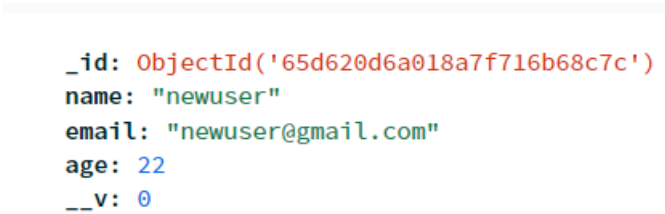


Integrate front-end with back-end

modify front-end createUser.jsx

```
==============================
import React, { useState } from "react";
import {useNavigate } from 'react-router-dom';
import axios from 'axios';

function CreateUser () {

   const [name, setName]= useState()
   const [email, setEmail]= useState()
   const [age, setAge]= useState()
   const navigate = useNavigate()

   const Submit = (e) => {
      e.preventDefault();
      axios.post("http://localhost:3001/createuser", {name,email,age})
      .then(result => console.log(result))
      .catch(err => console.log(err))
      navigate('/')
   }
   return(
      <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
         <div className='w-50 bg-white rounded p-3'>
            <form onSubmit={Submit}>
               <h2> Add User</h2>
               <div className="mb-2">
                  <lable htmlFor="">Name</lable>
                  <input type="text" placeholder="Enter Name" className="form-control"
                  onChange={(e) => setName(e.target.value)}/>

               </div>
               <div className="mb-2">
                  <lable htmlFor="">Email</lable>
                  <input type="text" placeholder="Enter Email" className="form-control"
                  onChange={(e) => setEmail(e.target.value)}/>

               </div>
               <div className="mb-2">
                  <lable htmlFor="">Age</lable>
                  <input type="text" placeholder="Enter Age" className="form-control"
                  onChange={(e) => setAge(e.target.value)}/>

               </div>
```





Get api

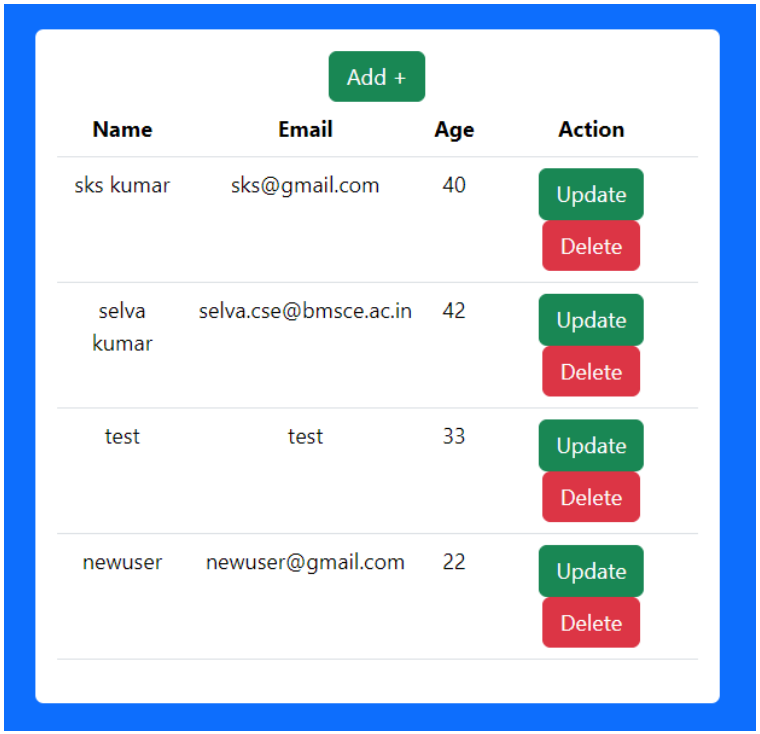
index.js

```
========
const express = require('express')
const mongoose = require('mongoose')
const cors = require('cors')
const UserModel = require('./Users')

const app = express()
const port = 3001
app.use(cors())
app.use(express.json())
//mongoose.connect("mongodb+srv://selvaBMS:<password>@cluster0.eli2h0j.mongodb.net/crud?retryWrites=true&w=majority")
mongoose.connect("mongodb://localhost:27017/crud")

app.get('/', (req,res) =>{
   UserModel.find({})
   .then(users => res.json(users))
   .catch(err => res.json(err))
})

app.post("/createuser", (req,res) => {
   UserModel.create(req.body)
   .then(users => res.json(users))
   .catch(err => res.json(err))
})

app.listen(port, () => {
  console.log('Server is running')
})
```

Display details

- Retrieve details from MongoDB and list the items.
- changes in front-end to display the get data in Users.jsx

```
import React, { useState, useEffect } from "react";
import {Link} from "react-router-dom";
Import axios from 'axios'

function Users () {
 const [users, setUsers] = useState([])

   useEffect (()=>{
      axios.get('http://localhost:3001')
      .then(result => setUsers(result.data))
      .catch(err => console.log(err))
   },[])
   return(
      <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
         <div className='w-50 bg-white rounded p-3'>
            <Link to="/create" className='btn btn-success'>Add +</Link>
            <table className='table'>
               <thead>
                  <tr>
                     <th>Name</th>
                     <th>Email</th>
                     <th>Age</th>
                     <th>Action</th>
                  </tr>
               </thead>
               <tbody>
                  {
                     users.map((user)=>{
                        return <tr>
                           <td>{user.name}</td>
                           <td>{user.email}</td>
                           <td>{user.age}</td>
                           <td>
                           <Link to="/update" className='btn btn-success'>Update</Link>
                           <button className='btn btn-danger'>Delete</button>
                           </td>
                        </tr>
                     })
                  }
```



Update function

- add id in the app.jsx

```
<Route path='/update/:id' element={<UpdateUsers />}></Route>
```

- modify user.jsx : pass id in the update button

```
<Link to={`/update/${user._id}`} className='btn btn-success'>Update</Link>
```

- modify index.js:

```
app.get('/getuser/:id', (req,res) =>{
  const id = req.params.id;
  UserModel.findById({_id:id})
  .then(users => res.json(users))
  .catch(err => res.json(err))
})

app.put('/updateuser/:id', (req,res) =>{
  const id = req.params.id;
  UserModel.findByIdAndUpdate({_id:id},
    {name: req.body.name,
    email: req.body.email,
    age: req.body.age})
  .then(users => res.json(users))
  .catch(err => res.json(err))
})
```

Integrate update with back-end

```
import React, {useState, useEffect} from "react";
import { useParams, useNavigate } from 'react-router-dom';
import axios from 'axios';

function UpdateUser () {

   const {id} = useParams()
   const [name, setName]= useState()
   const [email, setEmail]= useState()
   const [age, setAge]= useState()
   const navigate = useNavigate()

   useEffect (()=>{
      axios.get('http://localhost:3001/getuser/'+id)
      .then(result => {console.log(result)
           setName(result.data.name)
           setEmail(result.data.email)
           setAge(result.data.age)})

      .catch(err => console.log(err))
   }, [])

    const Update = (e) => {
      e.preventDefault();
      axios.put("http://localhost:3001/updateuser/"+id, {name,email,age})
      .then(result => console.log(result))
      .catch(err => console.log(err))
      navigate('/')
    }
   return(
      <div className= "d-flex vh-100 bg-primary justify-content-center align-items-center">
      <div className='w-50 bg-white rounded p-3'>
         <form onSubmit ={Update}>
            <h2> Update User</h2>
            <div className="mb-2">
               <lable htmlFor="">Name</lable>
               <input type="text" placeholder="Enter Name" className="form-control"
               value ={name} onChange={(e) => setName(e.target.value)}/>

            </div>
            <div className="mb-2">
               <lable htmlFor="">Email</lable>
               <input type="text" placeholder="Enter Email" className="form-control"
```

Delete function

- Users.jsx file: --> add onclick event

- <button className='btn btn-danger' onClick={(e) => handleDelete(user._id)}>Delete</button>

--> Add handleDelete below this code

```
  useEffect (()=>{
      axios.get('http://localhost:3001')
      .then(result => setUsers(result.data))
      .catch(err => console.log(err))
   }, [])
-->

const handleDelete =(id) => {
   axios.delete('http://localhost:3001/deleteuser/'+id)
   .then(res=> console.log(res))
   .catcg(err => console.log(err))
  navigate('/')
}
```

Delete Api

- Goto index.js --> write delete api

```
app.delete('/deleteuser/:id', (req,res) =>{
  const id = req.params.id;
  UserModel.findByIdAndDelete({_id:id})
  .then(res => res.json(res))
  .catch(err => res.json(err))

})
```

References

- https://www.mongodb.com/
- https://expressjs.com/
- https://reactjs.org/
- https://nodejs.dev/

Thank You