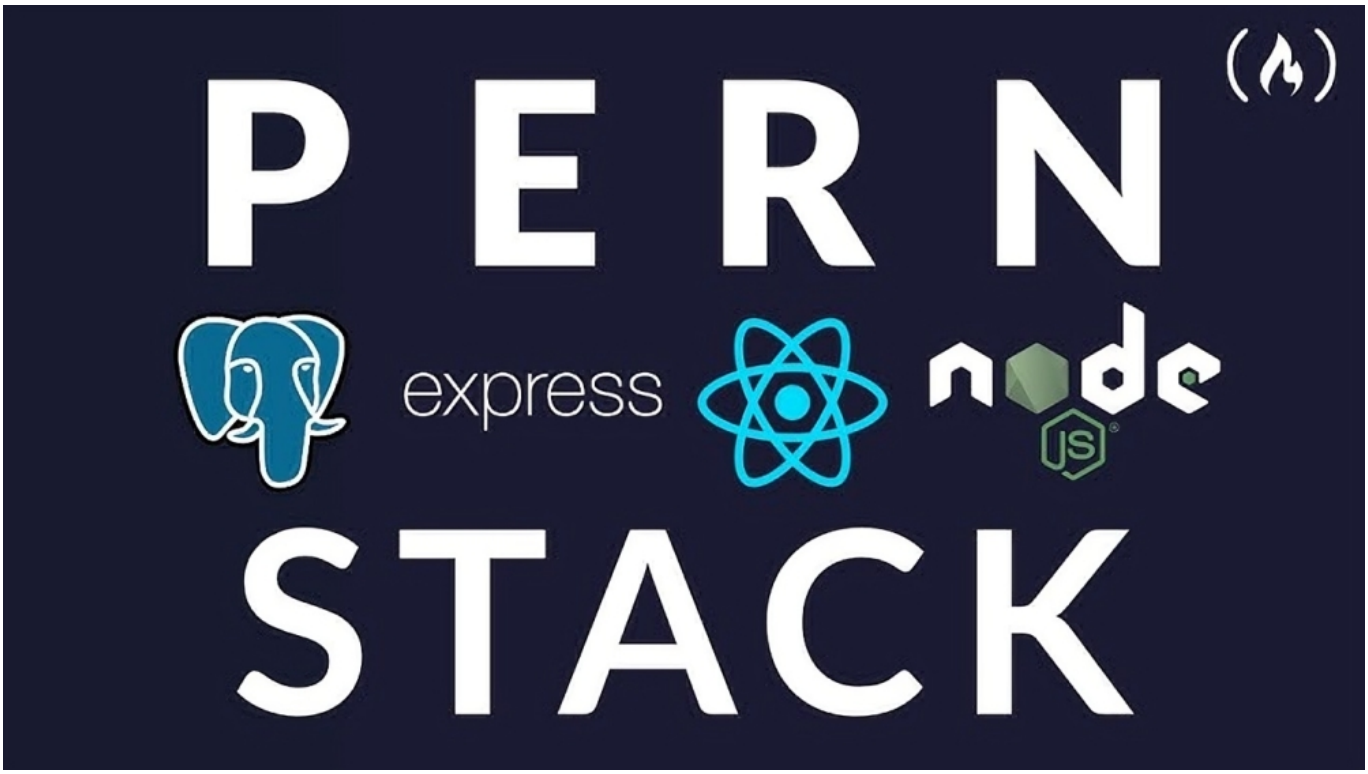
Task Tracker Web Application (PERN Stack)



Overview

This project is a full-stack **Task Tracker** web application, built using the **PERN** stack (PostgreSQL, Express, React, Node.js). The application features basic CRUD (Create, Read, Update, Delete) functionality for managing tasks. It integrates a React frontend with a Node.js backend, and the data is stored in a PostgreSQL database. The app is containerized with **Docker** and includes automation scripts for deployment and management on a cloud virtual machine (VM).

CRUD API Endpoints

Method	Endpoint	Description
GET	`/api/tasks`	Retrieve all tasks
GET	`/api/tasks/:id`	Retrieve a task by ID
POST	`/api/tasks`	Create a new task
PUT	`/api/tasks/:id`	Update a task by ID
DELETE	`/api/tasks/:id`	Delete a task by ID

Technologies Used

- **React.js** (Frontend)
- **Node.js** with **Express.js** (Backend)
- **PostgreSQL** (Database)

- **Docker** and **Docker Compose** (Containerization)
- **Ubuntu** (Local and cloud VM environment)
- **cron** (For scheduling automated tasks)

Project Structure

```
.
├── Dockerfile                  # Dockerfile backend
├── client/                     # Frontend directory
│   ├── Dockerfile              # Dockerfile for frontend service
│   ├── package-lock.json
│   ├── package.json            # Frontend dependencies
│   ├── public/
│   └── src/
│       ├── App.css
│       ├── App.js              # Main React component
│       ├── components/         # Reusable React components
│       ├── index.css
│       └── index.js
├── db.js                       # PostgreSQL connection
├── docker-compose.yml          # Docker Compose file for backend, frontend, and
PostgreSQL
├── index.js                    # Express.js backend entry point
├── init.sql                    # SQL file to initialize database and table
├── package-lock.json
├── package.json                # Backend dependencies
├── scripts/                    # Automation scripts for Docker
│   ├── build.sh                # Script to build Docker images
│   ├── run.sh                  # Script to run Docker containers
│   ├── stop.sh                 # Script to stop containers
│   ├── install-docker.sh       # Script to install Docker and Docker Compose
│   └── backup.sh               # Script to back up the database
├── crontab.txt                 # cron job for automating daily backups
```

1. **Clone the Repository**:

```
git clone https://github.com/gAhmedg/Scripting_Assignment.git
cd todo-app
```

2. **Set up Environment Variables**: Create a `.env` file to configure database settings:

```
DB_HOST=db
DB_USER=postgres
DB_PASSWORD=yourpassword
DB_NAME=tasks_db
```

Assignment Breakdown

Step 1: Develop the Web Application

- Built a **PERN stack** application with a React.js frontend and Node.js (Express) backend.
- Created API endpoints to handle CRUD operations with PostgreSQL.
- Developed a responsive React interface to manage tasks, allowing users to create, update, delete, and list tasks.
- Integrated PostgreSQL for data persistence, with backend logic for database communication.

Step 2: Containerize the Application Using Docker

- Wrote separate `Dockerfiles` for the backend and frontend services.

```
# Dockerfile for backend
FROM node:12.12.0-alpine
WORKDIR /usr/src/app
COPY package*.json ./
COPY .env ./
RUN npm i
COPY . .
EXPOSE 5000
RUN cd client && npm install && npm run build
CMD ["npm", "start"]
```

```
# Dockerfile for front
FROM node:12.12.0-alpine
WORKDIR /app
COPY package*.json ./
RUN npm i
COPY . .
EXPOSE 3000
CMD ["npm", "start"]
```

- Used **Docker Compose** to define and manage multiple services (frontend, backend, and PostgreSQL database).
- Ensured images are optimized and unnecessary files are excluded.

```
# docker-compose.yml
version: '3.8'

services:
  postgres:
    image: postgres:12-alpine
    ports:
      - "5432:5432"
    environment:
      POSTGRES_PASSWORD: 1234pass
    volumes:
      - db-volume:/var/lib/postgresql/data
      - ./init.sql:/docker-entrypoint-initdb.d/init.sql
    networks:
      - todos-network

  backend:
    container_name: node_api
    restart: unless-stopped

    build:
      context: .
      dockerfile: Dockerfile
    ports:
      - "5000:5000"
    depends_on:
      - postgres
    env_file:
      - .env
    networks:
      - todos-network

  frontend:
    container_name: react
    restart: unless-stopped
    build:
      context: ./client
      dockerfile: Dockerfile
    ports:
      - "3001:3000"
    stdin_open: true
    depends_on:
      - backend
    networks:
      - todos-network

networks:
```

```
    todos-network:

volumes:
  db-volume:
```

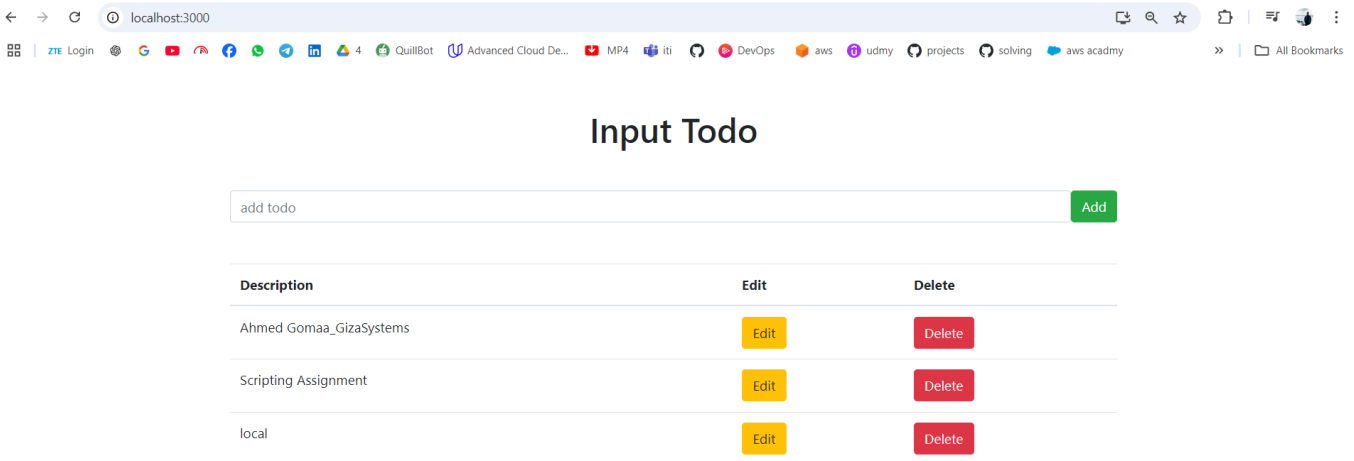
Local Development (Using Docker Compose)

1- **Build and Start the Services**: In the root directory, run:

```
docker-compose up --build
```

2- **Access the Application**:

- Frontend: Open `http://localhost:3001` in your browser.



- Backend API: Accessible at `http://localhost:5000/api/tasks`.

3- **Stop the Application**:

```
docker-compose down
```

Step 3: Automate Docker Operations with Scripts

- Created shell scripts to:
  - Build Docker images (`build.sh`)
  - Run the containers (`run.sh`)
  - Stop the containers (`stop.sh`) then make the exasible

```
```

```
chmod +x build.sh run.sh stop.sh
```

Step 4: Set Up a Cloud Virtual Machine (VM)

- Provisioned a cloud VM (on AWS EC2).
- Set up secure SSH access and necessary network configurations.

Step 5: Automate Deployment to the Cloud VM

- By clone repo for app and scripts
    - Installed **Docker** and **Docker Compose** using install_docker.sh .
- or Transfer Files to EC2 Ubuntu Instance Using SCP

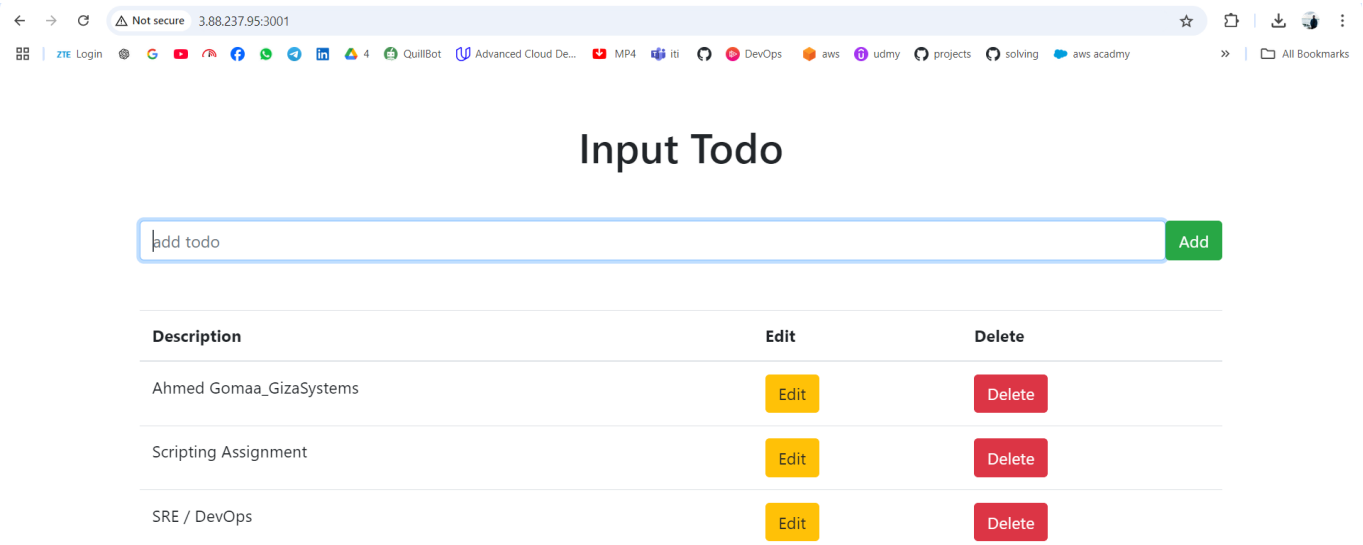
```
scp -i key.pem -r /todo-app ubuntu@your-ec2-ip:/home/ubuntu/
```

- Run the Build Script Now you can run the build.sh script to build your Docker images on the VM:

```
./scripts/build.sh
```

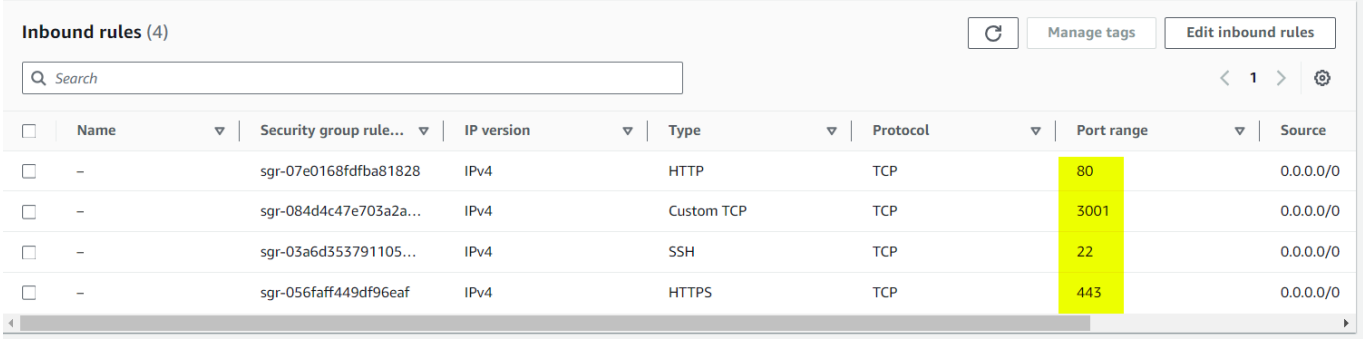
- Run the Application After building the images, use the run.sh script to start the containers:

```
./scripts/run.sh
```



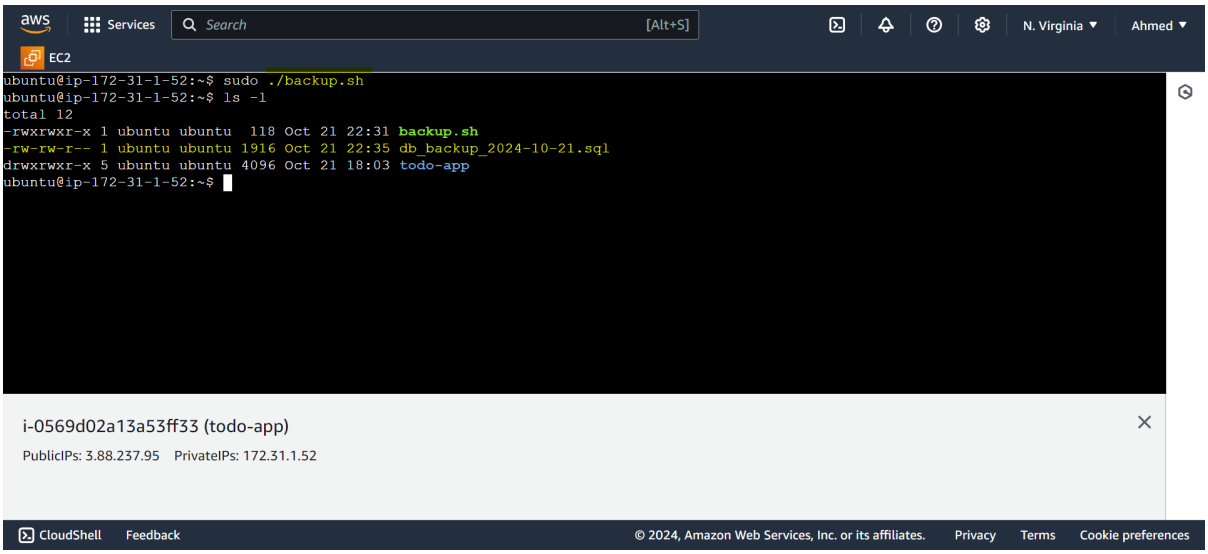
Step 6: Secure the Application and Configured firewall rules in VM

- Configured firewall rules to allow traffic only on the necessary ports (SSH, app port).



Step 7: Implement an Automated Daily Task

- Set up a **cron job** on the VM to back up the PostgreSQL database daily.
  - test backup script



  - Set Up cron to Run the Backup Daily:

```
crontab -e
0 0 * * * /home/ubuntu/backup.sh
```