

DevOps CAPSTONE PROJECT

DEPLOYING A **MOVIE LISTING WEBSITE** INTO **AWS CLOUD INFRASTRUCTURE** WITH PROPER SCALING

Group-4

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PURPOSE OF THE PROJECT

The purpose of the project is to deploy a website on an Amazon Elastic Compute Cloud (EC2) instance using Docker container technology. EC2 is a web service provided by AWS to easily deploy and manage virtual servers. It is highly scalable and flexible to use. Docker is a containerization tool which makes an application run on any platform. MongoDB is used instead of the local database so that the data is stored in our cluster and images are stored in S3.

By the concluding phase of this project, we can host a web application on EC2 which is highly reliable, can handle vast web traffic and runs smoothly. This application can be easily maintained and updated because of docker with a load balancer attached to it.

SCOPE OF THE PROJECT

The scope of the project is to deploy a website using Amazon Elastic Compute Cloud (EC2) and Docker container technology. The project includes developing a web application and modifying it according to our requirements. Configuring and setting up an EC2 instance also plays a vital role in this project. MongoDB is used instead of the local database.

The web application is containerized using docker for easier maintenance and deployment. It involves the deployment of web application from our EC2 instance and also attaching a load balancer to reduce the web traffic load on an instance. The project can be concluded by assigning a DNS for accessing the website.

TECHNOLOGIES USED IN THIS PROJECT



AWS: AWS is a cloud computing platform that provides a range of services for individuals and businesses to store, manage, and process data and applications in the cloud. With over 200 services, including computing, storage, databases, analytics, machine learning, IoT, and security, AWS is flexible, cost-effective, and reliable. Some popular AWS services include EC2 for computing, S3 for storage, RDS for databases, Lambda for serverless computing, DynamoDB for NoSQL databases, and ECS for container management.



Docker: Docker is an open-source platform that allows developers to create, deploy, and run applications in containers. Containers are self-contained, portable units of software that include all the components and dependencies an application needs to run. Docker simplifies application development and deployment by enabling developers to package their applications in containers and run them on any system with Docker installed. This provides greater flexibility, portability, and scalability for applications.



GIT: Git is a version control system that allows developers to track changes to their code and collaborate with others on a project. It is a free and open-source tool that provides features such as branching, merging, and version history. Git's distributed architecture enables developers to work independently and collaborate with others, making it a powerful tool for managing software development projects.



Web Development: Web development is the process of creating and maintaining websites and web applications. It involves a combination of programming, design, and content creation to create web pages that are functional and visually appealing. Web development can include both frontend development, which focuses on the user interface, and backend development, which focuses on the server-side programming that powers the website.

TECHNOLOGIES STACK:

Frontend: ReactJS

Backend: NodeJS

Database: MongoDB

IMPLEMENTATION and OBSERVATIONS

Step 1: Connecting the Server with Atlas MongoDB

Initially, cloned the “Movie listing” website which uses ReactJS as frontend, NodeJS as backend and MongoDB as database from the repo:

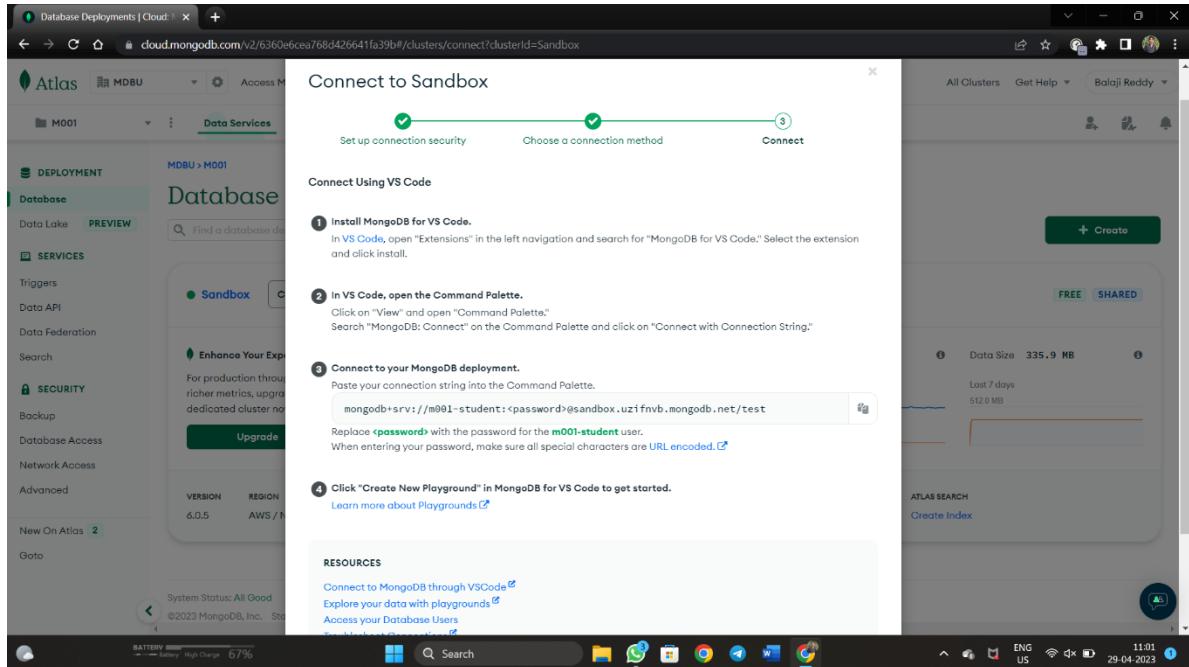
https://github.com/snehal-herovired/DEVOPS_CAPSTONE

Here, we create MongoDB account and create a free tier cluster and given network access as allow access from anywhere and create the cluster.

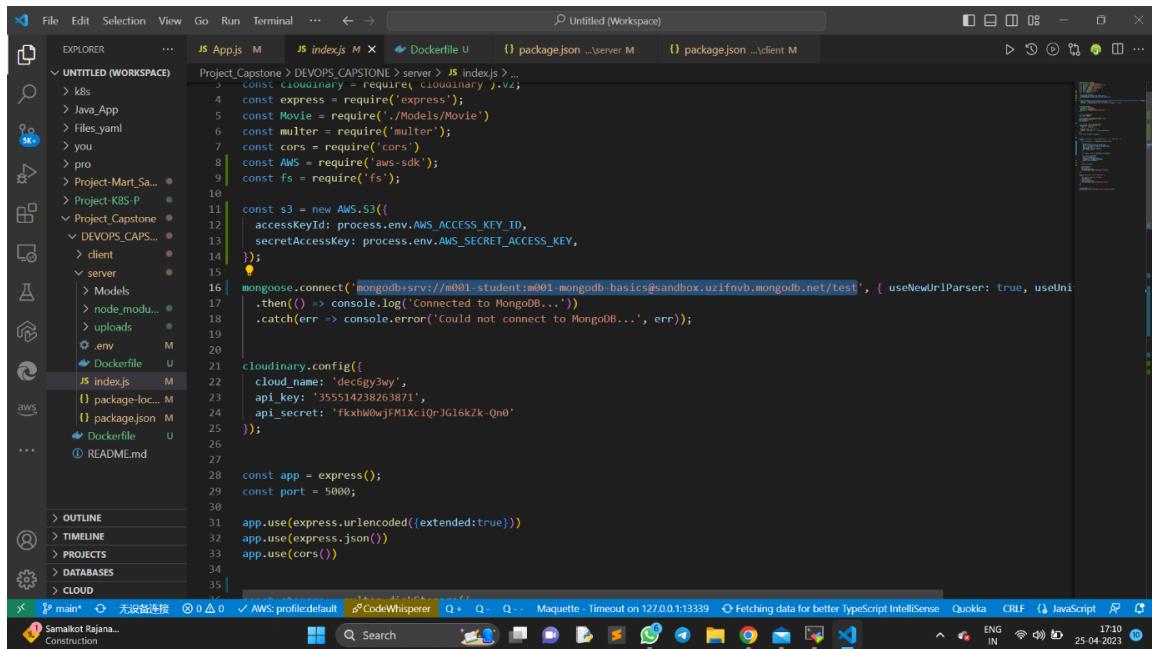
The screenshot shows the MongoDB Atlas interface. On the left, a sidebar lists services like Deployment, Database, and Security. The main area displays the 'Database Deployments' section for the 'M001' deployment. A prominent 'Sandbox' button is highlighted. Below it, a summary card provides real-time metrics: R: 0, W: 0, Connections: 3.0, In: 15.7 B/s, Out: 213.9 B/s, and Data Size: 335.9 MB. A large green 'Upgrade' button is visible. At the bottom, detailed cluster information is shown: VERSION 6.0.5, REGION AWS / N. Virginia (us-east-1), CLUSTER TIER M0 Sandbox (General), TYPE Replica Set - 3 nodes, BACKUPS Inactive, LINKED APP SERVICES None Linked, ATLAS SQL Connect, and ATLAS SEARCH Create Index.

- After creation of the cluster then connect it. Here we able to see the connection link.

This screenshot shows a modal dialog titled 'Connect to Sandbox'. It consists of three steps: 'Set up connection security' (completed with a green checkmark), 'Choose a connection method' (selected), and 'Connect' (not yet reached). The 'Choose a connection method' step contains two sections: 'Connect to your application' (Drivers) and 'Access your data through tools' (Compass, Shell, VS Code, and Atlas SQL). The background of the dialog shows the same MongoDB Atlas interface as the previous screenshot, including the 'Database Deployments' section for the M001 cluster.



- Now we must connect the server side with MongoDB, to achieve this we replace the local host link with the connection link where it is found in cluster.



- Create a S3 bucket to store the images which will be uploaded in the website.

The screenshot shows the AWS S3 service page. On the left, there's a sidebar with links like 'Buckets', 'Access Points', 'Object Lambda Access Points', etc. The main area displays an 'Account snapshot' with a link to 'View Storage Lens dashboard'. Below it, a table lists a single bucket:

Name	AWS Region	Access	Creation date
capprojectreact	US East (N. Virginia) us-east-1	Objects can be public	April 23, 2023, 02:10:30 (UTC+05:30)

- Create an IAM user and give necessary permissions to upload the images and access it.

The screenshot shows the AWS IAM service page. The left sidebar includes 'Access management' (User groups, Users, Roles, Policies), 'Identity providers', and 'Access reports' (Access analyzer, Archive rules, Analyzers, Settings). The main area shows a user named 'cap' with a summary table:

ARN	arn:aws:iam::910427843420:user/cap	Console access	Access key 1
		Disabled	AKIA5H6N2NNOOKKGJ3XX - Active
Created	April 23, 2023, 02:04 (UTC+05:30)	Last console sign-in	Used today, 2 days old.
		-	Access key 2
			Not enabled

Below the summary, there are tabs for 'Permissions', 'Groups', 'Tags (1)', 'Security credentials', and 'Access Advisor'. Under 'Permissions', it shows 'Permissions policies (2)' attached to the user.

Step 2: Modifying the Frontend and Backend Code

- The AWS SDK for JavaScript supports three runtimes: **JavaScript for browser**, **Node.js for server**, **React Native for mobile development**. It also supports cross-runtime: a service client package can be run on browsers, Node.js, and React-Native without code change. Now, we add:

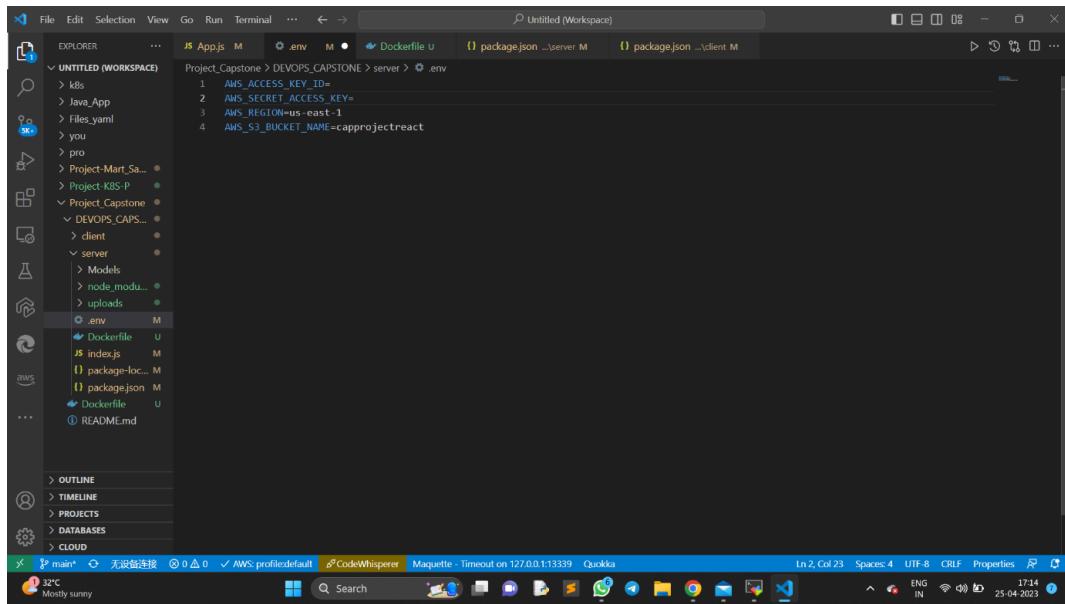
```
Project_Capstone > DEVOPS_CAPSTONE > server > index.js ...  
1  require('dotenv').config()  
2  const mongoose = require('mongoose');  
3  const cloudinary = require('cloudinary').v2;  
4  const express = require('express');  
5  const Movie = require('./Models/Movie')  
6  const multer = require('multer');  
7  const cors = require('cors')  
8  const AWS = require('aws-sdk');  
9  const fs = require('fs');  
10  
11  const s3 = new AWS.S3({  
12    accessKeyId: process.env.AWS_ACCESS_KEY_ID,  
13    secretAccessKey: process.env.AWS_SECRET_ACCESS_KEY,  
14  });  
15  
16  mongoose.connect('mongodb+srv://m001-student:m001-mongodb-basics@sandbox.uzifnrb.mongodb.net/test', { useNewUrlParser: true, useUnifiedTopology: true })  
17  .then(() => console.log('Connected to MongoDB...'))  
18  .catch(err => console.error('Could not connect to MongoDB...', err));  
19  
20  cloudinary.config({  
21    cloud_name: 'decig3y3wy',  
22    api_key: '35514238263871',  
23    api_secret: 'fkxhw0wjFMIXciQrJG16kZk-Qn0'  
24  });  
25  
26  
27  const app = express();  
28  const port = 5000;  
29  
30  app.use(express.urlencoded({ extended:true}))  
31  app.use(express.json())  
32  app.use(cors())
```

- Multer is a Node.js middleware used for handling multipart/form-data, which is primarily used for uploading files. It's a function that receives the request and response object when a user from the client-side makes any request. Now, we are adding multer to our code:

The screenshot shows a developer's workspace with the following details:

- File Explorer:** Shows the project structure under "UNTITLED (WORKSPACE)".
- Code Editors:** Two tabs are open:
 - App.js:** Contains logic for file uploads using Multer and AWS S3.
 - index.js:** Contains the main application logic, including an AWS Lambda function definition.
- Terminal:** Shows AWS profiling results for a function named "main". The results include metrics like Duration,吞吐量 (Throughput), and Error Rate.
- System Status:** Shows battery level at 32%, mostly sunny weather, and system temperature at 32°C.

- Now, we have replaced the access keys and ID with our credentials.



Step-3: Containerization of the code

- Here, we are converting our frontend and backend code into docker images to run. Docker can build images automatically by reading the instructions from a [Docker file](#). A [Dockerfile](#) is a text document that contains all the commands a user could call on the command line to assemble an image. Hence, the dockerfiles are written for both server and client.

Dockerfile for server:

```
# Use an official Node.js runtime as a parent image
FROM node:14

# Set the working directory to /app
WORKDIR /app

# Copy the current directory contents into the container at /app
COPY . /app

# Install any needed packages specified in package.json
RUN npm install

# Make port 5000 available to the world outside this container
EXPOSE 5000

# Start the app when the container launches
CMD ["npm", "start"]
```

- The docker build command builds Docker images from a Dockerfile and a “context”. A build's context is the set of files located in the specified PATH or URL.

```

Project_Capstone > DEVOPS_CAPSTONE > server > Dockerfile
1 # Use an official Node.js runtime as a parent image
2 FROM node:14
3
4 # Set the working directory to /app
5 WORKDIR /app
6
7 # Copy the current directory contents into the container at /app
8 COPY . /app
9
10 # Install any needed packages specified in package.json
11 RUN npm install
12
13 # Make port 5000 available to the world outside this container
14 EXPOSE 5000
15
16 # Start the app when the container launches
17 CMD ["npm", "start"]
18

```

TERMINAL

```

PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\client> cd ..
PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE> cd server
PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE> docker build -t server .

```

```

Project_Capstone > DEVOPS_CAPSTONE > server > Dockerfile
1 # Use an official Node.js runtime as a parent image
2 FROM node:14
3
4 # Set the working directory to /app
5 WORKDIR /app
6
7 # Copy the current directory contents into the container at /app
8 COPY . /app
9
10 # Install any needed packages specified in package.json
11 RUN npm install
12
13 # Make port 5000 available to the world outside this container
14 EXPOSE 5000
15
16 # Start the app when the container launches
17 CMD ["npm", "start"]
18

```

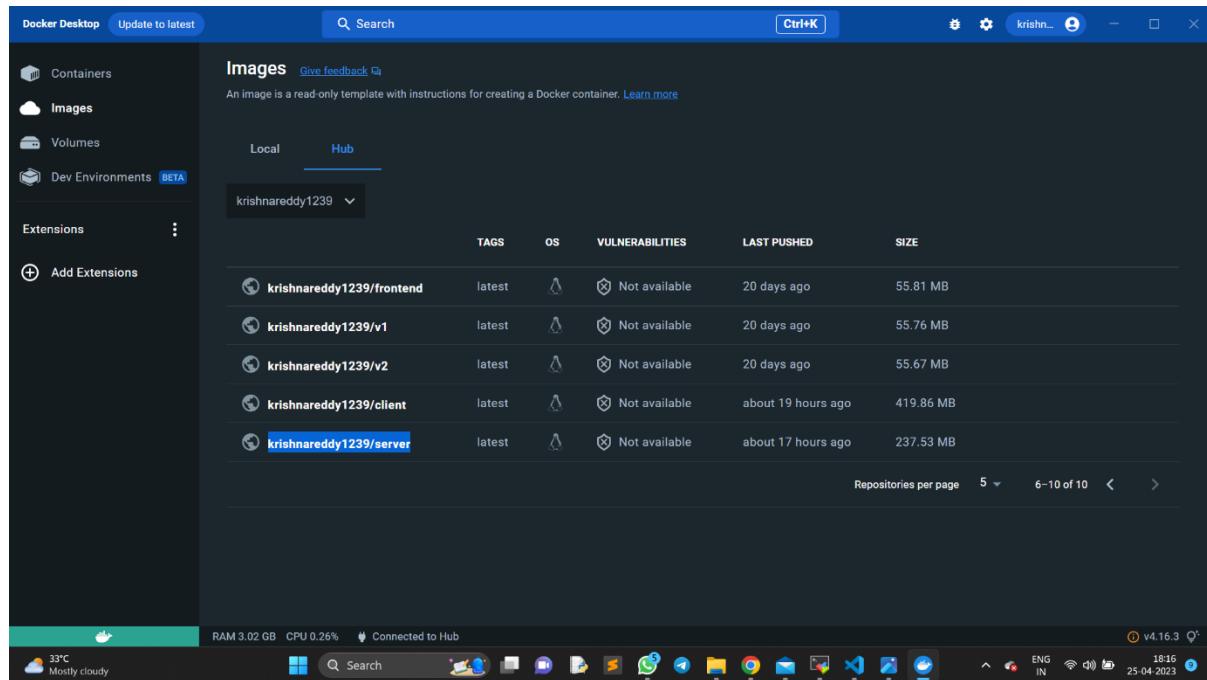
TERMINAL

server	latest	6f25d9236a6	18 hours ago	690MB	
krishnareddy1239/client	latest	1385f96e63bfa	20 hours ago	1.17GB	
client	latest	1385f96e63bfa	20 hours ago	1.17GB	
krishnareddy1239/details	latest	f137a86c8df4	2 weeks ago	182MB	
details	latest	f137a86c8df4	2 weeks ago	182MB	
krishnareddy1239/v2	latest	1540c98d94f	2 weeks ago	182MB	
v2	latest	1540c98d94f	2 weeks ago	182MB	
krishnareddy1239/v1	latest	cb3b594b707c	2 weeks ago	182MB	
v1	latest	cb3b594b707c	2 weeks ago	182MB	
krishnareddy1239/frontend	latest	bcaede0e8151	3 weeks ago	183MB	
frontend1	latest	bcaede0e8151	3 weeks ago	183MB	
gcr.io/k8s-minikube/kicbase	v0.0.39	67a4b1138d2d	3 weeks ago	1.05GB	
<none>		ae43a1169192	3 weeks ago	777MB	

- Docker Push is a command that is used to push or share a local Docker image or a repository to a central repository; it might be a public registry like <https://hub.docker.com> or a private registry or a self-hosted registry.

```
1 # Use an official Node.js runtime as a parent image
2 FROM node:14
3
4 # Set the working directory to /app
5 WORKDIR /app
6
7 # Copy the current directory contents into the container at /app
8 COPY . /app
9
10 # Install any needed packages specified in package.json
11 RUN npm install
12
13 # Make port 5000 available to the world outside this container
14 EXPOSE 5000
15
16 # Start the app when the container launches
17 CMD ["npm", "start"]
```

- The images built in previous steps are stored in docker as shown below:



Step 4: Deploying server on EC2 using Docker

- Now create an EC2 instance to deploy the backend and it is deployed by using docker.

The screenshot shows the AWS CloudWatch Metrics interface. A single metric named "Lambda Function Invocations" is displayed with a value of 100. The time range is set to "Last hour". The chart has a light blue background with a white grid. The data point at the end of the hour-long timeline is highlighted in red.

- Connect EC2 instance through local machine using MobaXterm and login into docker through EC2 instance by using the command **sudo docker login** and pull the docker image using **docker pull** command.

The screenshot shows a MobaXterm session connected to an EC2 instance with IP 100.25.86.45. The terminal window title is "100.25.86.45 (ec2-user)". The user is logged in as "ec2-user" and runs the command "sudo docker login". The response indicates an unauthorized error due to incorrect credentials. The user then runs "docker pull krishnareddy1239/server", which successfully pulls the image from Docker Hub.

```
[ec2-user@ip-172-31-89-206 ~]$ sudo docker login
Error response from daemon: Get "https://registry-1.docker.io/v2/": unauthorized: incorrect username or password
[ec2-user@ip-172-31-89-206 ~]$ sudo docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://hub.docker.com to create one.
Username: krishnareddy1239
Password:
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[ec2-user@ip-172-31-89-206 ~]$ docker pull krishnareddy1239/server
```

- Now run the docker image by listening the port number using the command **sudo docker run -p 5000:5000 image_name**. It shows that file is connecting to the MongoDB.

```
[ec2-user@ip-172-31-89-206 ~]$ sudo docker run -p 5000:5000 krishnareddy1239/server
```

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```
[ec2-user@ip-172-31-89-206 ~]$ sudo docker run -p 5000:5000 krishnareddy1239/client
docker: Error response from daemon: driver failed programming external connectivity on endpoint fervent_roentgen (db24ead5fcfd0b76ede32f967a0cef69497fe6a46be38bfdf20964bb127a75c): Bind for 0.0.0.0:5000 failed: port is already allocated.
[ec2-user@ip-172-31-89-206 ~]$ sudo docker run -p 5010:5000 krishnareddy1239/client

> server@01.0.0 start /app
> node index.js

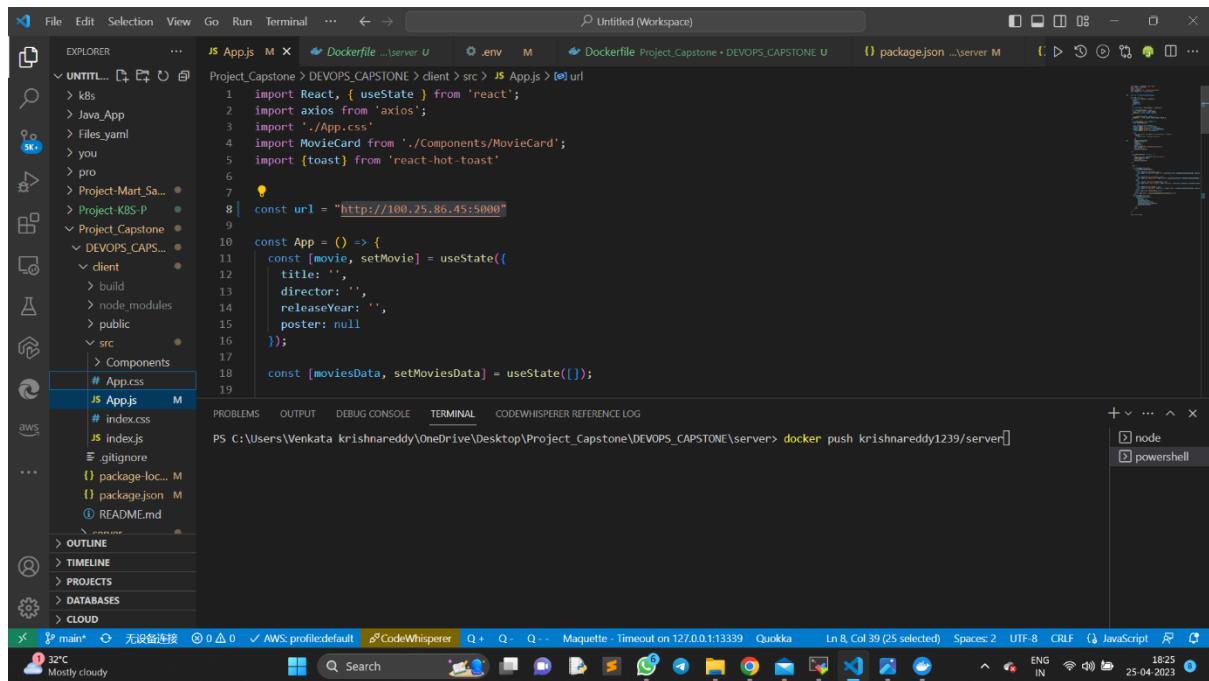
Server listening at http://localhost:5000
(node:19) NOTE: We are formalizing our plans to enter AWS SDK for JavaScript (v2) into maintenance mode in 2023.

Please migrate your code to use AWS SDK for JavaScript (v3).
For more information, check the migration guide at https://a.co/ZPzMcC
(Use `node --trace-warnings ...` to show where the warning was created)
Connected to MongoDB...
```

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Step 5: Deploying client on EC2 using Docker

- Modified the port number for listening to the client



- Now add the Dockerfile which is used to call all the commands on the command line and build the docker image using the command **docker build -t image path/name** .

Dockerfile for Client:

```

# base image
FROM node:14-alpine

# set working directory
WORKDIR /app

# add `/app/node_modules/.bin` to $PATH
ENV PATH /app/node_modules/.bin:$PATH

# install and cache app dependencies
COPY client/package.json /app/package.json
RUN npm install --silent
RUN npm install react-scripts@4.0.3 -g --silent

# start app
COPY client/public /app/public
COPY client/src /app/src
CMD ["npm", "start"]

```

```

1 # base image
2 FROM node:14-alpine
3
4 # set working directory
5 WORKDIR /app
6
7 # add `/app/node_modules/.bin` to $PATH
8 ENV PATH /app/node_modules/.bin:$PATH
9
10 # install and cache app dependencies
11 COPY client/package.json /app/package.json
12 RUN npm install --silent
13 RUN npm install react-scripts@4.0.3 -g --silent
14
15 # start app
16 COPY client/public /app/public
17 COPY client/src /app/src
18 CMD ["npm", "start"]
19

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL CODEWHISPERER REFERENCE LOG

```

PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE> cd ..
PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE> cd client
PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE\client> docdk build -t krishnareddy1239/client .

```

In 19, Col 1 Spaces: 4 UTF-8 CRLF Docker

- To check the status of running images in the docker using `docker ps` and check the image is created in the docker desktop.

```

1 # base image
2 FROM node:14-alpine
3
4 # set working directory
5 WORKDIR /app
6
7 # add `/app/node_modules/.bin` to $PATH
8 ENV PATH /app/node_modules/.bin:$PATH
9
10 # install and cache app dependencies
11 COPY client/package.json /app/package.json
12 RUN npm install --silent
13 RUN npm install react-scripts@4.0.3 -g --silent
14
15 # start app
16 COPY client/public /app/public
17 COPY client/src /app/src
18 CMD ["npm", "start"]
19

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL CODEWHISPERER REFERENCE LOG

server	latest	6f26d49236a6	18 hours ago	690MB	
client	latest	1385f96e63bf	21 hours ago	1.17GB	
krishnareddy1239/client	latest	1385f96e63bf	21 hours ago	1.17GB	
krishnareddy1239/details	latest	f137a86cd8f4	2 weeks ago	182MB	
details	latest	f137a86cd8f4	2 weeks ago	182MB	
krishnareddy1239/v2	latest	1548c98d94f	2 weeks ago	182MB	
v2	latest	1548c98d94f	2 weeks ago	182MB	
krishnareddy1239/v1	latest	cb3b594b707c	2 weeks ago	182MB	
v1	latest	cb3b594b707c	2 weeks ago	182MB	
krishnareddy1239/frontend	latest	bcae60e8151	3 weeks ago	183MB	
frontend1	latest	bcae60e8151	3 weeks ago	183MB	
gcr.io/k8s-minikube/kichache	v0.0.39	67a4b1138d2d	3 weeks ago	1.05GB	
<none>	<none>	ae43a1169192	3 weeks ago	777MB	

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL CODEWHISPERER REFERENCE LOG

```

server
client
krishnareddy1239/client
krishnareddy1239/details
details
krishnareddy1239/v2
v2
krishnareddy1239/v1
v1
krishnareddy1239/frontend
frontend1
gcr.io/k8s-minikube/kichache
<none>

```

In 19, Col 1 Spaces: 4 UTF-8 CRLF Docker

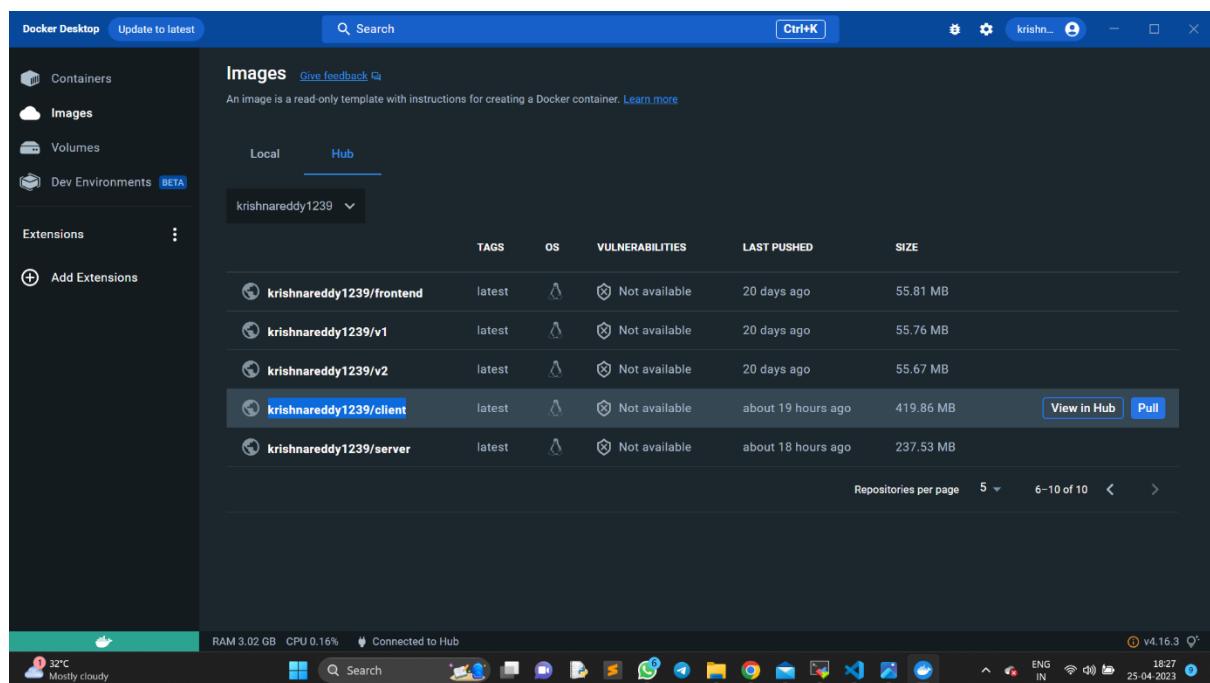
```

    Project_Capstone > DEVOPS_CAPSTONE > Dockerfile
    1 # base image
    2 FROM node:14-alpine
    3
    4 # set working directory
    5 WORKDIR /app
    6
    7 # add `/app/node_modules/.bin` to $PATH
    8 ENV PATH /app/node_modules/.bin:$PATH
    9
    10 # install and cache app dependencies
    11 COPY client/package.json /app/package.json
    12 RUN npm install --silent
    13 RUN npm install react-scripts@4.0.3 -g --silent
    14
    15 # start app
    16 COPY client/public /app/public
    17 COPY client/src /app/src
    18 CMD [ "npm", "start" ]
    19
  
```

TERMINAL CODEWHISPERER REFERENCE LOG

v2	latest	1548ca98d94f	2 weeks ago	182MB	
krishnareddy1239/v1	latest	cb3b594b707c	2 weeks ago	182MB	
v1	latest	cb3b594b707c	2 weeks ago	182MB	
krishnareddy1239/frontend	latest	bcae60e8151	3 weeks ago	183MB	
frontend1	latest	bcae60e8151	3 weeks ago	183MB	
gcr.io/k8s-minikube/kicbase	v0.0.39	67a4b1138d2d	3 weeks ago	1.05GB	
<none>	nginx	ae43a1169192	3 weeks ago	777MB	
my-java-app	latest	6d43946f2d97	2 months ago	526MB	
ubuntu	latest	58cb3edaef2bfe	2 months ago	77.8MB	
docker/getting-started	latest	3e3394f6b72f	4 months ago	47MB	
hello-world	latest	f0b5d9fea6a5	19 months ago	13.3KB	

PS C:\Users\Venkata krishnareddy\OneDrive\Desktop\Project_Capstone\DEVOPS_CAPSTONE\client> docker push krishnareddy1239/client



Step 6: Deploying EC2 instances for client

- Create another EC2 instance to deploy the frontend(client)

The screenshot shows the AWS CloudWatch Metrics interface. At the top, there are tabs for 'Metrics' and 'Logs'. Below the tabs, a search bar and a date range selector ('Last 1 hour') are visible. The main area displays a table of metrics for an EC2 instance. The columns include:

Metric	Value	Unit	Period
System CPU Utilization	0.00%	Percent	1 minute
System Memory Utilization	0.00%	Percent	1 minute
System Network In	0.00	Bytes/second	1 minute
System Network Out	0.00	Bytes/second	1 minute
System Disk Read Operations	0.00	Operations/second	1 minute
System Disk Write Operations	0.00	Operations/second	1 minute

At the bottom of the page, there is a footer with links to 'AWS Documentation', 'AWS Support', and 'Feedback'.

- Connect EC2 instance through local machine using MobaXterm.

The screenshot shows the MobaXterm application window. On the left, there is a sidebar titled 'Sessions' with a list of previous sessions. The main area is a terminal window titled '3.89.246.245 (ec2-user)'. The terminal output shows:

```

MobaXterm Personal Edition v23.1.1
(SSH client, X server and network tools)

SSH session to ec2-user@3.89.246.245
  • Direct SSH : ✓
  • SSH compression : ✓
  • SSH-browser : ✓
  • X11-forwarding : ✘ (disabled or not supported by server)

For more info, ctrl+click on help or visit our website.

Last login: Tue Apr 25 12:36:30 2023 from 169.238.75.161
[ec2-user@ip-172-31-67-203 ~]$ 

```

At the bottom of the terminal window, there is a message: 'UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net'.

```
Last login: Tue Apr 25 12:36:30 2023 from 160.238.75.161
[ec2-user@ip-172-31-87-203 ~]$ sudo docker pull krishnareddy1239/client
```

- Now run the docker image by listening the port number using the command **sudo docker run -p 5000:5000 image_name**. It shows starting the development server.

```
[ec2-user@ip-172-31-87-203 ~]$ sudo docker run -p 3001:3000 krishnareddy1239/server
> client@0.1.0 start /app
> react-scripts start

(node:25) [DEP_WEBPACK_DEV_SERVER_ON_AFTER_SETUP_MIDDLEWARE] DeprecationWarning: 'onAfterSetupMiddleware' option is deprecated. Please use the 'setupMiddlewares' option.
(Use `node --trace-deprecation ...` to show where the warning was created)
(node:25) [DEP_WEBPACK_DEV_SERVER_ON_BEFORE_SETUP_MIDDLEWARE] DeprecationWarning: 'onBeforeSetupMiddleware' option is deprecated. Please use the 'setupMiddlewares' option.
Starting the development server...

Compiled with warnings.

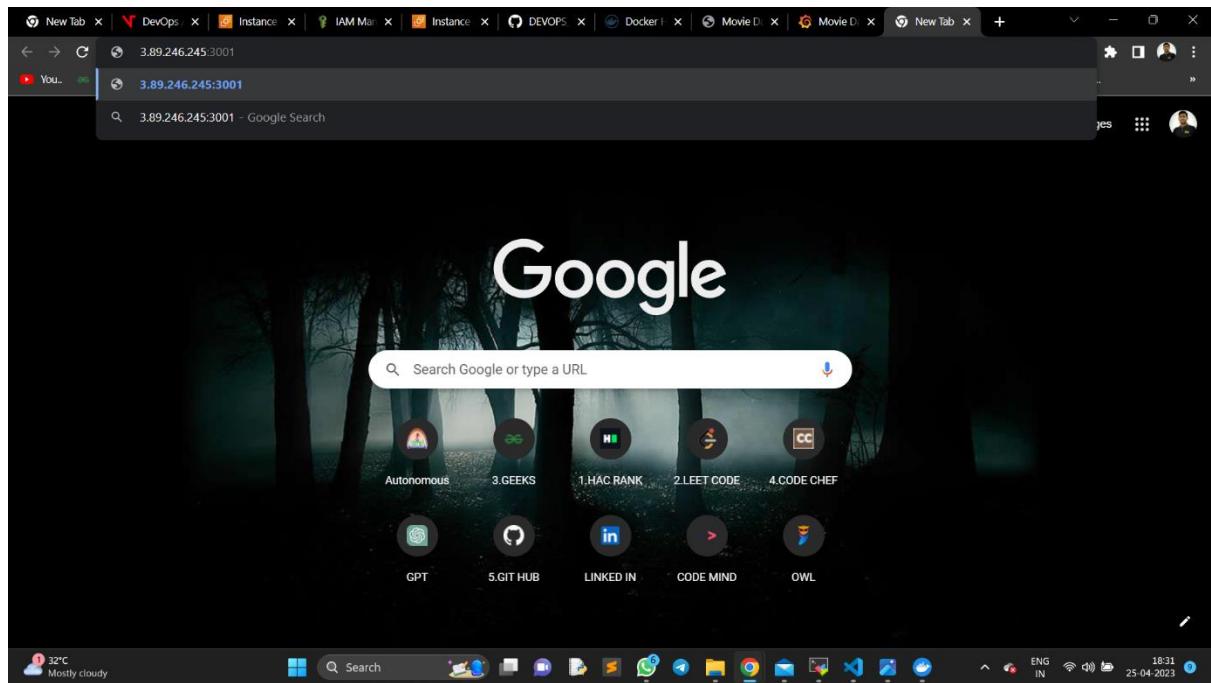
[eslint]
src/App.js
  Line 39:13: 'res' is assigned a value but never used  no-unused-vars
  Search for the keywords to learn more about each warning.
  To ignore, add // eslint-disable-next-line to the line before.

WARNING in [eslint]
src/App.js
  Line 39:13: 'res' is assigned a value but never used  no-unused-vars
webpack compiled with 1 warning
Compiling...
Compiled with warnings.

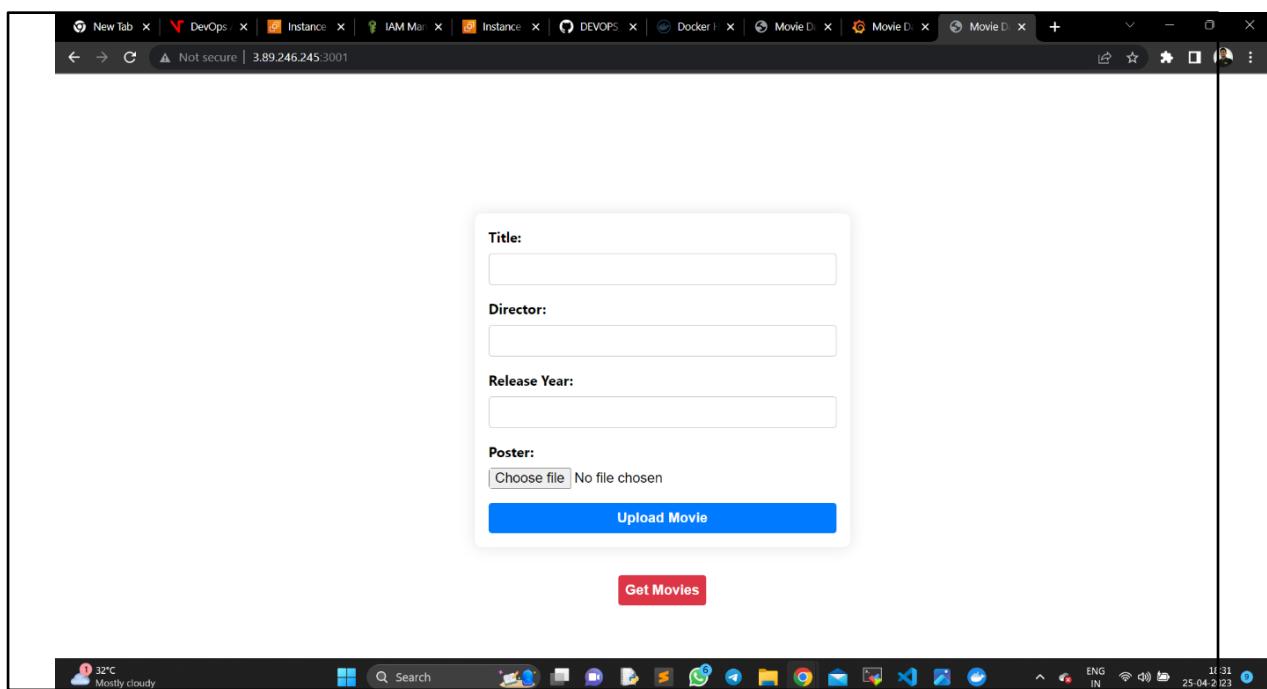
[eslint]
src/App.js
  Line 39:13: 'res' is assigned a value but never used  no-unused-vars
  Search for the keywords to learn more about each warning.
  To ignore, add // eslint-disable-next-line to the line before.

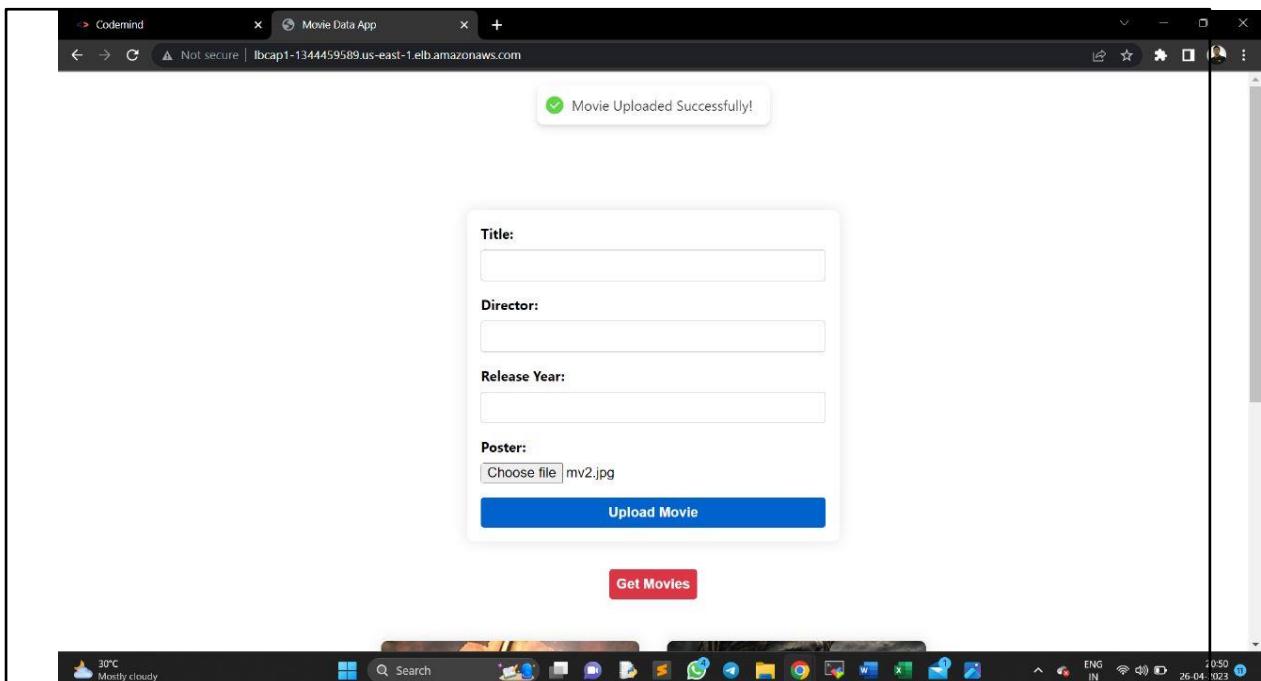
WARNING in [eslint]
src/App.js
  Line 39:13: 'res' is assigned a value but never used  no-unused-vars
webpack compiled with 1 warning
```

- After deploying to check the website we use the public IP address of the Client Instance along with the listening port number **3.89.246.245:3001**



- The deployed web application. Enter the details in the displayed web page and submit the details. The details are uploaded into the mongoDB server and photos are uploaded to the attached S3 bucket.

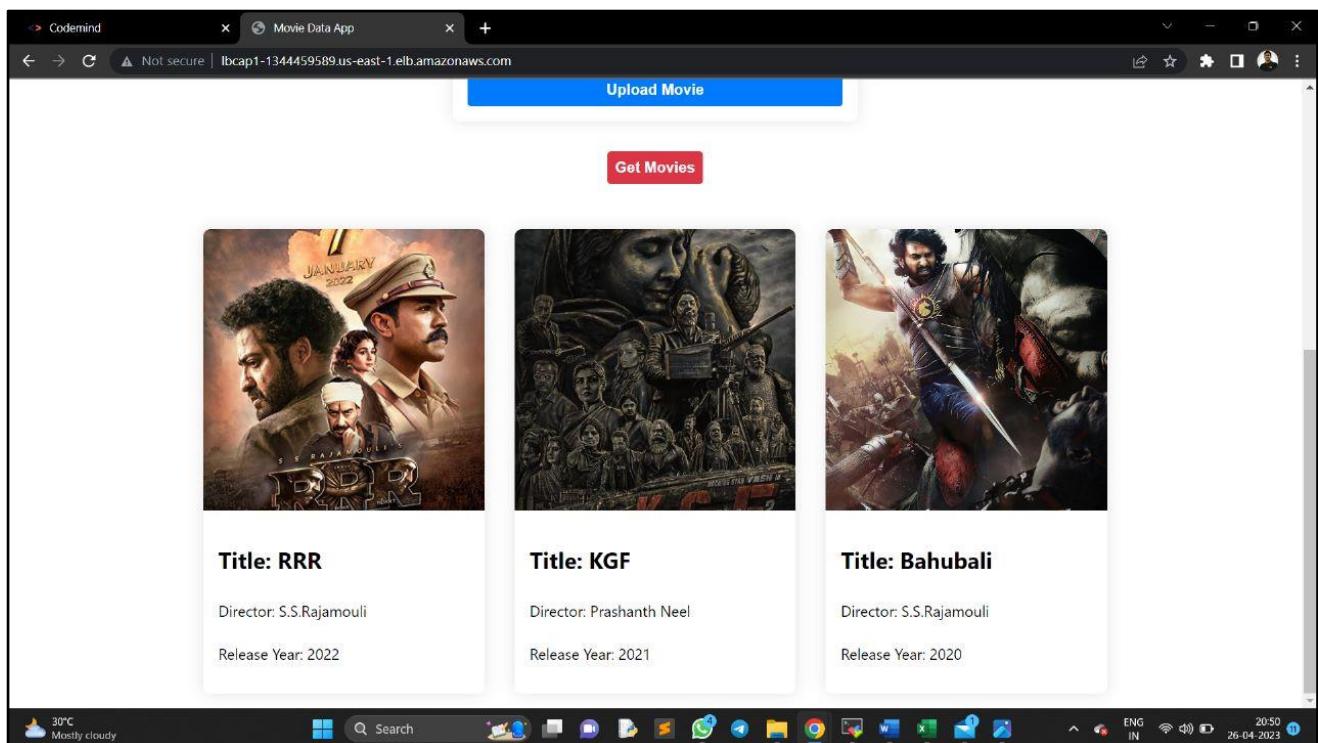




- Photos are uploaded in the S3 bucket.

The screenshot shows the AWS S3 console at s3.console.aws.amazon.com/s3/buckets/caprojectreact?region=us-east-1&tab=objects. The left sidebar shows "Amazon S3" with sections for Buckets, Storage Lens, and Feature spotlight. The main area lists uploaded files:

Name	Type	Last modified	Size	Storage class
1682261423182-w.p.2.jpg	jpg	April 23, 2023, 20:20:27 (UTC+05:30)	40.8 KB	Standard
1682262583627-w.p.2.jpg	jpg	April 23, 2023, 20:39:47 (UTC+05:30)	40.8 KB	Standard
1682262853360-balaji1.png	png	April 23, 2023, 20:44:18 (UTC+05:30)	2.3 MB	Standard
1682262854930-balaji1.png	png	April 23, 2023, 20:44:20 (UTC+05:30)	2.3 MB	Standard
1682427779527-wap1.jif	jif	April 25, 2023, 18:33:00 (UTC+05:30)	6.5 KB	Standard
1682439135117-w.p.2.jpg	jpg	April 25, 2023, 21:42:16 (UTC+05:30)	40.8 KB	Standard
1682441328186-wap1.jif	jif	April 25, 2023, 22:18:52 (UTC+05:30)	6.5 KB	Standard
1682443952321-wap3.jpeg	jpeg	April 25, 2023, 23:02:13 (UTC+05:30)	244.4 KB	Standard
1682522340075-mv1.jpg	jpg	April 26, 2023, 20:49:01 (UTC+05:30)	81.4 KB	Standard
1682522396024-mv6.jpg	jpg	April 26, 2023, 20:49:57 (UTC+05:30)	81.0 KB	Standard
1682522429153-mv2.jpg	jpg	April 26, 2023, 20:50:30 (UTC+05:30)	176.4 KB	Standard



- Details are uploaded in the MongoDB Document.

_id	title	director	releaseYear	poster
<code>ObjectId('644940e4ae2c241a44dd2839')</code>	"RRR"	"S.S.Rajamouli"	2022	" https://capprojectreact.s3.amazonaws.com/1682522340875-mv1.jpg "
<code>ObjectId('6449411cae2c241a44dd283c')</code>	"KGF"	"Prashanth Neel"	2021	" https://capprojectreact.s3.amazonaws.com/1682522396024-mv6.jpg "

Step 7 : Creation a target group and Load Balancer

- Create a target group which tells a load balancer where to direct traffic to EC2 instances, fixed IP addresses; or AWS Lambda functions, amongst others.
- When creating a load balancer, you create one or more listeners and configure listener rules to direct the traffic to one target group

The screenshot shows the AWS Target groups console. A search bar at the top has 'trtg' typed into it. Below the search bar, there's a 'Details' section with the following information:

- Target type:** Instance
- Protocol:** Port HTTP: 80
- Protocol version:** HTTP1
- VPC:** vpc-009059d36f6bb0363

Below the details, there's a table showing the status of registered targets:

Total targets	Healthy	Unhealthy	Unused	Initial	Draining
2	2	0	0	0	0

Under the 'Targets' tab, there's a table titled 'Registered targets (2)'. It lists two targets:

Instance ID	Name	Port	Zone	Health status
i-0dc3b006d170e119f	backup	3000	ap-south-1a	healthy
i-0d45cf266dad9264d	client	3000	ap-south-1a	healthy

- Create the load balancer which is used to increase capacity (concurrent users) and reliability of applications. Here we create load balancer for server and client.

The screenshot shows the AWS Load balancers console. A search bar at the top has 'efrrefdfs' typed into it. Below the search bar, there's a 'Details' section with the following information:

- Load balancer type:** Application
- DNS name:** efrrefdfs-1682755782.ap-south-1.elb.amazonaws.com (A Record)
- Status:** Active
- VPC:** vpc-009059d36f6bb0363
- IP address type:** IPv4
- Scheme:** Internet-facing
- Availability Zones:** subnets-0fb111499ee446, subnets-0ff6ac27e5129eb8, subnets-0102814b7630b116
- Hosted zone:** ZP97RAFLXTNZK

Below the details, there's a table titled 'Listeners (1)'. It shows a single listener rule for port 80:

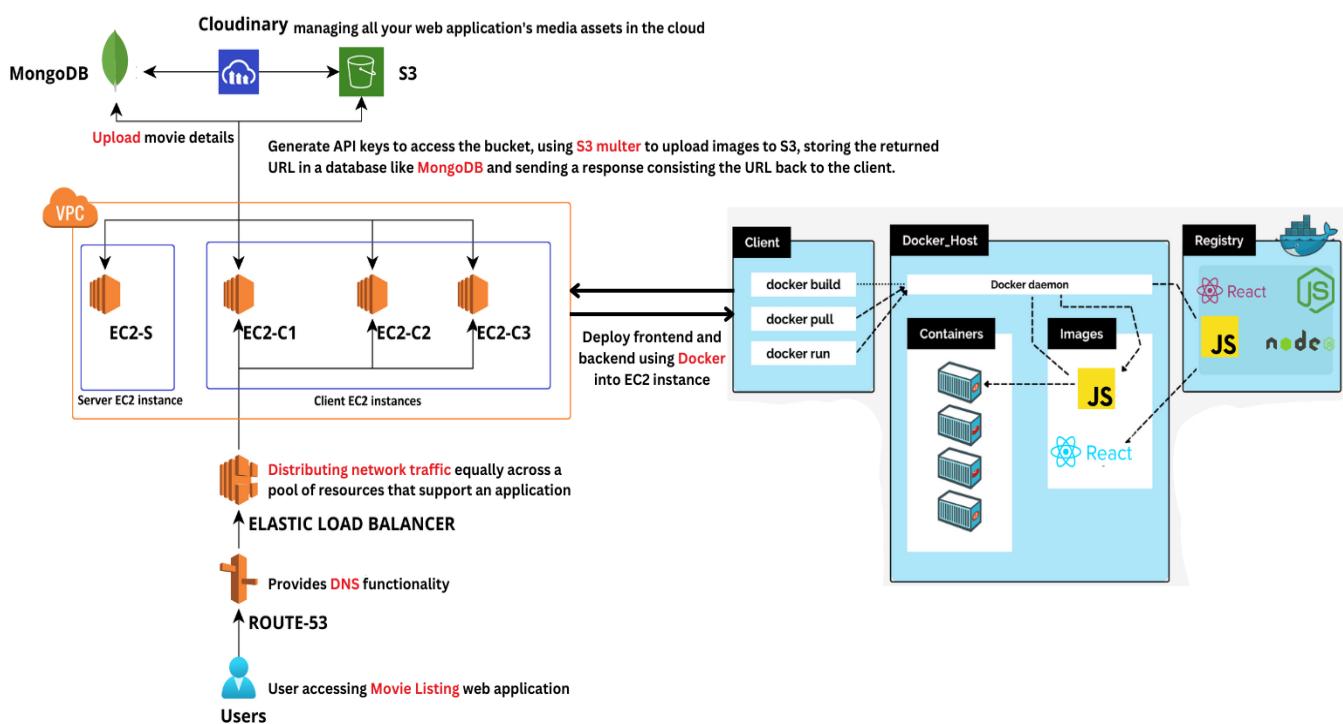
Protocol:Port	Default action	Rules	ARN	Security policy	Default SSL cert	Tags
HTTP:80	Forward to target group	1 rule	ARN	Not applicable	Not applicable	0 tags
	• http: 1 (100%)					
	• Group-level stickiness: Off					

- While creating Load balancer we got one **DNS (Domain Name System)** name which is used to translate a domain name into the appropriate IP address.

DNS NAME: <http://lbcap1-1344459589.us-east-1.elb.amazonaws.com/>

Project Git-Hub repository Link: [DevOps_Capstone](#)

AWS DEPLOYMENT DIAGRAM:



This project includes the utilization of various tools. Multiple observations are noted based on the tools. Some key observations are:

Visual Studio Code: Visual Studio Code is a source-code editor that can be used with a variety of programming languages. The code has been according to the requirements using VS Code.

MongoDB Atlas: MongoDB Atlas is a fully-managed cloud database that handles all the complexity of deploying, managing, and healing your deployments on the cloud service provider of your choice (AWS, Azure, and GCP). The local database has been replaced by this database and the data uploaded is stored here.

EC2: EC2 (Elastic Compute Cloud) is a web service provided by Amazon Web Services (AWS) that allows users to rent virtual computers, known as instances, on which they can run their own applications. The containerized frontend and backend have been deployed using EC2. The client instances are also attached to the load balancer to manage the traffic.

S3: Amazon S3 (Simple Storage Service) is a cloud-based storage service that enables users to store and retrieve data from anywhere on the internet. The images we have uploaded in the frontend have been stored in S3 buckets which was created.

IAM: AWS Identity and Access Management (IAM) is a web service provided by Amazon Web Services (AWS) that enables users to securely manage access to AWS resources. A user have been created for the access controls and full administrator access was given.

Route 53: Amazon Route 53 is a highly available and scalable cloud-based Domain Name System (DNS) service provided by Amazon Web Services (AWS). It helps the developers and business owners by translating the domain name into IP address. DNS has been assigned which can be accessed by anyone to view the website.

GitHub: GitHub is a web-based platform that provides developers with a variety of tools for software development and collaboration. The project has been uploaded in GitHub which would be accessible for future changes.

A project requires clear objectives and ground rules to work on to achieve the goal of any aspect.

- **Jira** has been used to plan the sprints, track the changes and complete the project efficiently.
- **Slack** is a great communication tool where we can interact efficiently and to collaborate.
- **Teams** is a collaboration app that kept us organized, enabled conversations, and let us schedule meetings to get the project done efficiently and effectively.

TEAM MEMBERS CONTRIBUTION:

During the course of the project, we distributed the workload among team members based on their individual strengths and interests.

We **communicated regularly** through daily **Team meetings** and daily updates on our project management tool through WhatsApp group. This allowed us to stay on top of any issues that arose and to make adjustments to our plan as needed.

To track the contributions of each team member, we created an Excel spreadsheet with "**Task Contributed**" and "**Members**" as columns. In the "Task Contributed" column, we listed each task that needed to be completed for the project, along with a brief description of the task. In the "Members" column, we listed the name of the team member who was responsible for completing that task.

By using this spreadsheet, we were able to keep track of who was responsible for each task and ensure that **everyone was contributing equally to the project**. We updated the spreadsheet regularly to reflect any changes to the task assignments, and we used it as a reference during our team meetings to discuss progress and identify any issues.

S No.	TASK CONTRIBUTED	MEMBERS
1	Connecting the Server with Atlas MongoDB.	Yamuna, Balaji, Karthik
2	Creating IAM user and Configuring S3-bucket.	Blessy, Iswarya, Yamuna
3	Configuring the Application Code with S3-multer.	Vaseem, Krishna, Sunil
4	Containerization of the code using Dockerfile.	Krishna, Sunil, Iswarya
5	Deploying server on EC2 using Docker.	Karthik, Balaji, Krishna
6	Deploying client on EC2 using Docker.	Balaji, Vaseem, karthik
7	Creation a target group and Load Balancer.	Balaji, Blessy, Sunil
8	Creating AWS Deployment Diagram.	Sunil, Krishna, Vaseem
9	Preparing Project Documentation.	Blessy , Yamuna, Iswarya

Overall, we believe that our team was successful in distributing the workload effectively and working together to achieve our goals. By outlining our roles and responsibilities, maintaining open communication, and evaluating our performance, we were able to complete the project on time and to a high standard.

CHALLENGES FACED

- Due to lack of node of react knowledge, it took lot of time to analyse the code.
- We face most of the issues while modifying the server code for configuring with S3-multer.
- Due to lack of good internet, Docker image creation took a lot of time.
- When something went wrong, we had to reframe the frontend (connection) and dockarize the frontend code again.
- Due to our lack of knowledge on how to create an AWS architecture diagram, we had to learn how to work with different editing tools like Canva and figma...etc.

RESOURCES

MongoDB : <https://www.mongodb.com/docs/>

AWS : <https://docs.aws.amazon.com/>

S3-multer : <https://www.npmjs.com/package/multer-s3>

Docker : <https://docs.docker.com/>

Git : <https://git-scm.com/docs>

AWS Architecture Diagram Developing tools: <https://aws.amazon.com/architecture/icons/>

CONCLUSION

At the end of this project, we successfully deployed frontend using docker into EC2 instance. The given capstone project involves using ReactJS as Frontend, NodeJS as Backend, MongoDB as Database, multer in Backend for file upload and cloud infrastructure (AWS) to deploy. The deployed frontend application gives us the required “Movie Listing” web site in which users can upload movie details.

For achieving this, we used multer-s3 library for storing images, replaced local database with Atlas MongoDB cloud infrastructure to take the database into the cloud, deployed backend and frontend in EC2 instances using Docker and attached Elastic IP to this instance and modified the Frontend Code to be able to fetch data from Backend.

The frontend user interface of the application having 4 fields like **Title**, **Director**, **Release year** and **Poster**. And having 2 functions **upload Movie** and **Get Movies**. When the user enters the details of the movie the data will be stored in mongoDB database. The poster field having images these images are stored in S3 bucket using S3-multer and by using clouddinary which provides a URL of that image which is stored in mongoDB database. When the user clicks on Get Movies button the user will get details of all the movies which are stored in mongoDB database and images are fetched from S3 bucket.