Project 2 React Application Deployment

(To Deploy the given React application to a production ready state)

Application:

Clone the below mentioned repository and deploy the application (Run application in port 3000).

Repo URL : https://github.com/Vennilavan12/Trend.git

Docker:

- Dockerize the application by creating Dockerfile
- Build an application and check output using docker image.

Terraform:

- Define infrastructure in main.tf to create VPC, IAM, EC2 with Jenkins, etc.
- Use terraform command to provision infrastructure.

DockerHub:

- Create a DockerHub repository.

Kubernetes:

- Setup Kubernetes in AWS EKS and Confirm EKS cluster is running.
- Write deployment and service YAML files.
- Deploy using kubectl via Jenkins.

Version Control:

- Push the codebase to a Git provider (GitHub).
- Add gitignore and dockerignore files and use CLI commands to push code.

Jenkins:

- Install Jenkins and necessary plugins (Docker, Git, Kubernetes, Pipeline) for build, push &deploy applications.
- Setup Github and jenkins integration using github webhook build trigger for auto build for every commit.
- Create a declarative pipeline script and pipeline project to build, push & deploy using CI-CD.

Monitoring:

- Setup a monitoring system to check the health of the cluster or application (opensource) is highly appreciable.

Step 1: Local Project Setup and Version Control

1. Create a new folder for your project (e.g., ‘Project2'DevOps ')
2. Clone the original repository into this folder: *git clone https://github.com/Vennilavan12/Trend.git*
3. Navigate into the newly cloned project folder: *cd Trend*
4. First, check the current remote URL (it should show 'Vennilavan12/Trend.git'): git remote -v
5. Now, set the new remote URL to your repository : *git remote set-url origin https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git*
6. Verify that the remote URL has been updated to your repository: *git remote -v*
7. Change the default branch name to 'main' for consistency (if it's not already): *git branch -M main*
8. Push the existing code from your local machine to your new GitHub repository: *git push -u origin main*
9. Add .gitignore and .dockerignore Files
10. Commit and Push the New Files

- ***.gitignore***

  # Node modules

  node_modules

  .env

  # Build artifacts

  build

  dist

  **.log*

  # OS generated files

  .DS_Store

  .idea

  .vscode

- ***.dockerignore***

  node_modules

  .git

  .gitignore

  Dockerfile

  Jenkinsfile

  README.md

  .env

- git commit -m "Add .gitignore and .dockerignore files"
- git push origin main

Step 2: Dockerize the Application

In this step, you will create a Docker image of your React application. This image will contain a web server (Nginx) that is configured to serve your application's static files from the dist folder. This makes your application portable and runnable in any environment that supports Docker.

2.1. Create the Dockerfile

```
FROM nginx:alpine

COPY nginx.conf /etc/nginx/conf.d/default.conf

COPY dist /usr/share/nginx/html

EXPOSE 3000

CMD ["nginx", "-g", "daemon off;"]
```

2.2. Create the nginx.conf

```
server {
    listen 3000;
    server_name localhost;
    location / {
        root /usr/share/nginx/html;
        index index.html index.htm;
        try_files $uri $uri/ /index.html;
    }
    error_page 500 502 503 504 /50x.html;
    location = /50x.html {
        root /usr/share/nginx/html;
    }
}
```

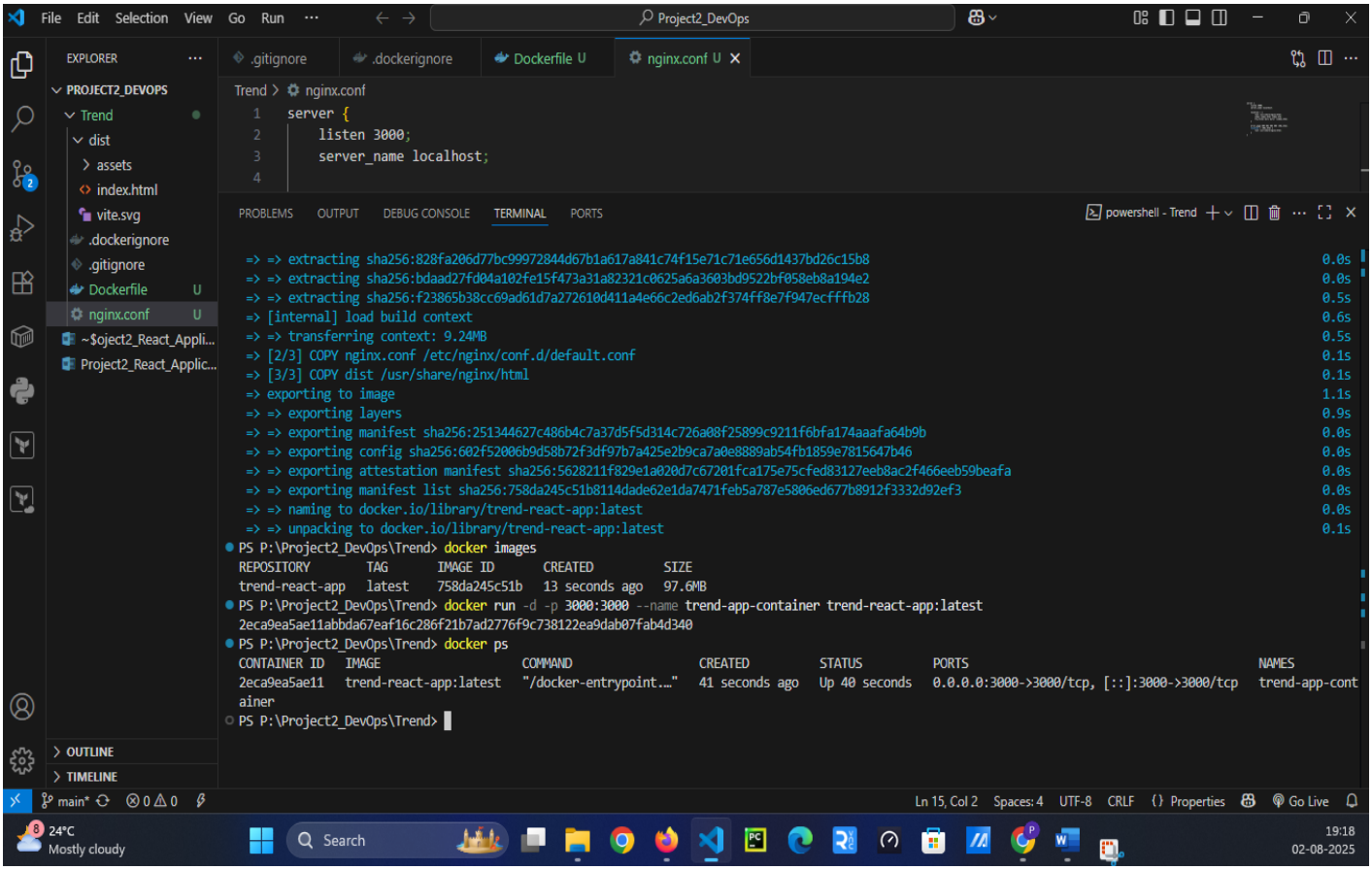
2.3. Build and Test the Docker Image Locally

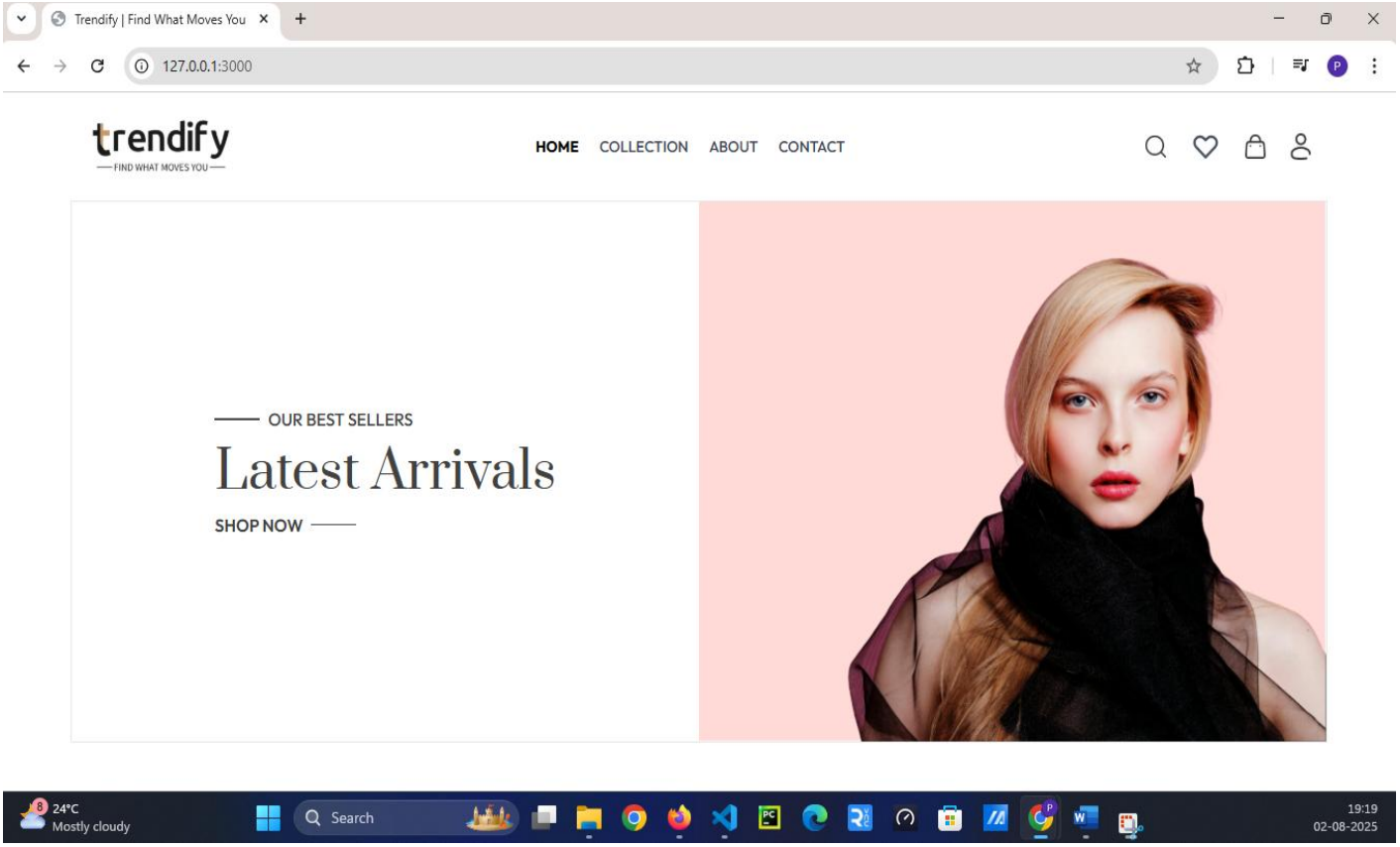
```
docker build -t trend-react-app:latest .

docker images
```

docker run -d -p 3000:3000 --name trend-app-container trend-react-app:latest

docker stop trend-app-container

docker rm trend-app-container



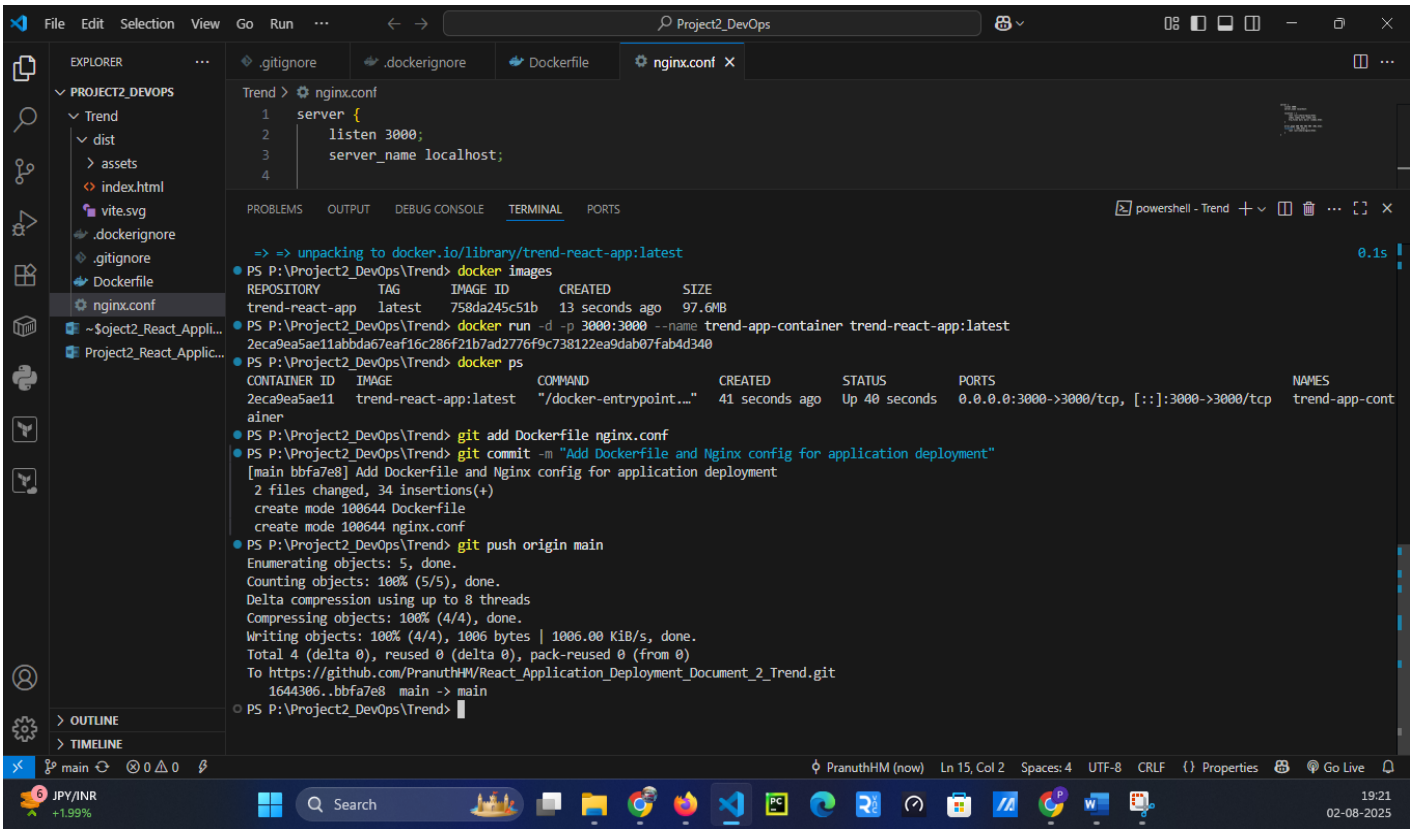


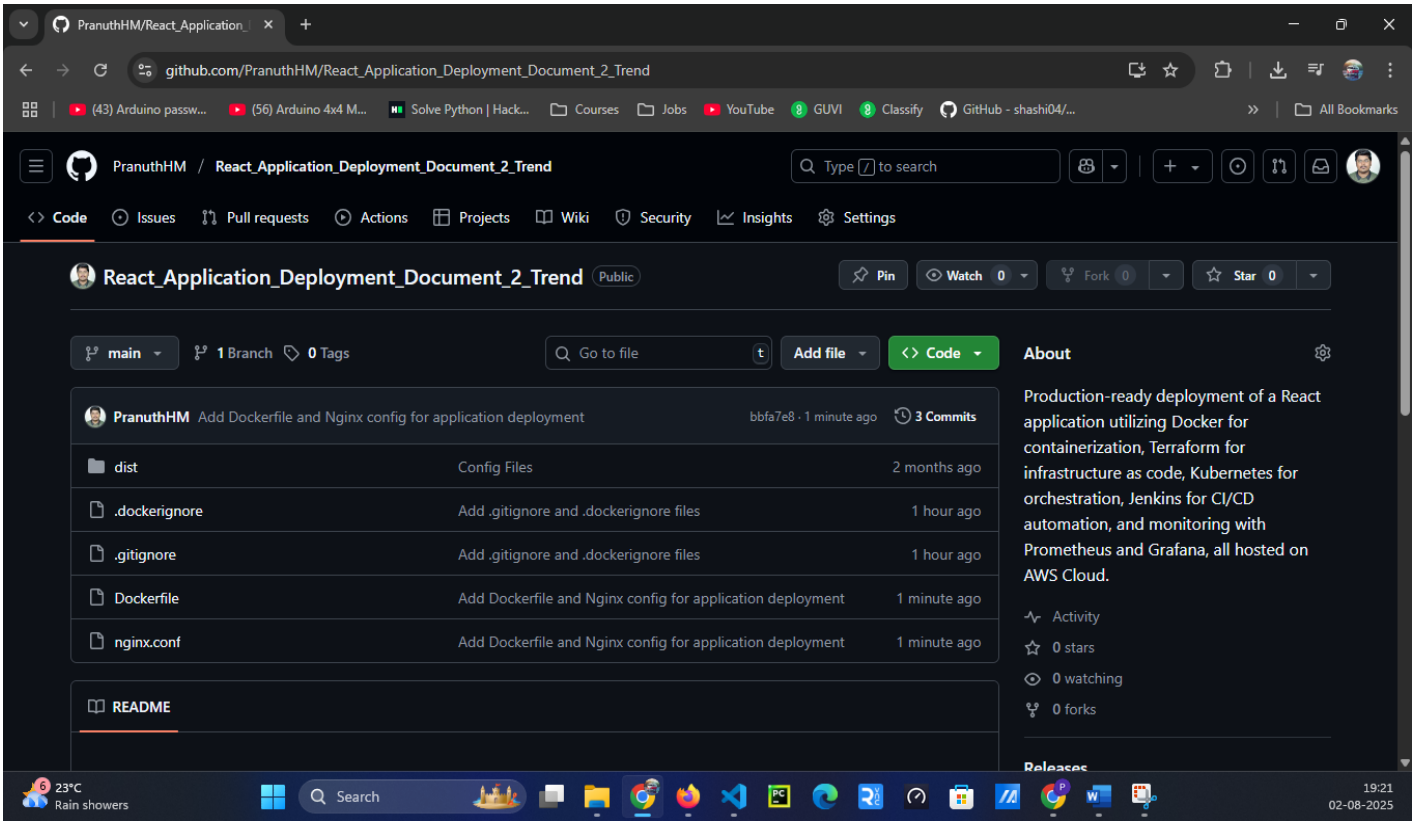
2.4. Commit and Push Docker Files

git add Dockerfile nginx.conf

git commit -m "Add Dockerfile and Nginx config for application deployment"

git push origin main





Step 3: Terraform Infrastructure

3.1. Create a Terraform Directory and main.tf

1. *# Go back to the parent directory (e.g., DevOpsProject) : cd ..*
2. *# Create a new directory for Terraform files*

   mkdir terraform

   cd terraform
3. *Inside this new terraform directory, create a file named: main.tf*

3.2. Define Your Infrastructure in main.tf

```
terraform {
  required_providers {
    aws = {
      source  = "hashicorp/aws"
      version = "~> 4.0"
    }
  }

  # Remote state storage in S3
  backend "s3" {
    bucket = "your-unique-terraform-state-bucket" # ⚠️ REPLACE THIS NAME
    key    = "devops-project/terraform.tfstate"
    region = "ap-south-1"
  }
}

provider "aws" {
  region = "ap-south-1"
}
```

```
# --- VPC and Subnet ---
resource "aws_vpc" "project_vpc" {
  cidr_block           = "10.0.0.0/16"
  enable_dns_support   = true
  enable_dns_hostnames = true

  tags = {
    Name = "Project-VPC"
  }
}

resource "aws_subnet" "public_subnet" {
  vpc_id                  = aws_vpc.project_vpc.id
  cidr_block              = "10.0.1.0/24"
  availability_zone       = "ap-south-1a"
  map_public_ip_on_launch = true

  tags = {
    Name = "Project-Public-Subnet"
  }
}
resource "aws_subnet" "public_subnet_2" {
  vpc_id                  = aws_vpc.project_vpc.id
  cidr_block              = "10.0.2.0/24" # New CIDR block for the second subnet
  availability_zone       = "ap-south-1b" # Different AZ
  map_public_ip_on_launch = true
```

```
  tags = {
    Name = "Project-Public-Subnet-2"
  }
}

resource "aws_internet_gateway" "project_igw" {
  vpc_id = aws_vpc.project_vpc.id

  tags = {
    Name = "Project-IGW"
  }
}

resource "aws_route_table" "project_rt" {
  vpc_id = aws_vpc.project_vpc.id

  route {
    cidr_block = "0.0.0.0/0"
    gateway_id = aws_internet_gateway.project_igw.id
  }

  tags = {
    Name = "Project-RouteTable"
  }
}

resource "aws_route_table_association" "project_rta" {
  subnet_id      = aws_subnet.public_subnet.id
```

```
  route_table_id = aws_route_table.project_rt.id
}

# --- Security Group for Jenkins EC2 ---
resource "aws_security_group" "jenkins_sg" {
  vpc_id      = aws_vpc.project_vpc.id
  name        = "jenkins-ec2-sg"
  description = "Security group for Jenkins EC2 instance"

  ingress {
    from_port   = 22
    to_port     = 22
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

  ingress {
    from_port   = 8080
    to_port     = 8080
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

  ingress {
    from_port   = 50000
    to_port     = 50000
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
```

```
  }

  egress {
    from_port   = 0
    to_port     = 0
    protocol    = "-1"
    cidr_blocks = ["0.0.0.0/0"]
  }

  tags = {
    Name = "Jenkins-EC2-SG"
  }
}

# --- IAM Role for Jenkins EC2 ---
resource "aws_iam_role" "ec2_instance_profile_role" {
  name = "ec2-jenkins-role"

  assume_role_policy = jsonencode({
    Version = "2012-10-17"
    Statement = [
      {
        Action = "sts:AssumeRole"
        Effect = "Allow"
        Principal = {
          Service = "ec2.amazonaws.com"
        }
      },
```

```
    ]
  })

  tags = {
    Name = "EC2-Jenkins-Role"
  }
}

resource "aws_iam_role_policy_attachment" "ec2_policy_attachment" {
  role       = aws_iam_role.ec2_instance_profile_role.name
  policy_arn = "arn:aws:iam::aws:policy/AmazonEC2ContainerRegistryFullAccess"
}

resource "aws_iam_role_policy_attachment" "eks_cluster_policy" {
  role       = aws_iam_role.ec2_instance_profile_role.name
  policy_arn = "arn:aws:iam::aws:policy/AmazonEKSClusterPolicy"
}

resource "aws_iam_role_policy_attachment" "eks_service_policy" {
  role       = aws_iam_role.ec2_instance_profile_role.name
  policy_arn = "arn:aws:iam::aws:policy/AmazonEKSServicePolicy"
}

resource "aws_iam_instance_profile" "ec2_instance_profile" {
  name = "ec2-jenkins-instance-profile"
  role = aws_iam_role.ec2_instance_profile_role.name
}
```

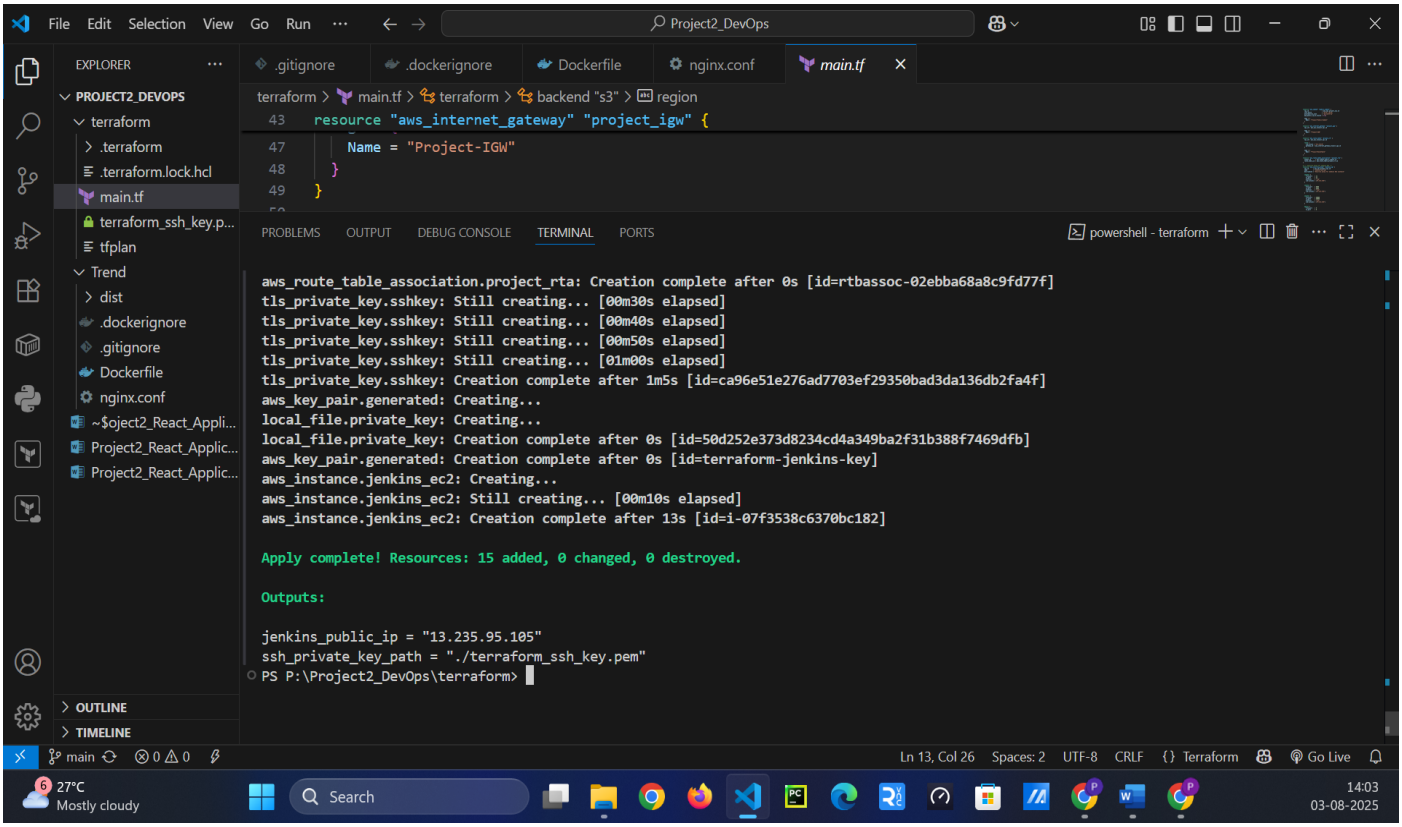
```
# --- SSH Key Pair Generation ---
resource "tls_private_key" "sshkey" {
  algorithm = "RSA"
  rsa_bits  = 4096
}

resource "local_file" "private_key" {
  content         = tls_private_key.sshkey.private_key_pem
  filename        = "${path.module}/terraform_ssh_key.pem"
  file_permission = "0400"
}

resource "aws_key_pair" "generated" {
  key_name   = "terraform-jenkins-key"
  public_key = tls_private_key.sshkey.public_key_openssh
}

# --- Jenkins EC2 Instance ---
resource "aws_instance" "jenkins_ec2" {
  ami                    = "ami-00bb6a80f01f03502" # Ubuntu Server 22.04 LTS (HVM)
  instance_type          = "t3.medium"
  key_name               = aws_key_pair.generated.key_name
  subnet_id              = aws_subnet.public_subnet.id
  vpc_security_group_ids = [aws_security_group.jenkins_sg.id]
  associate_public_ip_address = true
  iam_instance_profile   = aws_iam_instance_profile.ec2_instance_profile.name
```

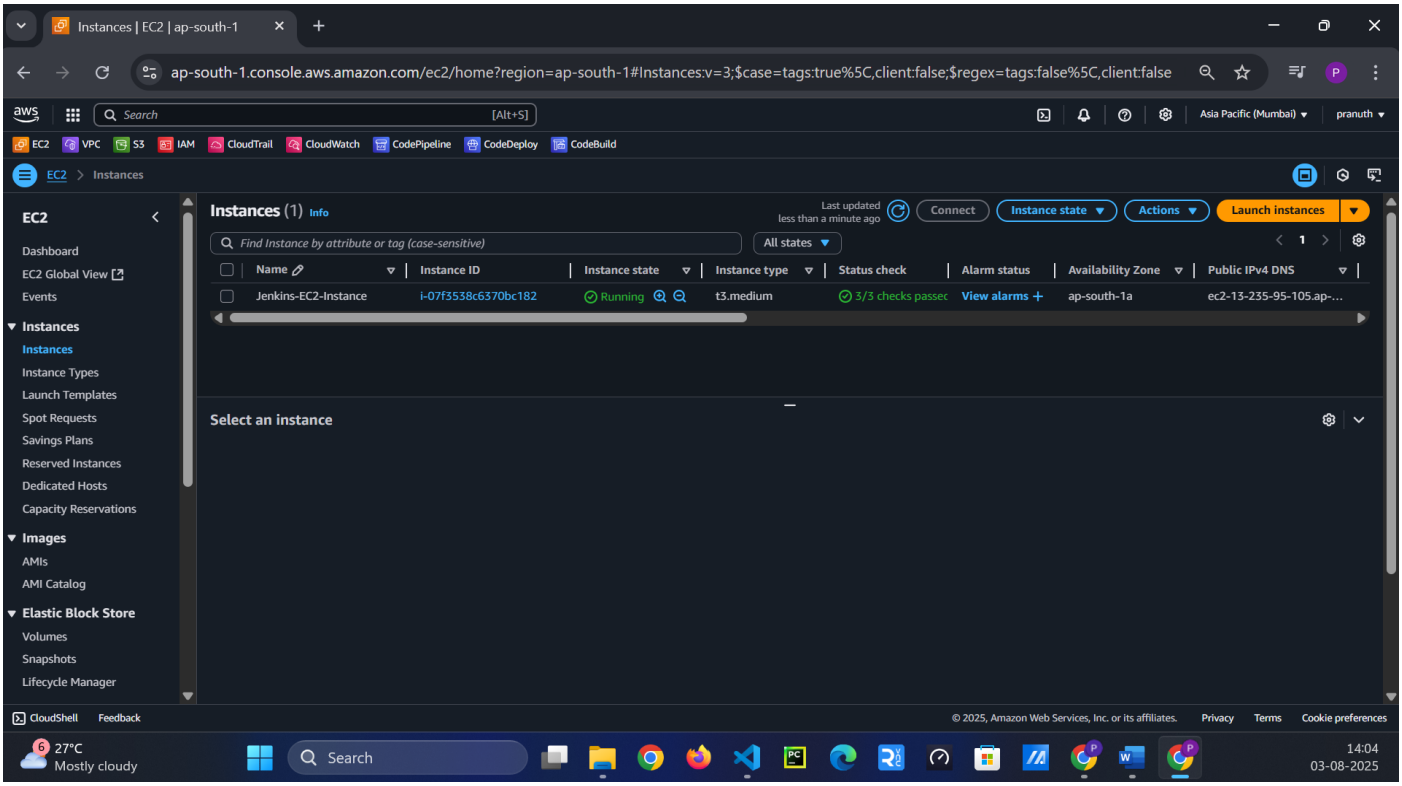
```
user_data = <<-EOF
        #!/bin/bash
        sudo apt update -y
        sudo apt upgrade -y

        # Install Java 17
        sudo apt install -y openjdk-17-jdk

        # Add Jenkins repository key
        curl -fsSL https://pkg.jenkins.io/debian/jenkins.io-2023.key | sudo tee \
          /usr/share/keyrings/jenkins-keyring.asc > /dev/null
        echo "deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \
          https://pkg.jenkins.io/debian binary/" | sudo tee \
          /etc/apt/sources.list.d/jenkins.list > /dev/null
        sudo apt update -y
        sudo apt install -y jenkins

        # Install Docker
        sudo apt install -y docker.io
        sudo usermod -aG docker jenkins
        sudo usermod -aG docker ubuntu
        sudo systemctl enable docker
        sudo systemctl start docker

        # Start and enable Jenkins
        sudo systemctl start jenkins
        sudo systemctl enable jenkins
```

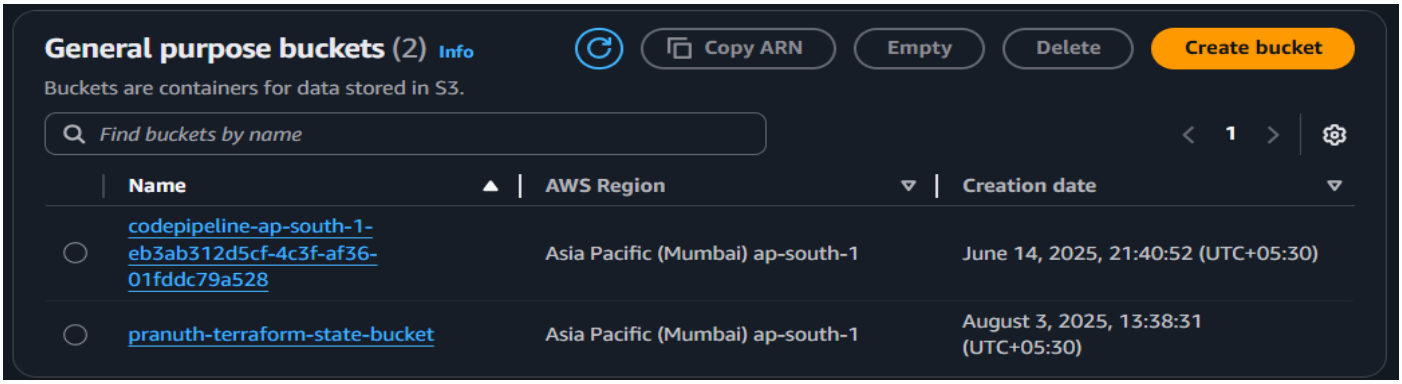
```
            # Install kubectl

            curl -LO "https://dl.k8s.io/release/$(curl -L -s
https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl"

            sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl



            # Install eksctl

            curl -LO
"https://github.com/weaveworks/eksctl/releases/latest/download/eksctl_Linux_amd64.tar.gz"

            tar -xzf eksctl_Linux_amd64.tar.gz

            sudo mv eksctl /usr/local/bin



            # Install AWS CLI

            sudo apt install awscli -y

            EOF

  tags = {

    Name = "Jenkins-EC2-Instance"

  }

}

output "jenkins_public_ip" {

  description = "The public IP address of the Jenkins EC2 instance"

  value       = aws_instance.jenkins_ec2.public_ip

}

output "ssh_private_key_path" {

  description = "Path to the generated SSH private key"

  value       = "${path.module}/terraform_ssh_key.pem"

}
```

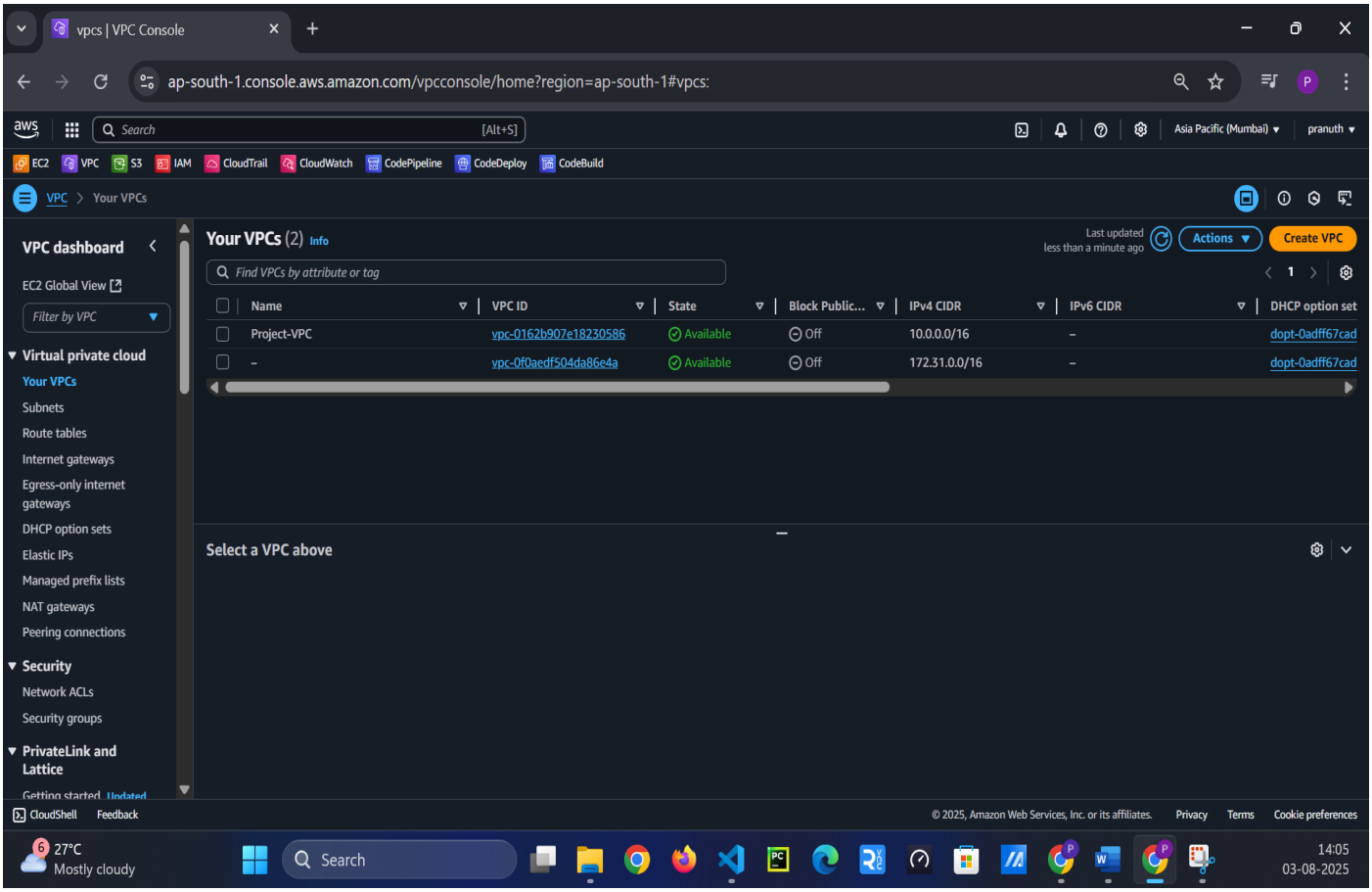
3.3. Run Terraform Commands

- *terraform init*
- *terraform plan -out tfplan*
- *terraform apply "tfplan"*


File Edit Selection View Go Run
Project2_DevOps
EXPLORER
PROJECT2_DEVOPS
terraform
.terraform
.terraform.lock.hcl
main.tf
terraform_ssh_key.p...
tfplan
Trend
dist
.dockerignore
.gitignore
Dockerfile
nginx.conf
.gitignore
.dockerignore
Dockerfile
nginx.conf
main.tf
terraform > main.tf > terraform > backend "s3" > region
43 resource "aws_internet_gateway" "project_igw" {
47 Name = "Project-IGW"
48 }
49 }
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
powershell - terraform
aws_route_table_association.project_rta: Creation complete after 0s [id=rtbassoc-02ebba68a8c9fd77f]
tls_private_key.sshkey: Still creating... [00m30s elapsed]
tls_private_key.sshkey: Still creating... [00m40s elapsed]
tls_private_key.sshkey: Still creating... [00m50s elapsed]
tls_private_key.sshkey: Still creating... [01m00s elapsed]
tls_private_key.sshkey: Creation complete after 1m5s [id=ca96e51e276ad7703ef29350bad3da136db2fa4f]
aws_key_pair.generated: Creating...
local_file.private_key: Creating...
local_file.private_key: Creation complete after 0s [id=50d252e373d8234cd4a349ba2f31b388f7469dfb]
aws_key_pair.generated: Creation complete after 0s [id=terraform-jenkins-key]
aws_instance.jenkins_ec2: Creating...
aws_instance.jenkins_ec2: Still creating... [00m10s elapsed]
aws_instance.jenkins_ec2: Creation complete after 13s [id=i-07f3538c6370bc182]
Apply complete! Resources: 15 added, 0 changed, 0 destroyed.
Outputs:
jenkins_public_ip = "13.235.95.105"
ssh_private_key_path = "./terraform_ssh_key.pem"
PS P:\Project2_DevOps\terraform>
OUTLINE
TIMELINE
main
Ln 13, Col 26 Spaces: 2 UTF-8 CRLF Terraform Go Live
27°C
Mostly cloudy
Search
14:03
03-08-2025


Instances | EC2 | ap-south-1
ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Instances:v=3;$case=tags:true%5C,client:false;$regex=tags:false%5C,client:false
Search [Alt+S]
Asia Pacific (Mumbai)
pranuth
EC2 VPC S3 IAM CloudTrail CloudWatch CodePipeline CodeDeploy CodeBuild
EC2 > Instances
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Lifecycle Manager
Instances (1) Info
Last updated less than a minute ago
Connect
Instance state
Actions
Launch instances
Find Instance by attribute or tag (case-sensitive)
All states
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
Public IPv4 DNS
Jenkins-EC2-Instance
i-07f3538c6370bc182
Running
t3.medium
3/3 checks passed
View alarms
ap-south-1a
ec2-13-235-95-105.ap-...
Select an instance
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
27°C
Mostly cloudy
Search
14:04
03-08-2025


General purpose buckets (2) Info
Copy ARN
Empty
Delete
Create bucket
Buckets are containers for data stored in S3.
Find buckets by name
1
Name
AWS Region
Creation date
codepipeline-ap-south-1-eb3ab312d5cf-4c3f-af36-01fddc79a528
Asia Pacific (Mumbai) ap-south-1
June 14, 2025, 21:40:52 (UTC+05:30)
pranuth-terraform-state-bucket
Asia Pacific (Mumbai) ap-south-1
August 3, 2025, 13:38:31 (UTC+05:30)


vpcs | VPC Console
ap-south-1.console.aws.amazon.com/vpcconsole/home?region=ap-south-1#vpcs:
Search
[Alt+S]
Asia Pacific (Mumbai)
pranuth
EC2
VPC
S3
IAM
CloudTrail
CloudWatch
CodePipeline
CodeDeploy
CodeBuild
VPC > Your VPCs
VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Security
Network ACLs
Security groups
PrivateLink and Lattice
Getting started Updated
Your VPCs (2) Info
Last updated less than a minute ago
Actions
Create VPC
Find VPCs by attribute or tag
Name
VPC ID
State
Block Public...
IPv4 CIDR
IPv6 CIDR
DHCP option set
Project-VPC
vpc-0162b907e18230586
Available
Off
10.0.0.0/16
-
dopt-0adff67cad
-
vpc-0f0aedf504da86e4a
Available
Off
172.31.0.0/16
-
dopt-0adff67cad
Select a VPC above
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
27°C
Mostly cloudy
Search
14:05
03-08-2025

Step 4: Jenkins Setup and Configuration (Jenkins server configuration and integration with GitHub and DockerHub.)

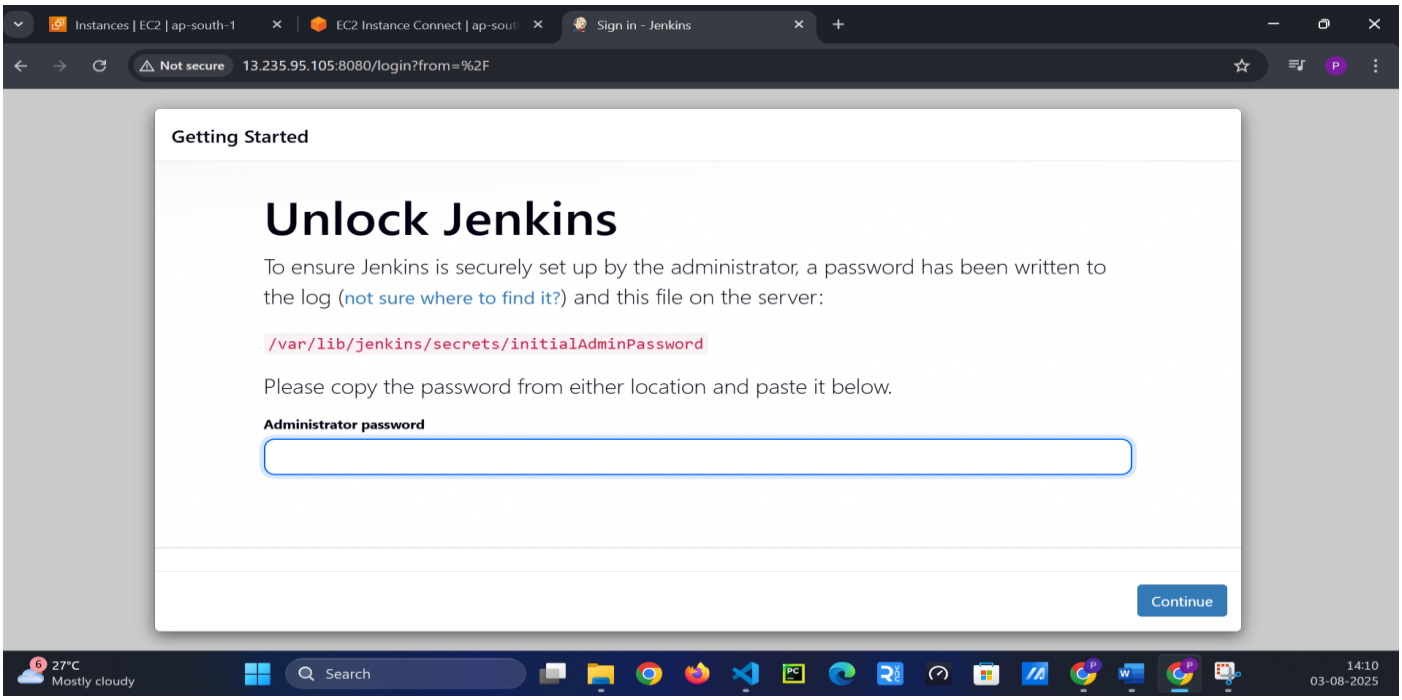
4.1. Access Jenkins and Complete Initial Setup

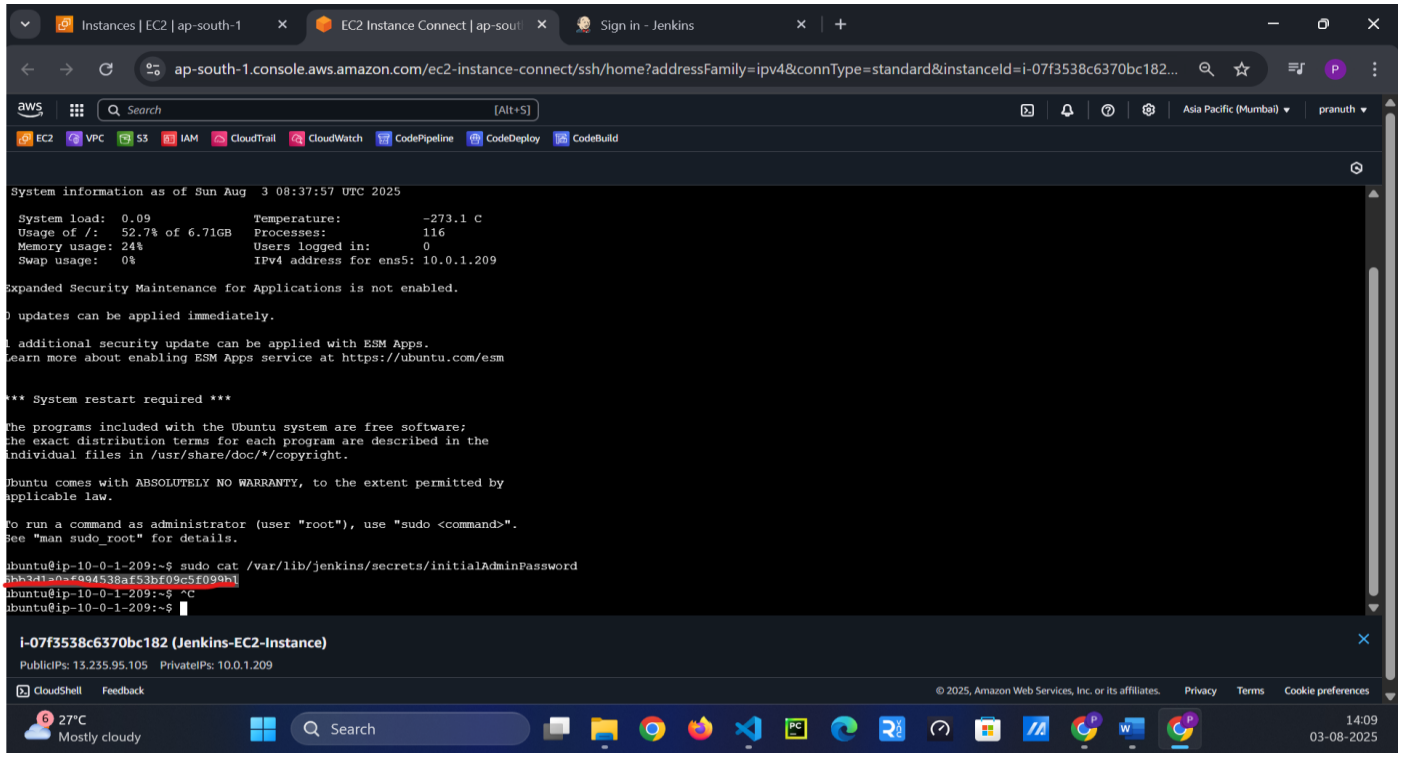
Find Your Jenkins Public IP:

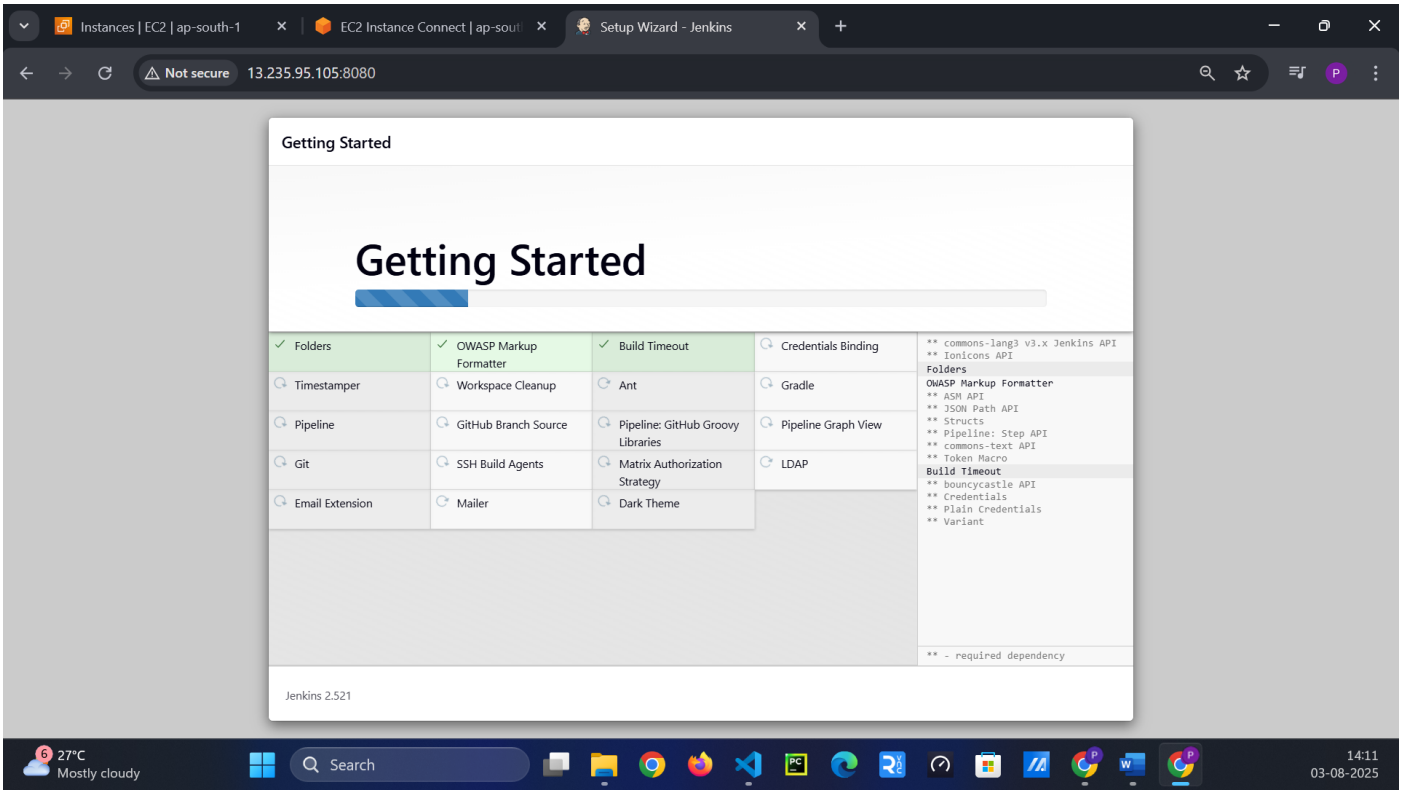
Access the Jenkins UI:

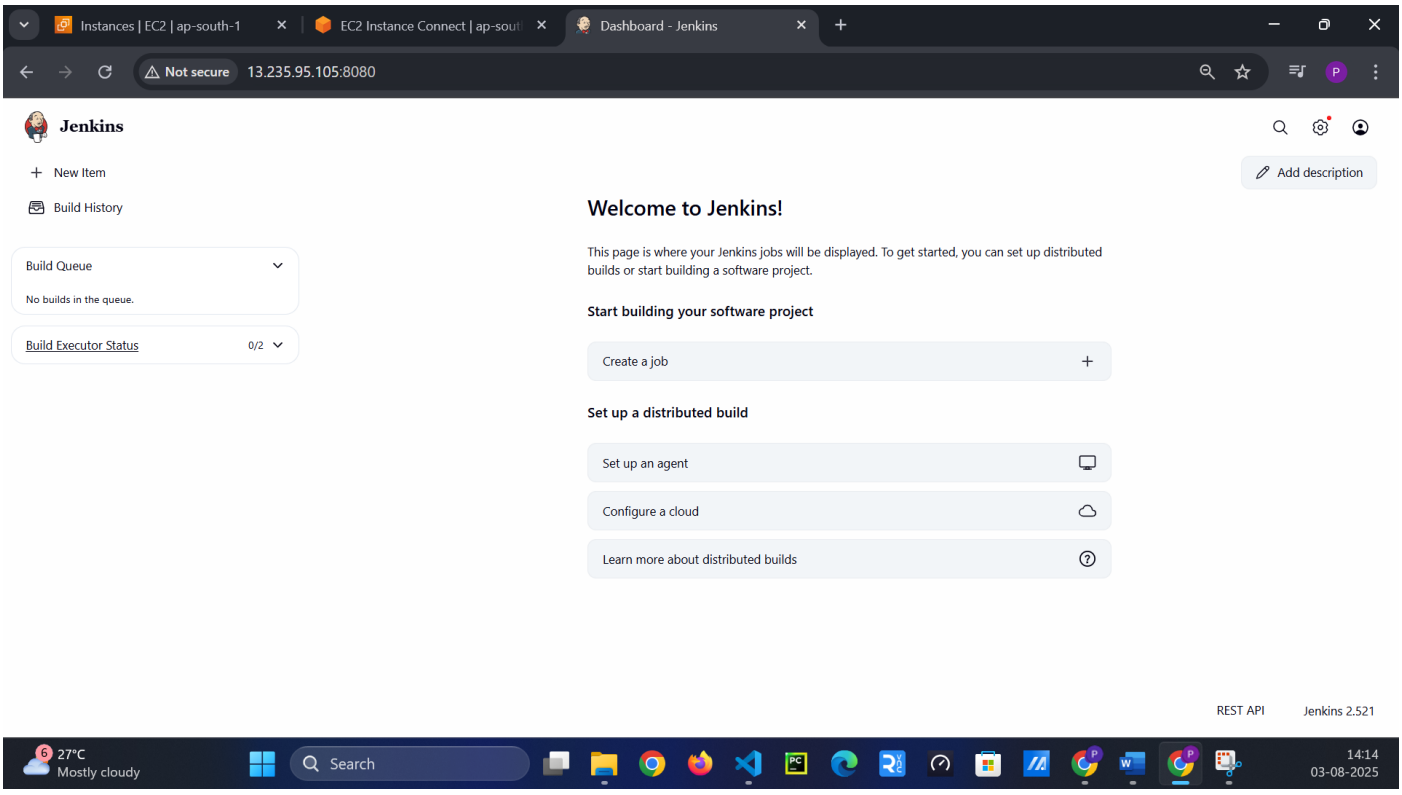
Retrieve the Initial Admin Password: sudo cat /var/lib/jenkins/secrets/initialAdminPassword

Complete the Jenkins Wizard:









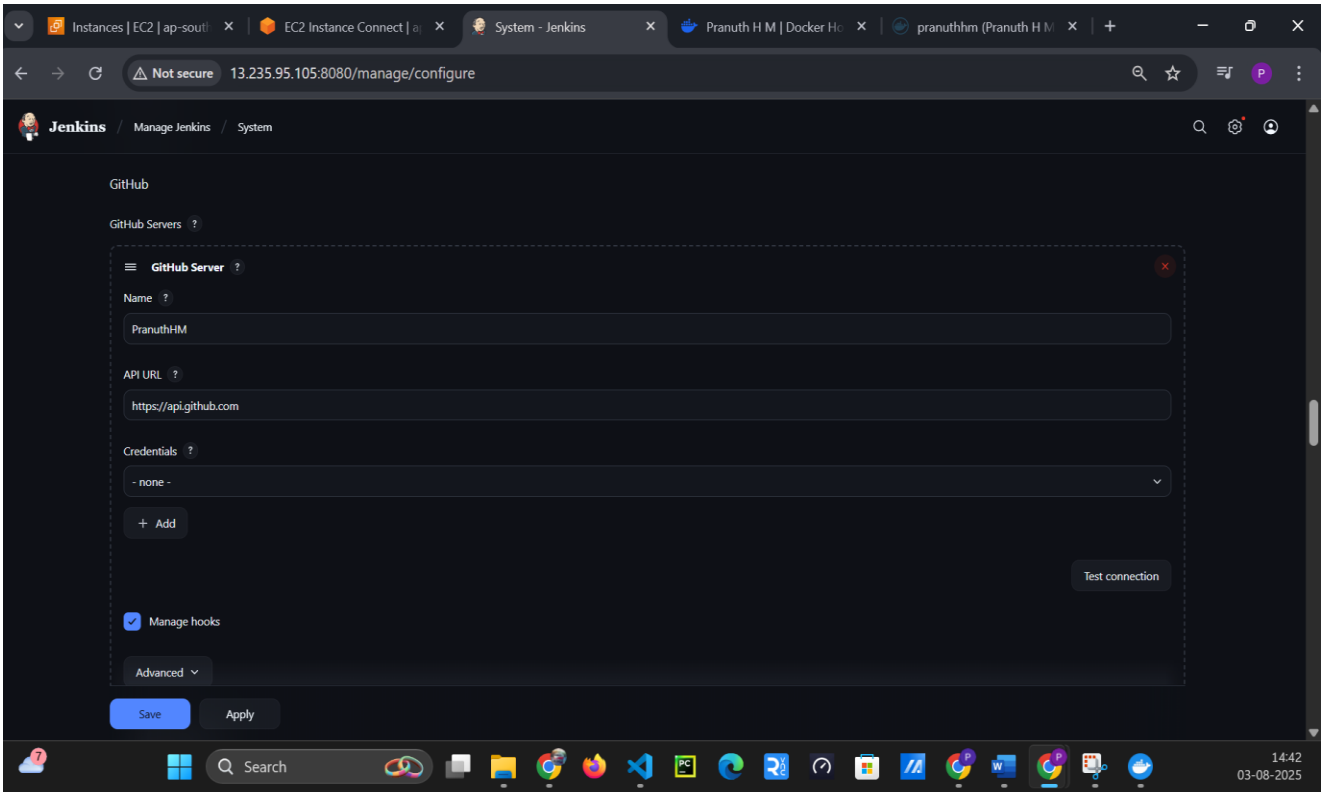
4.2. Install Necessary Plugins: go to Manage Jenkins -> Manage Plugins.-> Click on the Available tab.

- GitHub Plugin
- GitHub Branch Source Plugin
- Docker Pipeline
- Kubernetes CLI

4.3. Configure GitHub Webhook Trigger

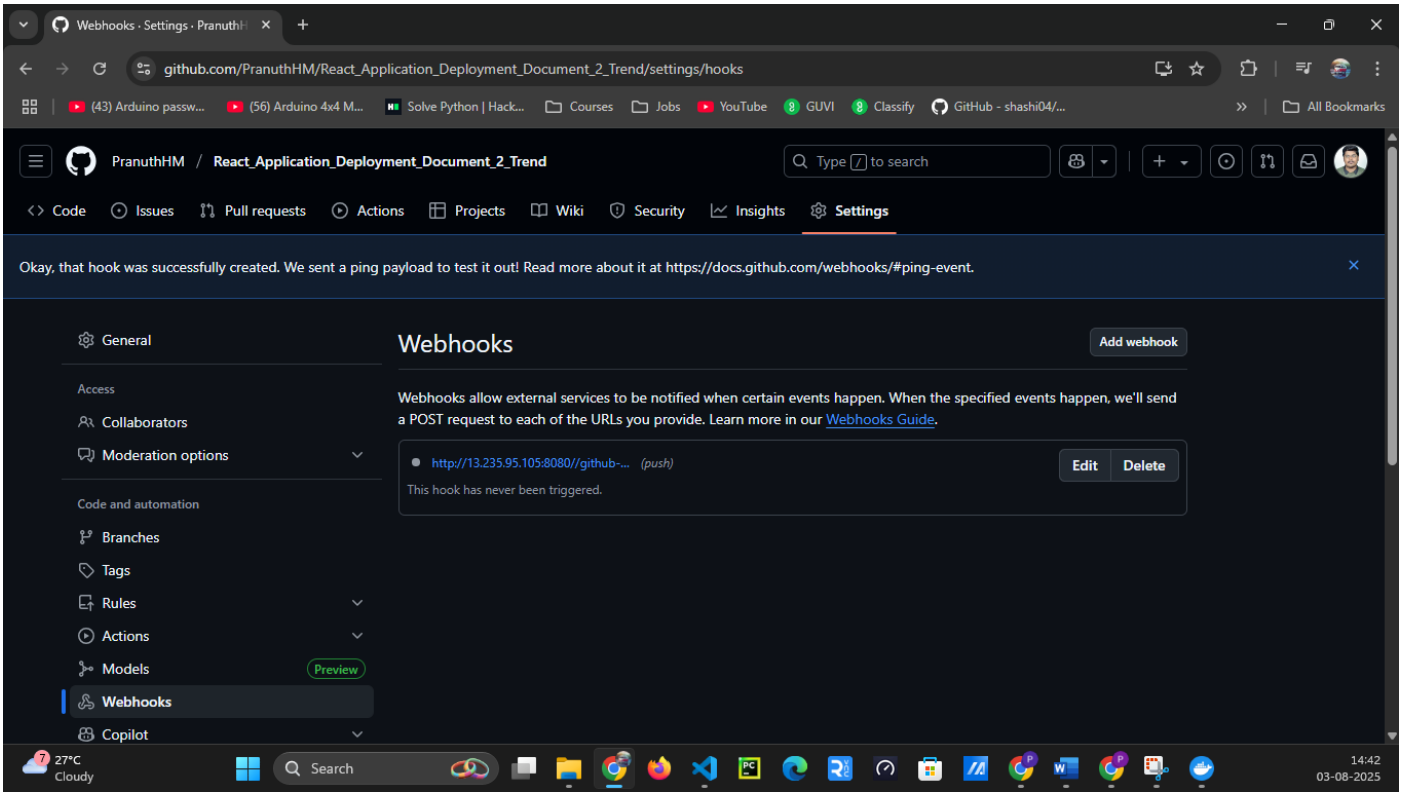
4.3.1 In Jenkins:

- Go to Manage Jenkins -> Configure System.
- Scroll down to the GitHub section.
- Click Add GitHub Server and select GitHub Server.
- Click Manage Hooks and ensure the box Manage hooks for this server is checked.
- Click Save.



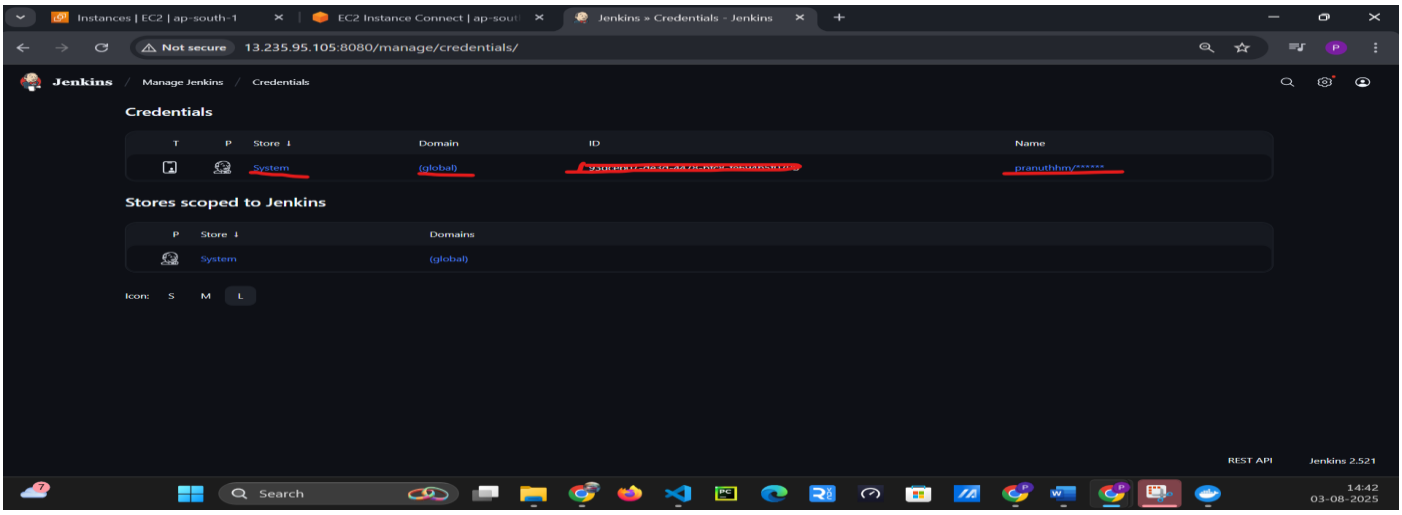
4.3.2 In GitHub:

- Go to your repository: https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git
- Click on Settings -> Webhooks->Click Add webhook.
- **Payload URL:** Enter http://<YOUR_JENKINS_PUBLIC_IP>:8080/github-webhook/
- **Content type:** Select application/json.
- **Which events would you like to trigger this webhook?**: Select Just the push event.
- Make sure Active is checked.
- Click Add webhook.



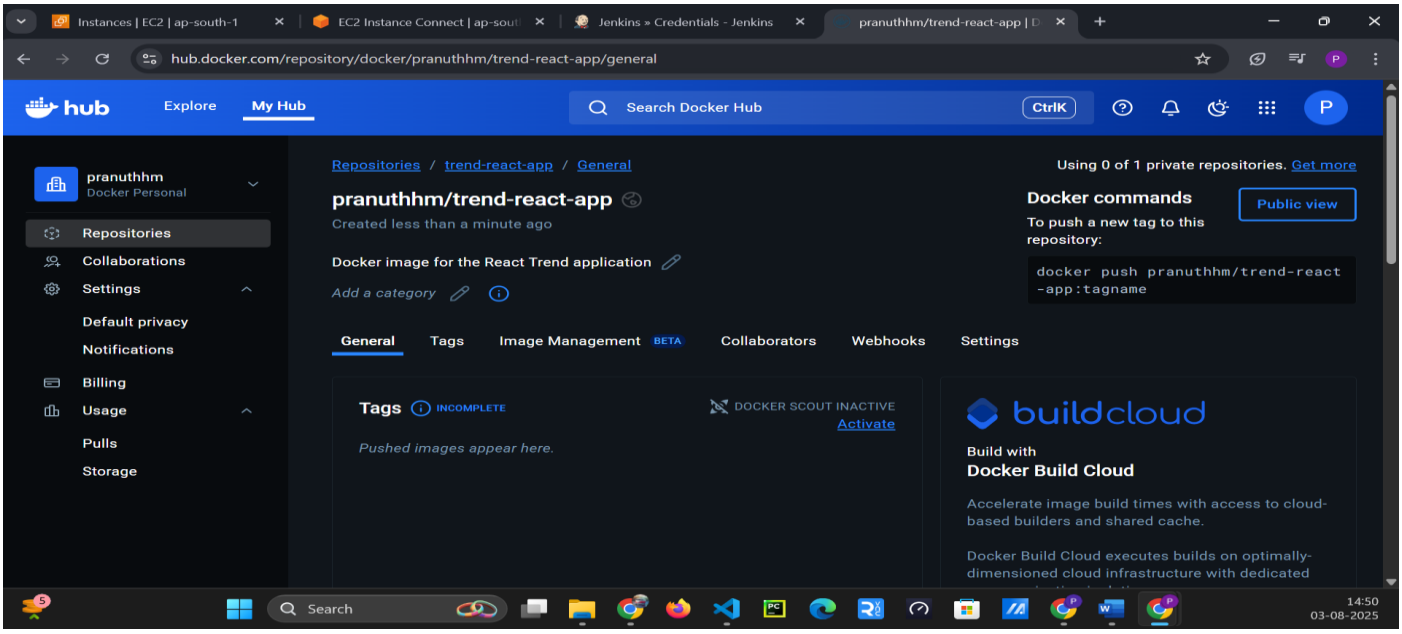
4.4. Store DockerHub Credentials in Jenkins:

- In Jenkins, go to Manage Jenkins -> Manage Credentials.
- Click on (global) -> Add Credentials.
- From the dropdown, select Username with password.
- Username: Your DockerHub username.
- Password: Your DockerHub password.
- ID: dockerhub_credentials (This ID is very important; you will use it in your Jenkinsfile later).
- Description: DockerHub Credentials
- Click Create.



Step 5: DockerHub Repository: This is a quick but crucial step. Your Jenkins pipeline will build a Docker image of your React application and then push that image to a repository. You need to create this repository on DockerHub first.

1. **Navigate to DockerHub:**
    - Open your web browser and go to https://hub.docker.com/.
    - Log in to your DockerHub account if you haven't already.
2. **Create a New Repository:**
    - In the top navigation bar, click on **Repositories**.
    - Click the **Create Repository** button.
3. **Fill in the Repository Details:**
    - **Name:** This name needs to be consistent with what you will use in your Jenkins pipeline. A good naming convention is your_dockerhub_username/application_name.
        - Use the name: your_dockerhub_username/trend-react-app
        - Replace your_dockerhub_username with your actual DockerHub username.
    - **Description:** You can add a short description, like Docker image for the React Trend application.
    - **Visibility:** Set this to **Public**. This is important because it allows the Kubernetes cluster to pull the image without needing extra authentication credentials, simplifying the deployment process.
4. Click the **Create** button.



Step 6: Kubernetes Setup (AWS EKS)

Your Terraform user_data script has already installed awscli, eksctl, and kubectl for you. However, you need to ensure the IAM role of the Jenkins EC2 instance has the right permissions to create and manage EKS resources.

1. **Verify IAM Role Permissions:**
    - Go to your AWS IAM console.
    - Go to Roles and find the role named ec2-jenkins-role.
    - Click on the role and check the Permissions tab.
    - Ensure the following policies are attached:
        - AmazonEKSClusterPolicy
        - AmazonEKSServicePolicy
        - AmazonEC2ContainerRegistryFullAccess (Even though we're using DockerHub, this is a standard permission for EKS node groups).

    Create policy ->jsontab

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "eks:CreateCluster",
                "eks:DescribeCluster",
                "eks:UpdateClusterConfig",
                "eks:DeleteCluster",
                "eks:TagResource",
                "eks:UntagResource",
                "eks:ListTagsForResource",
                "eks:DescribeUpdate",
                "eks:ListUpdates",
                "eks:UpdateClusterVersion",
                "eks:CreateNodegroup",
                "eks:UpdateNodegroupConfig",
```

"eks:DeleteNodegroup",

"eks:DescribeNodegroup",

"eks:ListNodegroups",

"eks:DescribeClusterVersions",

"iam:GetRole",

"iam:ListRoles",

"iam:CreateRole",

"iam:AttachRolePolicy",

"iam:DeleteRole",

"iam:DetachRolePolicy",

"iam:PassRole",

"ec2:DescribeKeyPairs",

"ec2:CreateTags",

"ec2:DescribeVpcs",

"ec2:DescribeSubnets",

"ec2:DescribeSecurityGroups",

"ec2:CreateSecurityGroup",

"ec2:RevokeSecurityGroupEgress",

"ec2:AuthorizeSecurityGroupEgress",

"ec2:AuthorizeSecurityGroupIngress",

"ec2:DeleteSecurityGroup",

"ec2:CreateNetworkInterface",

"ec2:DeleteNetworkInterface",

"ec2:DescribeNetworkInterfaces",

"ec2:AttachNetworkInterface",

"ec2:DetachNetworkInterface",

"ec2:RunInstances",

"ec2:DescribeInstances",

"ec2:TerminateInstances",

"ec2:DescribeImages",

"ec2:DescribeInstanceStatus",

"ec2:DescribeVolumes",

"ec2:CreateVolume",

"ec2:AttachVolume",

"ec2:DetachVolume",

```
                "ec2:DeleteVolume",
                "ecr:GetAuthorizationToken",
                "ecr:BatchCheckLayerAvailability",
                "ecr:GetDownloadUrlForLayer",
                "ecr:BatchGetImage",
                "ssm:GetParameter"
            ],
            "Resource": "*"
        }
    ]
}
```

- Add permissions -> Attach policies and add them.

6.2. Create EKS Cluster Configuration File (cluster.yaml)

This file will describe the EKS cluster you want to create. It's best practice to define it in a file rather than passing all parameters in the command line.

1. While you are logged into the Jenkins EC2 instance, create a new file named cluster.yaml in your home directory: *nano cluster.yaml*

2. Copy and paste the following content into the file. **You must replace the placeholders for the VPC and subnet IDs with the ones created by Terraform in Step 3.**

To find these IDs, go to your AWS Console:

- **VPC ID:** Go to VPC -> Your VPCs and find the one named Project-VPC. Copy its ID.
- **Subnet ID:** Go to VPC -> Subnets and find the one named Project-Public-Subnet. Copy its ID.

```
apiVersion: eksctl.io/v1alpha5

kind: ClusterConfig


metadata:

  name: my-trend-cluster

  region: ap-south-1

  version: "1.29" # Use a stable Kubernetes version
```

```
vpc:
  id: <YOUR_VPC_ID>
  subnets:
    public:
      ap-south-1a:
        id: <YOUR_PUBLIC_SUBNET_ID>
      ap-south-1b:
        id: <YOUR_PUBLIC_SUBNET_2_ID>

managedNodeGroups:
  - name: my-trend-nodes
    instanceType: t3.medium
    desiredCapacity: 2
    minSize: 1
    maxSize: 3
    volumeSize: 20 # GB
    ssh:
      allow: true
      publicKeyPath: /home/ubuntu/.ssh/id_rsa.pub # We will create this key next
```

6.4. Create the EKS Cluster

Now, use eksctl with the configuration file to create the cluster.

1. Run the following command:

   eksctl create cluster -f cluster.yaml+

6.5. Verify Cluster Creation and Configure kubectl

After eksctl finishes, you need to configure kubectl to communicate with the new cluster.

Before that configure AWS CLI in your instance

i. sudo apt update && sudo apt upgrade -y

ii. sudo apt install unzip curl -y

iii. curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"

iv. unzip awscliv2.zip

v. sudo ./aws/install

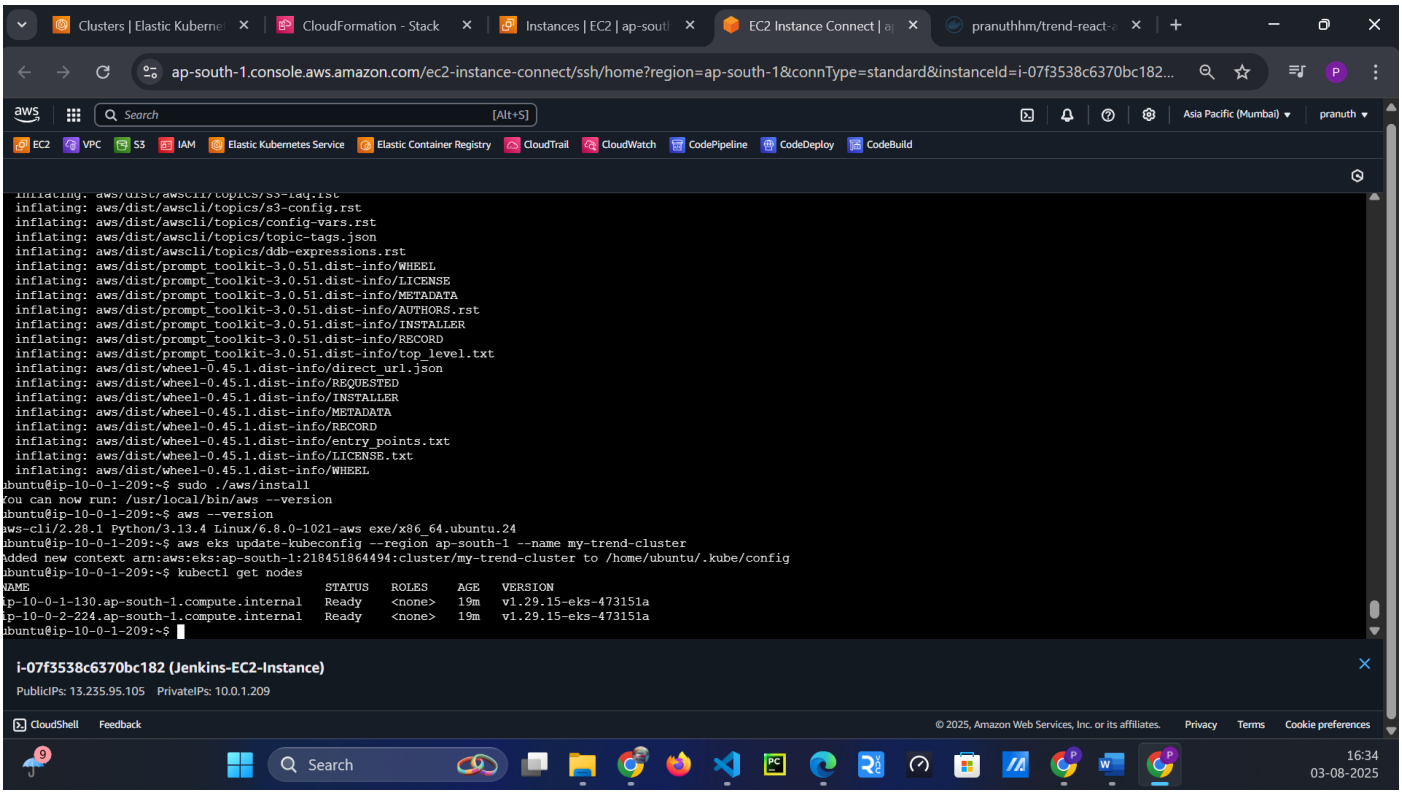
vi. aws –version

1. Run the following command to update your kubeconfig file with the cluster information:

   aws eks update-kubeconfig --region ap-south-1 --name my-trend-cluster

2. Now, verify that kubectl can see the cluster nodes:

   kubectl get nodes



Step 7: Kubernetes Deployment Manifests

Now that you have a running Kubernetes cluster, you need to tell it how to deploy your application. You will do this by creating two YAML files: a Deployment to manage your application's pods and a Service to expose your application to the internet.

You will create these files on the Jenkins EC2 instance because your Jenkins pipeline will need to use them.

7.1. Create the deployment.yaml File: *nano deployment.yaml*

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: trend-app-deployment
  labels:
    app: trend-app
spec:
  replicas: 2
  selector:
    matchLabels:
      app: trend-app
  template:
    metadata:
      labels:
        app: trend-app
    spec:
      containers:
      - name: trend-app-container
        image: pranuthhm/trend-react-app:latest
        ports:
        - containerPort: 3000
```

7.2. Create the service.yaml

This file creates a Service that provides a stable IP address and DNS name for your application. We will use the LoadBalancer type, which automatically provisions an AWS Network Load Balancer (NLB) to expose your application to the public internet.

```
apiVersion: v1
kind: Service
metadata:
  name: trend-app-service
  labels:
    app: trend-app
  annotations:
    service.beta.kubernetes.io/aws-load-balancer-type: "nlb"
spec:
  selector:
    app: trend-app
  type: LoadBalancer
  ports:
  - protocol: TCP
    port: 80
    targetPort: 3000
```

Excellent! Step 6 is a major milestone, and it's great that your AWS EKS cluster is now successfully created and operational

7.3. Initial Deployment and Verification (Optional but Recommended)

It's a good practice to test these files manually before putting them in your Jenkins pipeline.

1. **Deploy your application and service:**

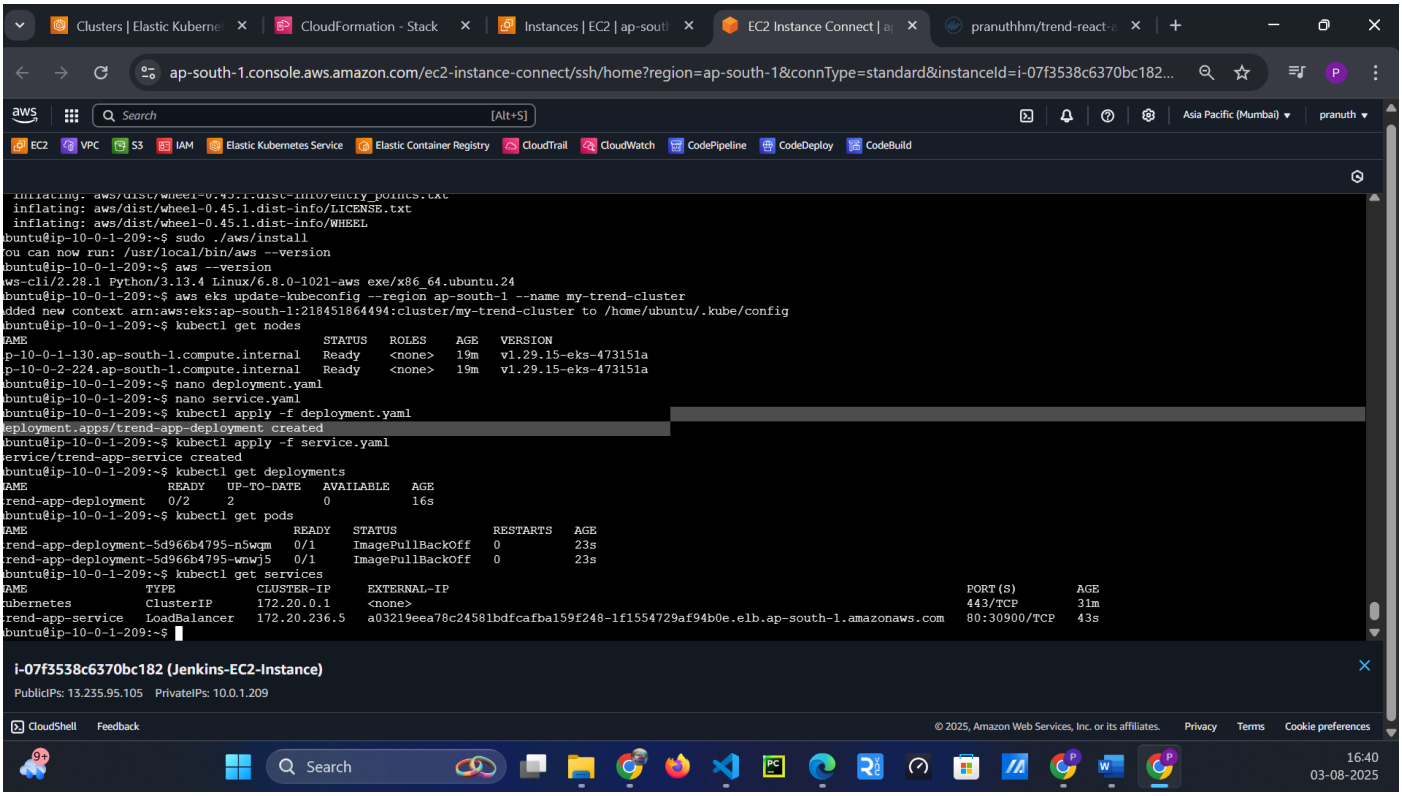
   ```
   kubectl apply -f deployment.yaml
   kubectl apply -f service.yaml
   ```

2. **Verify the deployment:**

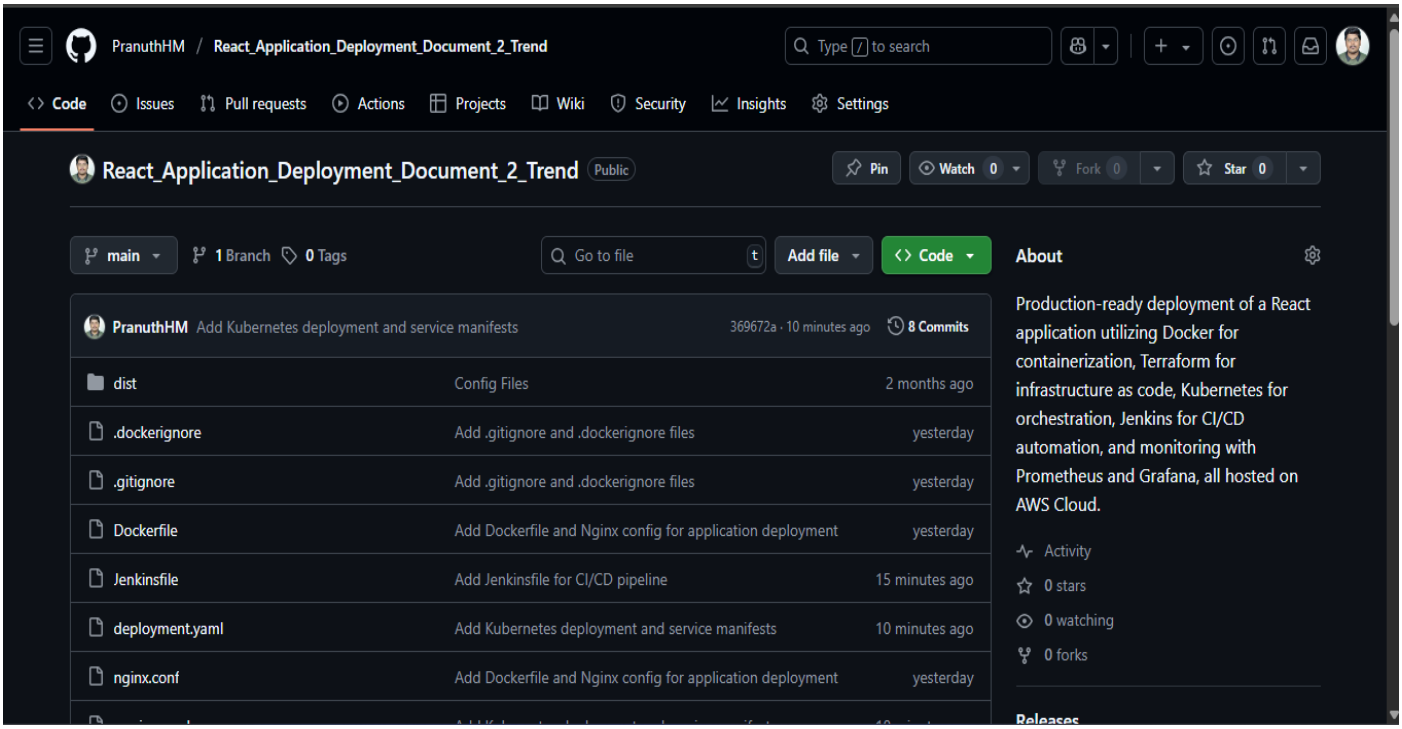
kubectl get deployments

kubectl get pods

kubectl get services



7.4. Push to GitHub



Step 8: Jenkins CI/CD Pipeline: The **Jenkinsfile** is a text file that defines the steps of your pipeline. It lives in the root of your application's GitHub repository.

1. **On your local machine**, navigate to the root of your `Trend` project directory. This is the directory where you cloned the code and created the Docker files.
2. Create the **Jenkinsfile**
3. **Paste the following content.** This script has stages for building the Docker image, pushing it to DockerHub, and deploying it to Kubernetes. **Make sure to replace `pranuthhm/trend-react-app` with your actual DockerHub username and repository name.**

```
pipeline {

    agent any

    environment {

        DOCKER_IMAGE = "pranuthhm/trend-react-app"

        DOCKERHUB_CREDENTIALS = "dockerhub_credentials"

        // Update the path to the new location

        KUBECONFIG_PATH = "/var/lib/jenkins/.kube/config"

    }

    stages {

        stage('Git Checkout') {

            steps {

                // This is handled automatically by the Git plugin

                echo 'Checking out code from Git...'

                checkout scm

            }

        }

        stage('Build Docker Image') {

            steps {

                script {

                    // Get the current Git commit hash for tagging the image
```

```
                def gitHash = sh(returnStdout: true, script: 'git rev-parse --short HEAD').trim()
                // Build the Docker image with the Git commit hash as a tag
                sh "docker build -t ${DOCKER_IMAGE}:${gitHash} -t ${DOCKER_IMAGE}:latest ."
            }
        }
    }
    stage('Push to DockerHub') {
        steps {
            withCredentials([usernamePassword(credentialsId: DOCKERHUB_CREDENTIALS, usernameVariable: 'DOCKER_USER', passwordVariable: 'DOCKER_PASS')]) {
                script {
                    // Login to DockerHub
                    sh "echo $DOCKER_PASS | docker login --username $DOCKER_USER --password-stdin"
                    // Push the 'latest' and commit-tagged images to DockerHub
                    sh "docker push ${DOCKER_IMAGE}:latest"
                    sh "docker push ${DOCKER_IMAGE}:${sh(returnStdout: true, script: 'git rev-parse --short HEAD').trim()}"
                }
            }
        }
    }
    stage('Deploy to Kubernetes') {
        steps {
            sh """
                # Configure kubectl to use the kubeconfig file on the Jenkins server
                export KUBECONFIG=/var/lib/jenkins/.kube/config
                # Apply the Kubernetes Deployment and Service manifests
```

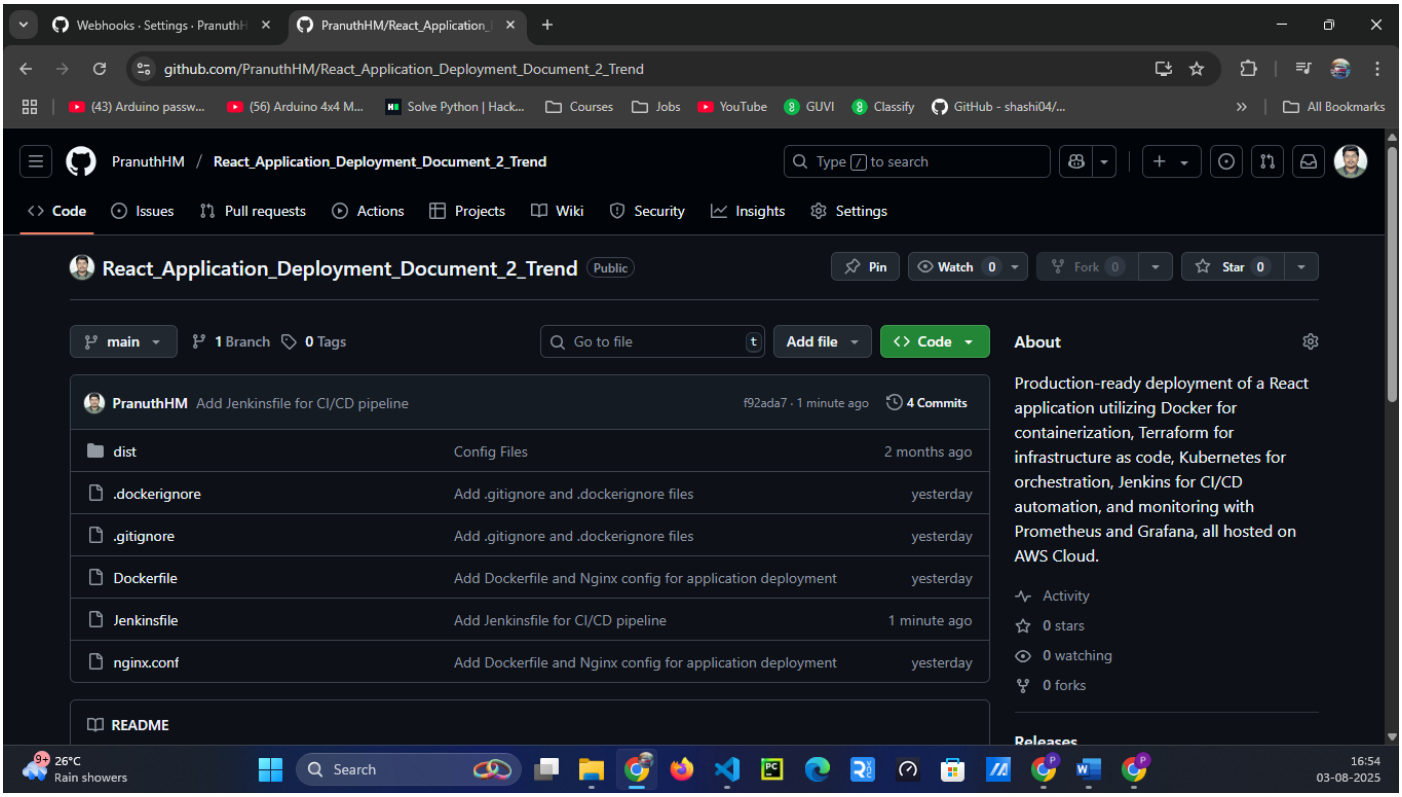
```
                echo "Applying Kubernetes Deployment..."
                kubectl apply -f deployment.yaml
                echo "Applying Kubernetes Service..."
                kubectl apply -f service.yaml
            """
        }
    }
}
```

4. **Commit and Push the Jenkinsfile:**

   git add Jenkinsfile

   git commit -m "Add Jenkinsfile for CI/CD pipeline"

   git push origin main



8.2. Create the Pipeline Job in Jenkins

8.2.1. Access your Jenkins UI: http://<YOUR_JENKINS_PUBLIC_IP>:8080

8.2.2. Create a New Item:

- Click New Item on the left-hand side.
- Enter an item name: Trend-App-CI-CD
- Select a type: Pipeline
- Click OK.

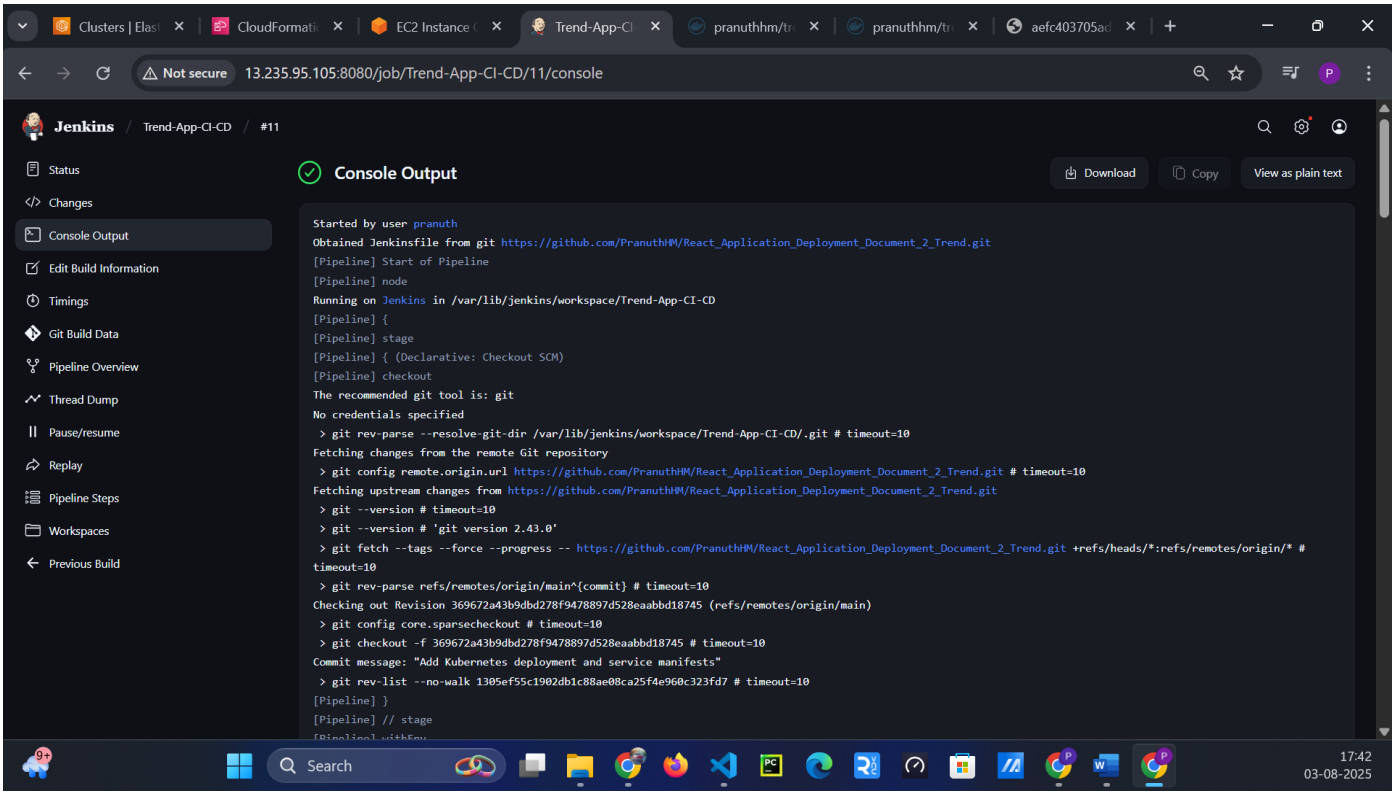
8.2.3. Configure the Pipeline:

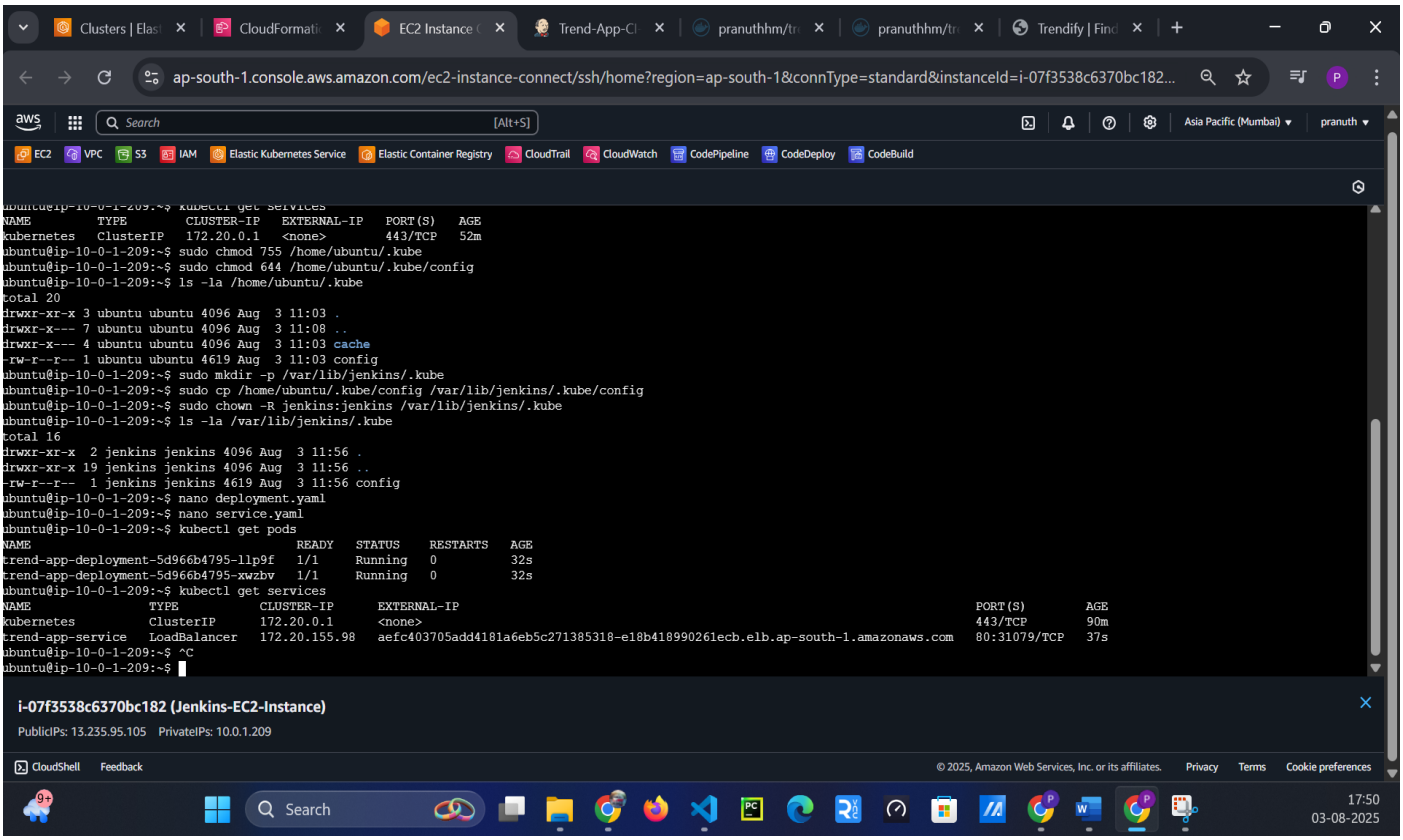
- GitHub project: Enter your GitHub repository URL: https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git
- Build Triggers: Check the GitHub hook trigger for GITScm polling box. This ensures a build is triggered on every Git push.
- Pipeline:
    - Definition: Select Pipeline script from SCM.
    - SCM: Select Git.
    - Repository URL: Enter your GitHub repository URL: https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git
    - Credentials: Select - none - as your repository is public.
    - Branch Specifier: main
    - Script Path: Jenkinsfile

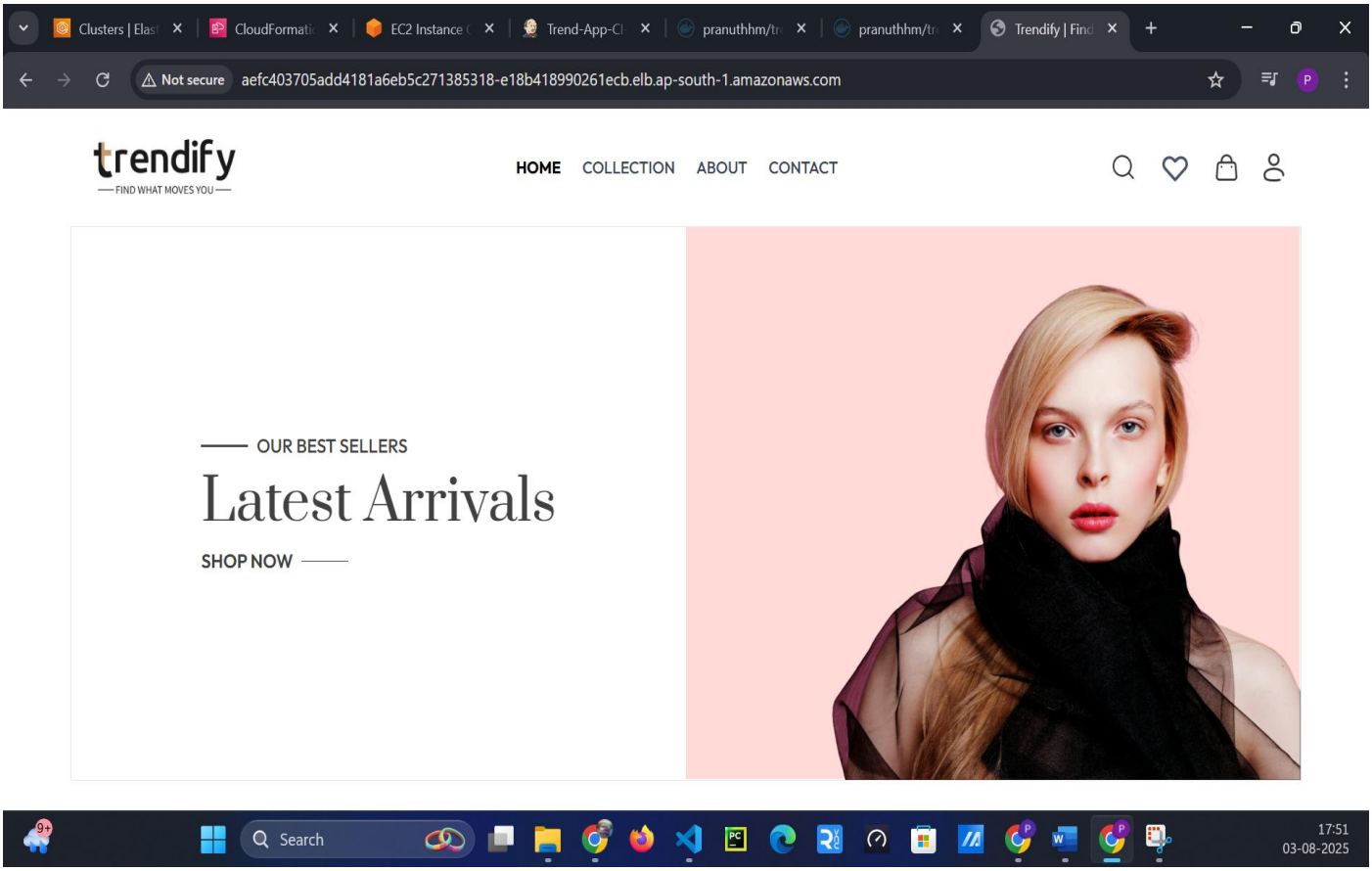
8.2.4.Save the job.

8.3. Trigger and Verify the Pipeline

- Go to your Jenkins job dashboard and click Build Now on the left.
- Wait for the build to complete. You can click on the build number to see the console output and watch each stage run.
- Once the pipeline completes successfully, go back to your SSH session on the Jenkins EC2 instance.
- Run kubectl get services and wait a few minutes for the EXTERNAL-IP (DNS name) of your service to be assigned. Copy the DNS name and paste it into your web browser. This time, you should see your application running!


Not secure 13.235.95.105:8080/job/Trend-App-CI-CD/11/console
Jenkins / Trend-App-CI-CD / #11
Status
Changes
Console Output
Edit Build Information
Timings
Git Build Data
Pipeline Overview
Thread Dump
Pause/resume
Replay
Pipeline Steps
Workspaces
Previous Build
Console Output
Download
Copy
View as plain text
Started by user pranuth
Obtained Jenkinsfile from git https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/lib/jenkins/workspace/Trend-App-CI-CD
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
The recommended git tool is: git
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/Trend-App-CI-CD/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git # timeout=10
Fetching upstream changes from https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git
> git --version # timeout=10
> git --version # 'git version 2.43.0'
> git fetch --tags --force --progress -- https://github.com/PranuthHM/React_Application_Deployment_Document_2_Trend.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/main^{commit} # timeout=10
Checking out Revision 369672a43b9dbd278f9478897d528eaabbd18745 (refs/remotes/origin/main)
> git config core.sparsecheckout # timeout=10
> git checkout -f 369672a43b9dbd278f9478897d528eaabbd18745 # timeout=10
Commit message: "Add Kubernetes deployment and service manifests"
> git rev-list --no-walk 1305ef55c1902db1c88ae08ca25f4e960c323fd7 # timeout=10
[Pipeline] }
[Pipeline] // stage
Search
17:42
03-08-2025


ap-south-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?region=ap-south-1&connType=standard&instanceId=i-07f3538c6370bc182...
Search [Alt+S]
Asia Pacific (Mumbai)
pranuth
EC2 VPC S3 IAM Elastic Kubernetes Service Elastic Container Registry CloudTrail CloudWatch CodePipeline CodeDeploy CodeBuild
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
kubernetes ClusterIP 172.20.0.1 <none> 443/TCP 52m
ubuntu@ip-10-0-1-209:~$ sudo chmod 755 /home/ubuntu/.kube
ubuntu@ip-10-0-1-209:~$ sudo chmod 644 /home/ubuntu/.kube/config
ubuntu@ip-10-0-1-209:~$ ls -la /home/ubuntu/.kube
total 20
drwxr-xr-x 3 ubuntu ubuntu 4096 Aug 3 11:03 .
drwxr-x--- 7 ubuntu ubuntu 4096 Aug 3 11:08 ..
drwxr-x--- 4 ubuntu ubuntu 4096 Aug 3 11:03 cache
-rw-r--r-- 1 ubuntu ubuntu 4619 Aug 3 11:03 config
ubuntu@ip-10-0-1-209:~$ sudo mkdir -p /var/lib/jenkins/.kube
ubuntu@ip-10-0-1-209:~$ sudo cp /home/ubuntu/.kube/config /var/lib/jenkins/.kube/config
ubuntu@ip-10-0-1-209:~$ sudo chown -R jenkins:jenkins /var/lib/jenkins/.kube
ubuntu@ip-10-0-1-209:~$ ls -la /var/lib/jenkins/.kube
total 16
drwxr-xr-x 2 jenkins jenkins 4096 Aug 3 11:56 .
drwxr-xr-x 19 jenkins jenkins 4096 Aug 3 11:56 ..
-rw-r--r-- 1 jenkins jenkins 4619 Aug 3 11:56 config
ubuntu@ip-10-0-1-209:~$ nano deployment.yaml
ubuntu@ip-10-0-1-209:~$ nano service.yaml
ubuntu@ip-10-0-1-209:~$ kubectl get pods
NAME READY STATUS RESTARTS AGE
trend-app-deployment-5d966b4795-llp9f 1/1 Running 0 32s
trend-app-deployment-5d966b4795-xwzbv 1/1 Running 0 32s
ubuntu@ip-10-0-1-209:~$ kubectl get services
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
kubernetes ClusterIP 172.20.0.1 <none> 443/TCP 90m
trend-app-service LoadBalancer 172.20.155.98 aefc403705add4181a6eb5c271385318-e18b418990261ecb.elb.ap-south-1.amazonaws.com 80:31079/TCP 37s
ubuntu@ip-10-0-1-209:~$ ^C
ubuntu@ip-10-0-1-209:~$
i-07f3538c6370bc182 (Jenkins-EC2-Instance)
PublicIPs: 13.235.95.105 PrivateIPs: 10.0.1.209
CloudShell Feedback
© 2025, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences
Search
17:50
03-08-2025



Application deployed kubernetes Loadbalancer ARN:

http://aefc403705add4181a6eb5c271385318-e18b418990261ecb.elb.ap-south-1.amazonaws.com/

Step 9: Set up Prometheus and Grafana for Monitoring

9.1. Install Helm

First, you need to install Helm on your Jenkins EC2 instance if you haven't already.

1. SSH into your Jenkins EC2 instance.
2. Run the following commands to install Helm:

curl https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3 | bash

9.2. Install the Prometheus Stack with Helm

We'll use a Helm chart called kube-prometheus-stack, which is a comprehensive bundle that includes Prometheus, Grafana, and all the necessary components for Kubernetes monitoring**.**

1. **Add the Prometheus Helm repository:**

helm repo add prometheus-community https://prometheus-community.github.io/helm-charts

helm repo update

2. Next, create a file named grafana-values.yaml on your Jenkins instance with the following content. This file tells Helm to create a public Load Balancer for Grafana.

   # grafana-values.yaml

   grafana:

   service:

   type: LoadBalancer

   port: 80

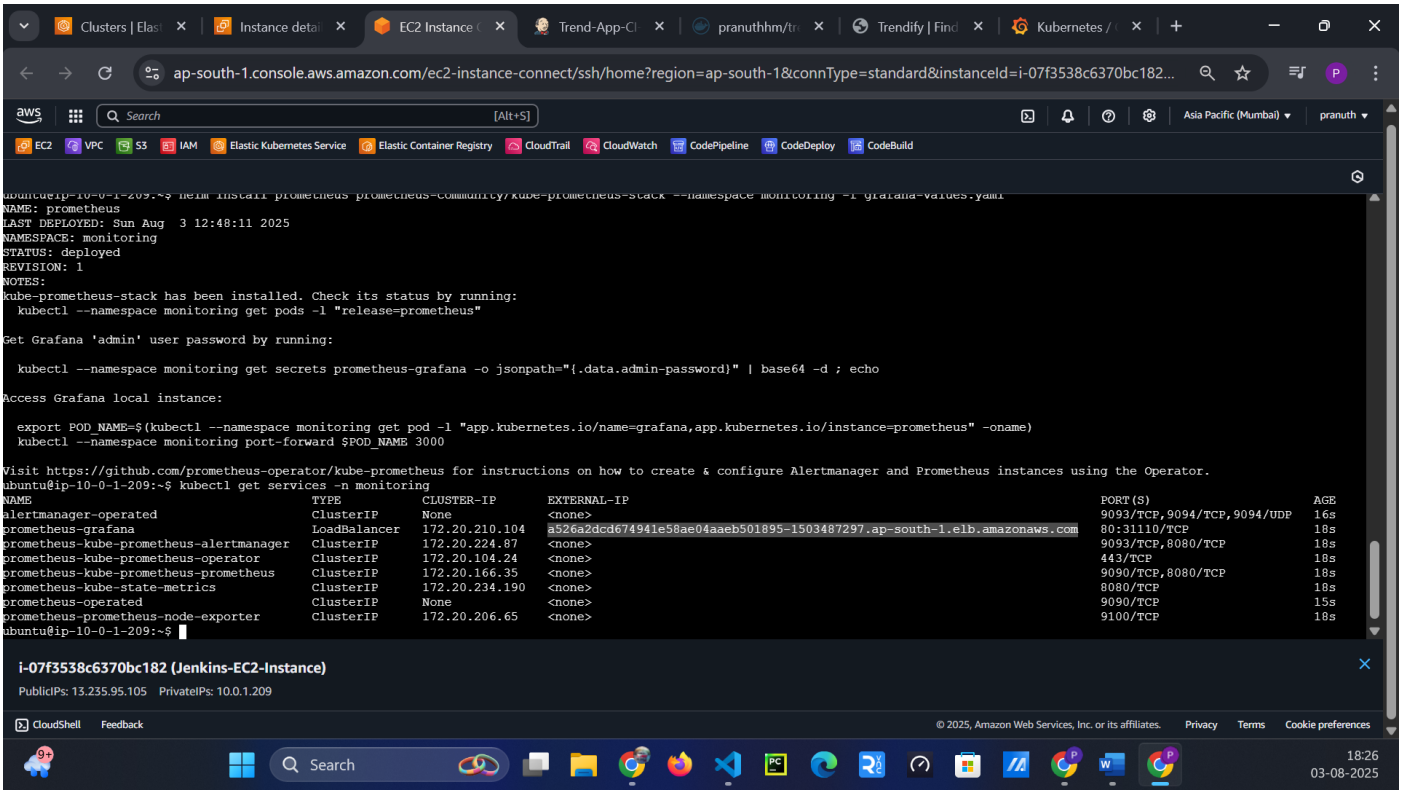
   targetPort: 3000

3. Install the kube-prometheus-stack chart. This will deploy Prometheus and Grafana to a new namespace called monitoring.

   helm install prometheus prometheus-community/kube-prometheus-stack --namespace monitoring --create-namespace

4. Verify that the pods are running in the monitoring namespace:

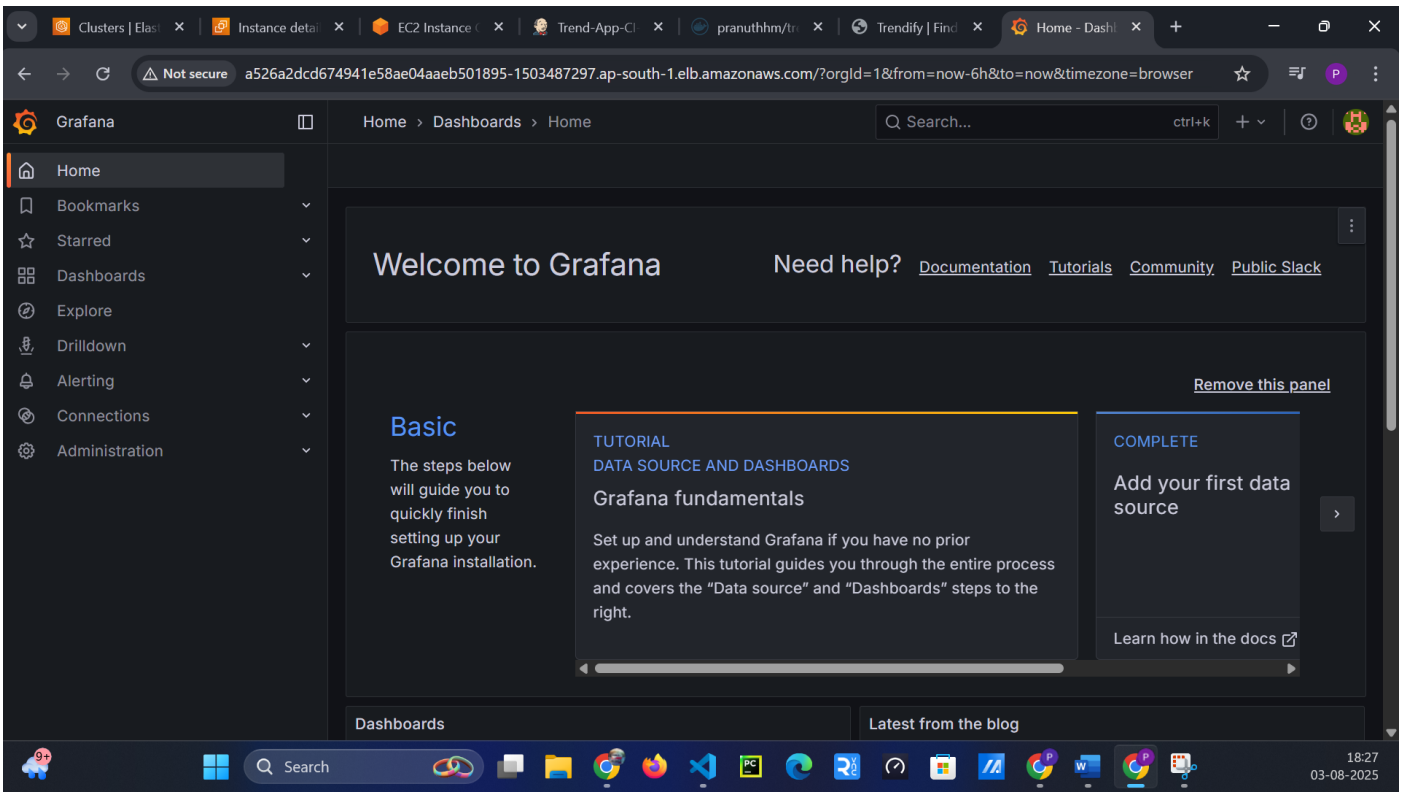
   kubectl get pods -n monitoring

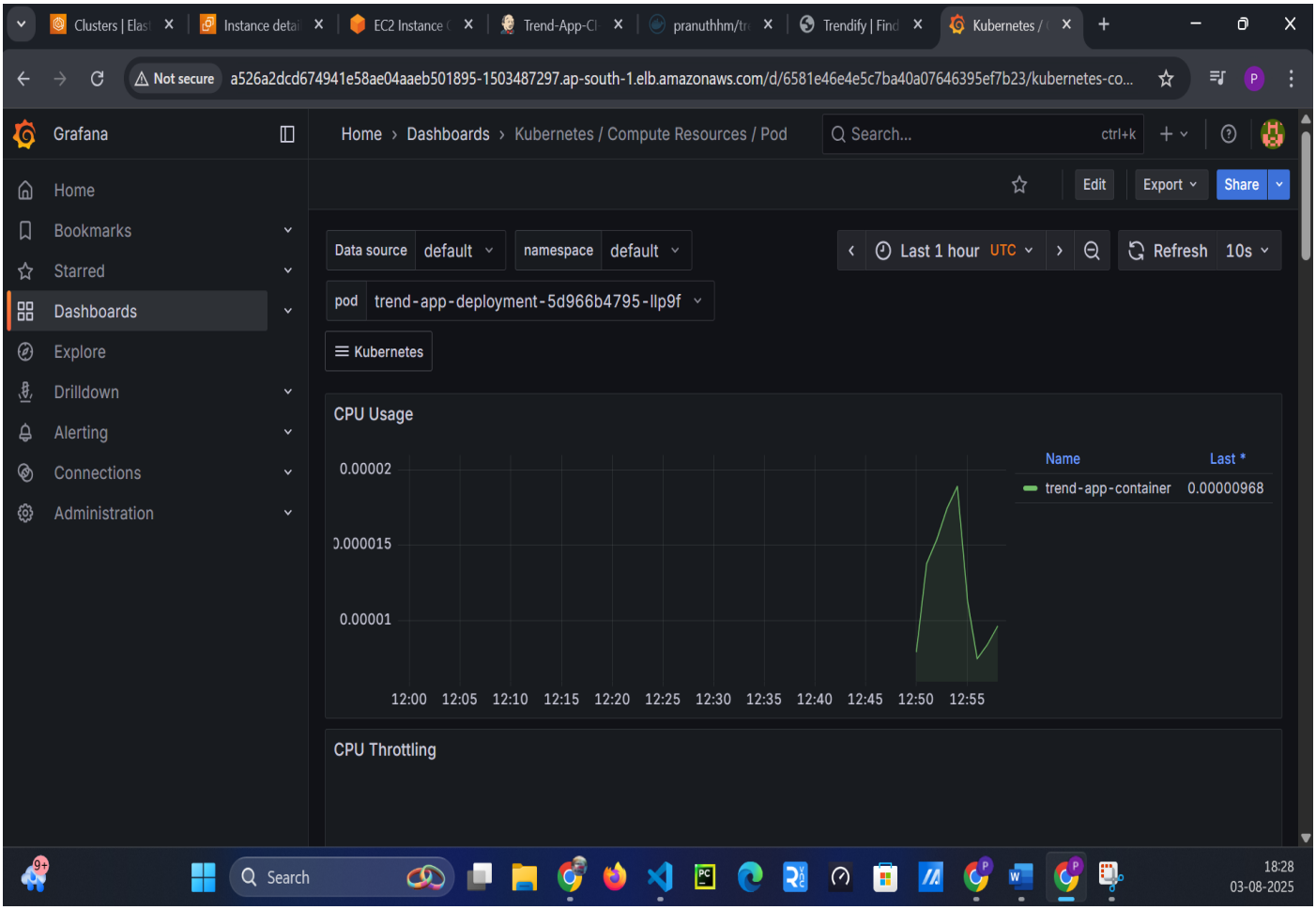


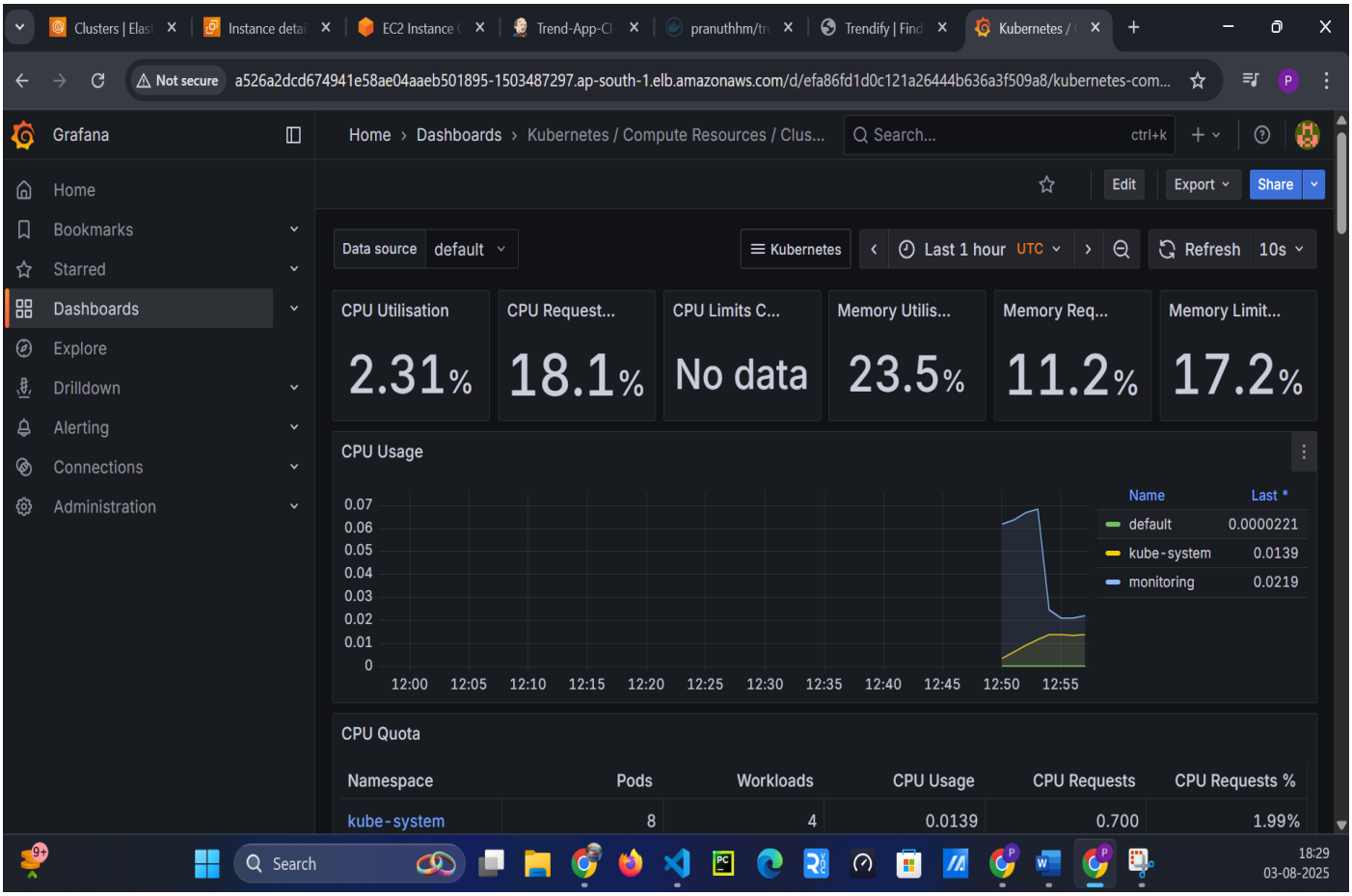
Look for the prometheus-grafana service. It will now have an AWS DNS name listed under the **EXTERNAL-IP** column. Copy this DNS name, paste it into your browser, and you should be able to see the Grafana login page.

Default Credentials:

- **Username:** admin
- **Password:** prom-operator




Clusters | Elas
Instance detai
EC2 Instance
Trend-App-Cl
pranuthhm/tr
Trendify | Find
Kubernetes /
Not secure
a526a2dcd674941e58ae04aaeb501895-1503487297.ap-south-1.elb.amazonaws.com/d/6581e46e4e5c7ba40a07646395ef7b23/kubernetes-co...
Grafana
Home
Bookmarks
Starred
Dashboards
Explore
Drilldown
Alerting
Connections
Administration
Home › Dashboards › Kubernetes / Compute Resources / Pod
Search...
ctrl+k
Edit
Export
Share
Data source default
namespace default
Last 1 hour UTC
Refresh 10s
pod trend-app-deployment-5d966b4795-llp9f
Kubernetes
CPU Usage
0.00002
0.000015
0.00001
12:00 12:05 12:10 12:15 12:20 12:25 12:30 12:35 12:40 12:45 12:50 12:55
Name Last *
trend-app-container 0.00000968
CPU Throttling
Search
18:28
03-08-2025


Clusters | Elas
Instance detai
EC2 Instance
Trend-App-Cl
pranuthhm/tr
Trendify | Find
Kubernetes /
Not secure
a526a2dcd674941e58ae04aaeb501895-1503487297.ap-south-1.elb.amazonaws.com/d/efa86fd1d0c121a26444b636a3f509a8/kubernetes-com...
Grafana
Home
Bookmarks
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Explore
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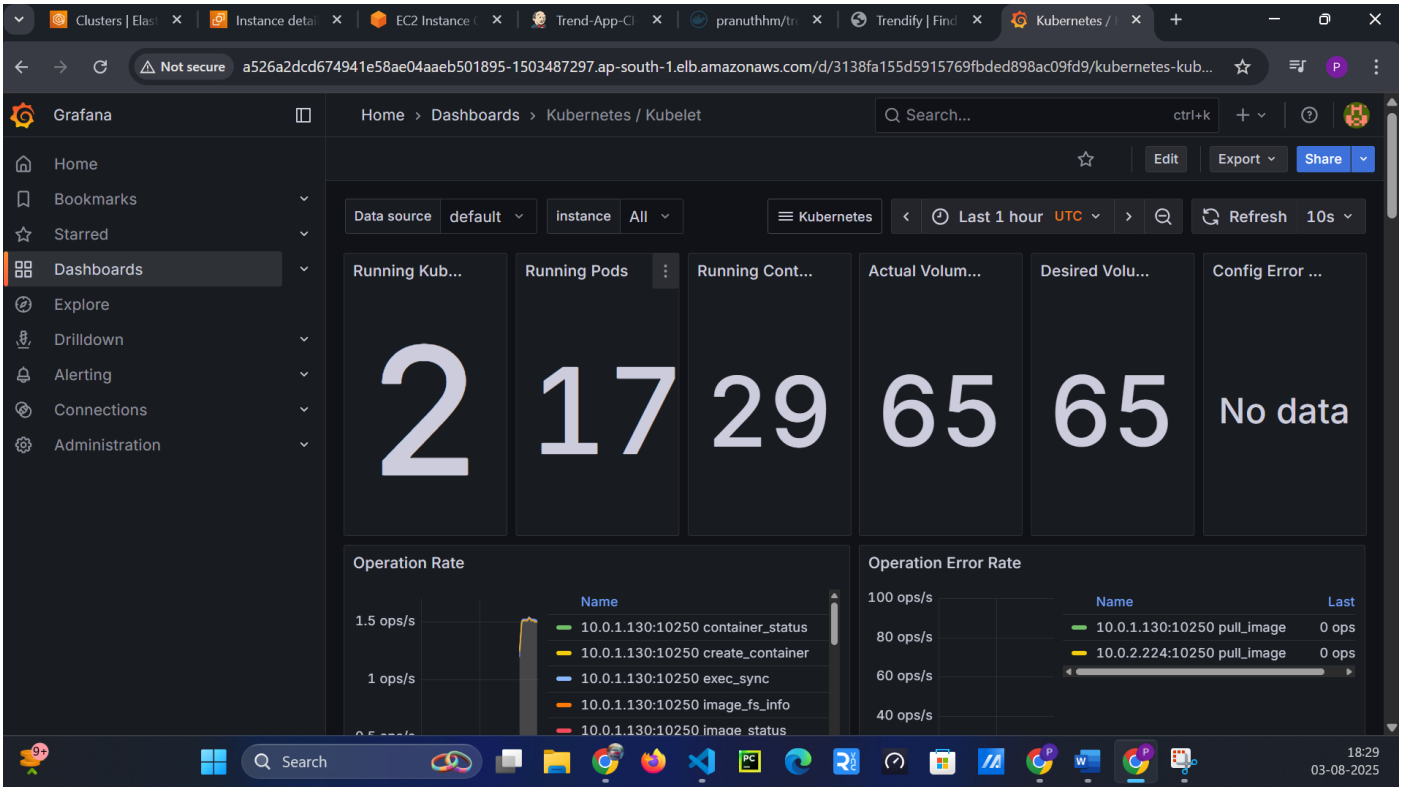
Alerting
Connections
Administration
Home › Dashboards › Kubernetes / Compute Resources / Clus...
Search...
ctrl+k
Edit
Export
Share
Data source default
Kubernetes
Last 1 hour UTC
Refresh 10s
CPU Utilisation
2.31%
CPU Request...
18.1%
CPU Limits C...
No data
Memory Utilis...
23.5%
Memory Req...
11.2%
Memory Limit...
17.2%
CPU Usage
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
12:00 12:05 12:10 12:15 12:20 12:25 12:30 12:35 12:40 12:45 12:50 12:55
Name Last *
default 0.0000221
kube-system 0.0139
monitoring 0.0219
CPU Quota
Namespace Pods Workloads CPU Usage CPU Requests CPU Requests %
kube-system 8 4 0.0139 0.700 1.99%
Search
18:29
03-08-2025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Home › Dashboards › Kubernetes / Kubelet
Search...
Edit
Export
Share
Data source default
instance All
Kubernetes
Last 1 hour UTC
Refresh 10s
Running Kub...
2
Running Pods
17
Running Cont...
29
Actual Volum...
65
Desired Volu...
65
Config Error ...
No data
Operation Rate
1.5 ops/s
1 ops/s
Name
10.0.1.130:10250 container_status
10.0.1.130:10250 create_container
10.0.1.130:10250 exec_sync
10.0.1.130:10250 image_fs_info
Operation Error Rate
100 ops/s
80 ops/s
60 ops/s
40 ops/s
Name
Last
10.0.1.130:10250 pull_image
0 ops
10.0.2.224:10250 pull_image
0 ops
Search
18:29
03-08-2025