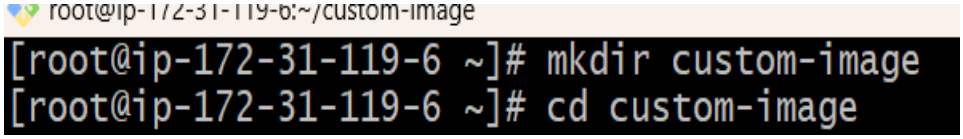
1. **Create a customized Docker image using a Dockerfile.**

- mkdir custom-image
- cd custom-image




To create and store data in a file.

- echo "<h1>Hello from my custom Docker image!</h1>" > index.html

vi Dockerfile and add this script

```
# Use official nginx base image
FROM nginx:latest

# Copy custom HTML to nginx web directory
COPY index.html /usr/share/nginx/html/index.html

# Expose port
EXPOSE 80

# Start Nginx server
CMD ["nginx", "-g", "daemon off;"]
```

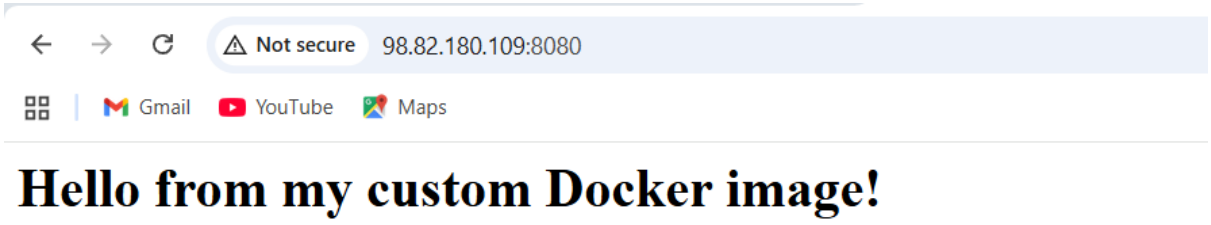
- docker build -t my-custom-image:1.0 .

```
[root@ip-172-31-119-6 custom-image]# ls
Dockerfile  index.html
[root@ip-172-31-119-6 custom-image]# docker build -t my-custom-image:1.0 .
[+] Building 4.8s (7/7) FINISHED
 => [internal] load build definition from Dockerfile
 => => transferring dockerfile: 324B
 => [internal] load metadata for docker.io/library/nginx:latest
 => [internal] load .dockerignore
 => => transferring context: 2B
 => [internal] load build context
 => => transferring context: 141B
 => [1/2] FROM docker.io/library/nginx:latest@sha256:553f64aecdc31b5bf944521731cd70e35da4f
 => => resolve docker.io/library/nginx:latest@sha256:553f64aecdc31b5bf944521731cd70e35da4f
 => => sha256:53d743880af45adf9f141eec1fe3a413087e528075a5d8884d6215ddfdd2b806 954B / 954B
 => => sha256:5c733364e9a8f7e6d7289ceaad623c6600479fe95c3ab5534f07bfd7416d9541 2.29kB / 2.
 => => sha256:0e4bc2bd6656e6e004e3c749af70e5650bac2258243eb0949dea51cb8b7863db 29.78MB / 2
 => => sha256:b5feb73171bf1bcf29fdd1ba642c3d30cdf4c6329b19d89be14d209d778c89ba 29.97MB / 2
 => => sha256:553f64aecdc31b5bf944521731cd70e35da4faed96b2b7548a3d8e2598c52a42 10.23kB / 1
 => => sha256:60adc2e137e757418d4d771822fa3b3f5d3b4ad58ef2385d200c9ee78375b6d5 8.75kB / 8.
 => => sha256:108ab82928207dabd9abfddbc960dd8423640375 63fc560b8f6304e4a91454fe 628B / 628B
 => => sha256:77fa2eb0631772679b0e48eca04f4906fba5fe94377e01618873a4a1171107ce 404B / 404B
 => => sha256:192e2451f8751fb74549c932e26a9bcfd7b669fe2f5bd8381ea5ac65f09b256b 1.21kB / 1.
 => => sha256:de57a609c9d5148f10b38f5c920d276e9e38b2856fe16c0aae1450613dc12051 1.40kB / 1.
 => => extracting sha256:0e4bc2bd6656e6e004e3c749af70e5650bac2258243eb0949dea51cb8b7863db
 => => extracting sha256:b5feb73171bf1bcf29fdd1ba642c3d30cdf4c6329b19d89be14d209d778c89ba
 => => extracting sha256:108ab82928207dabd9abfddbc960dd8423640375 63fc560b8f6304e4a91454fe
 => => extracting sha256:53d743880af45adf9f141eec1fe3a413087e528075a5d8884d6215ddfdd2b806
 => => extracting sha256:77fa2eb0631772679b0e48eca04f4906fba5fe94377e01618873a4a1171107ce
 => => extracting sha256:192e2451f8751fb74549c932e26a9bcfd7b669fe2f5bd8381ea5ac65f09b256b
 => => extracting sha256:de57a609c9d5148f10b38f5c920d276e9e38b2856fe16c0aae1450613dc12051
```

- docker run -d -p 8080:80 my-custom-image:1.0

```
[root@ip-172-31-119-6 custom-image]# docker run -d -p 8080:80 my-custom-image:1.0
c03781b6fed481c0a51dbed4e6ec953cb49f6e755a94b7e5352a0f77210342bd
```

Go and search in the browser with the public_ip and port number 8080.




## 2. Push the image to Docker Hub.

* docker login

```
[root@ip-172-31-119-6 ~]# docker login
Log in with your Docker ID or email address to push and pull images from Docker Hub. If you don't have a Docker ID, h
er.com/ to create one.
You can log in with your password or a Personal Access Token (PAT). Using a limited-scope PAT grants better security
tions using SSO. Learn more at https://docs.docker.com/go/access-tokens/

Username: mujaheed00
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
```

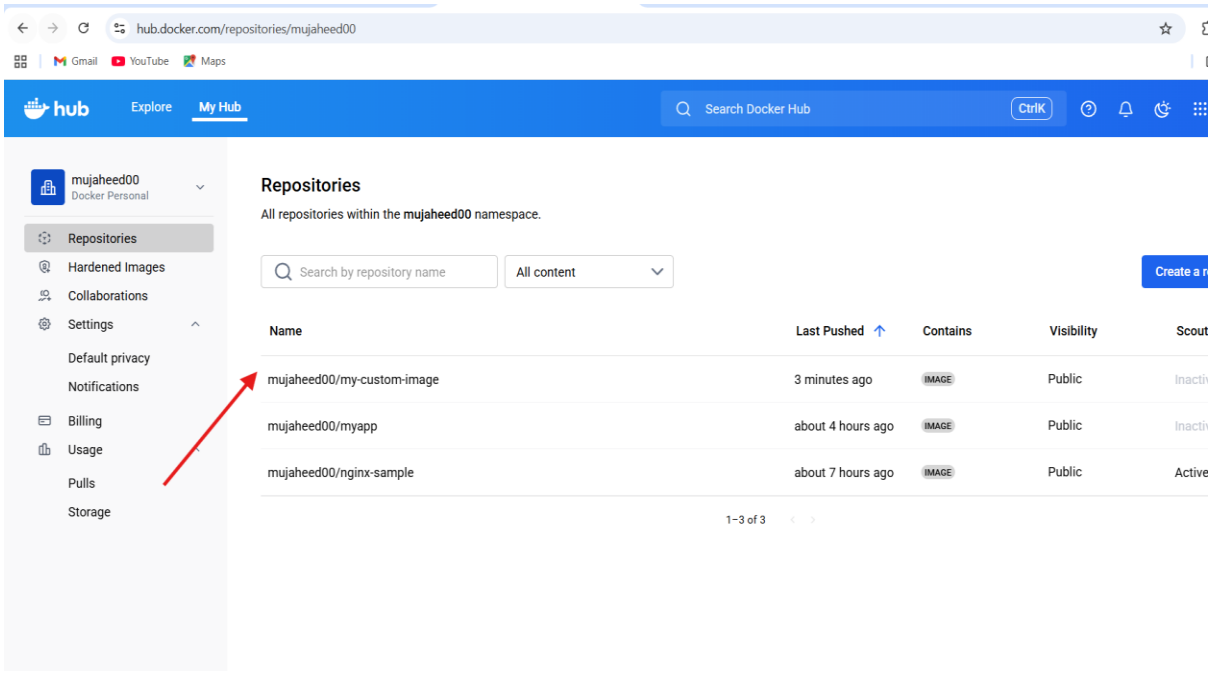
- docker tag my-custom-image:1.0 mujaheed00/my-custom-image:1.0

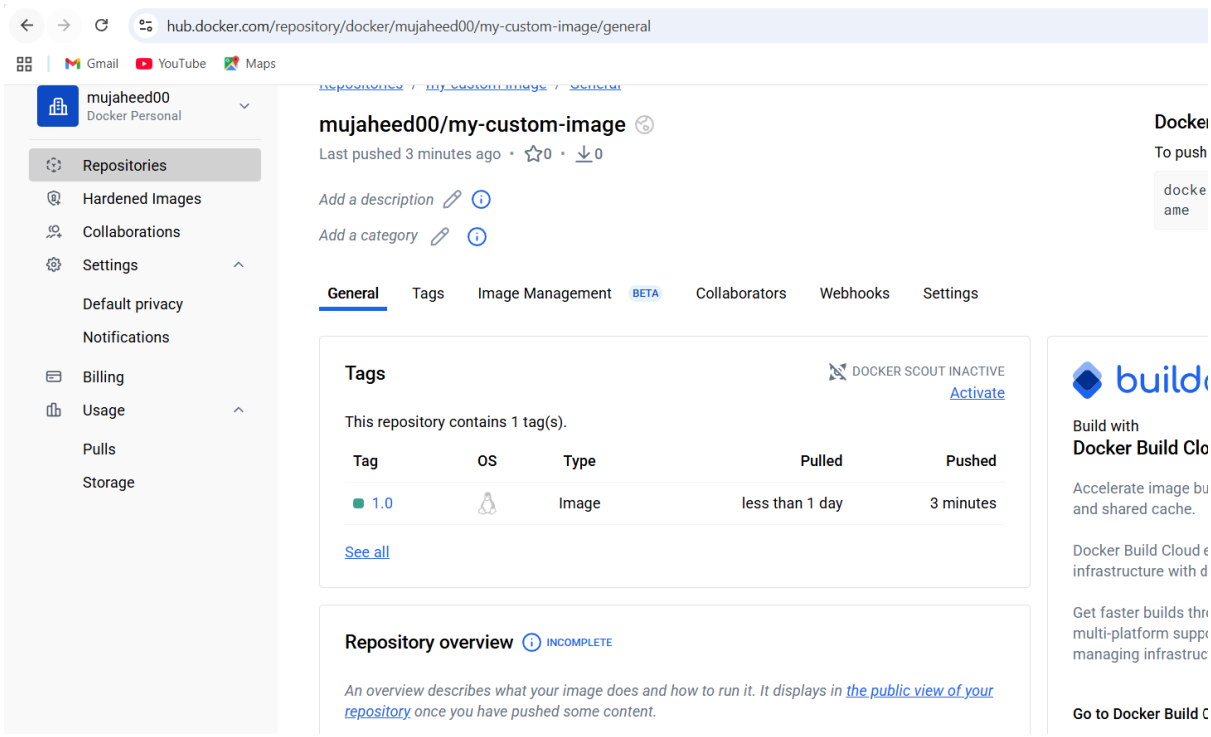
```
[root@ip-172-31-119-6 ~]# docker tag my-custom-image:1.0 mujaheed00/my-custom-image:1.0
```

- docker push mujaheed00/my-custom-image:1.0

```
[root@ip-172-31-119-6 ~]# docker push mujaheed00/my-custom-image:1.0
The push refers to repository [docker.io/mujaheed00/my-custom-image]
b3a1959b9926: Pushed
38d44e06fd01: Mounted from library/nginx
388bb4cadb9e: Mounted from library/nginx
5f0d4d15245b: Mounted from library/nginx
fe0771a36433: Mounted from library/nginx
1e79db1a7c1e: Mounted from library/nginx
008ba900efa1: Mounted from library/nginx
70a290c5e58b: Mounted from library/nginx
1.0: digest: sha256:194ceccfdec8adbee1361276d2d1465fc59f0407a1c1f59da4a389b6a0936b0e size: 1985
[root@ip-172-31-119-6 ~]#
```

The image has been pushed to dockerhub.






## 3. Push the same image to Amazon ECR.

- aws configure

```
[root@ip-172-31-119-6 ~]# aws configure
AWS Access Key ID [****************XKPJ]: AKIATNTADWLTUPIUCUVT
AWS Secret Access Key [****************3n6u]: 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
Default region name [us-east-1]: us-east-1
Default output format [json]: json
[root@ip-172-31-119-6 ~]#
```

- aws ecr create-repository --repository-name my-custom-image

```
[root@ip-172-31-119-6 ~]# aws ecr create-repository --repository-name my-custom-image
{
    "repository": {
        "repositoryArn": "arn:aws:ecr:us-east-1:235351028455:repository/my-custom-image"
        "registryId": "235351028455",
        "repositoryName": "my-custom-image",
        "repositoryUri": "235351028455.dkr.ecr.us-east-1.amazonaws.com/my-custom-image",
        "createdAt": "2025-11-26T16:40:48.128000+00:00",
        "imageTagMutability": "MUTABLE",
        "imageScanningConfiguration": {
            "scanOnPush": false
        },
        "encryptionConfiguration": {
            "encryptionType": "AES256"
        }
    }
}
[root@ip-172-31-119-6 ~]#
```

- aws ecr get-login-password --region us-east-1 | \docker login --username AWS --password-stdin 235351028455.dkr.ecr.us-east-1.amazonaws.com

```
[root@ip-172-31-119-6 ~]# aws ecr get-login-password --region us-east-1 | \
docker login --username AWS --password-stdin 235351028455.dkr.ecr.us-east-1.amazonaws.com
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
```

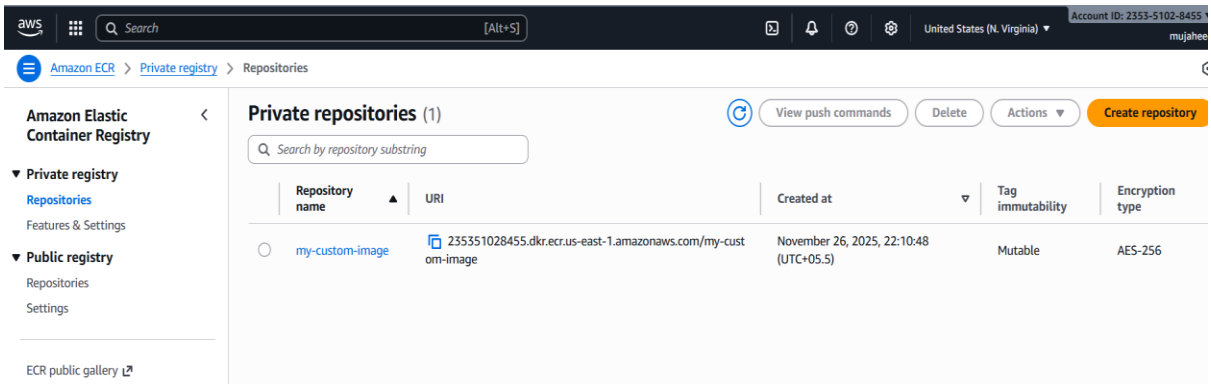
- docker tag my-custom-image:1.0 23531028455.dkr.ecr.us-east-1.amazonaws.com/my-custom-image:1.0

```
[root@ip-172-31-119-6 ~]# docker tag my-custom-image:1.0 123456789012.dkr.ecr.us-east-1.amazonaws.com/my-custom-image:1.0
```

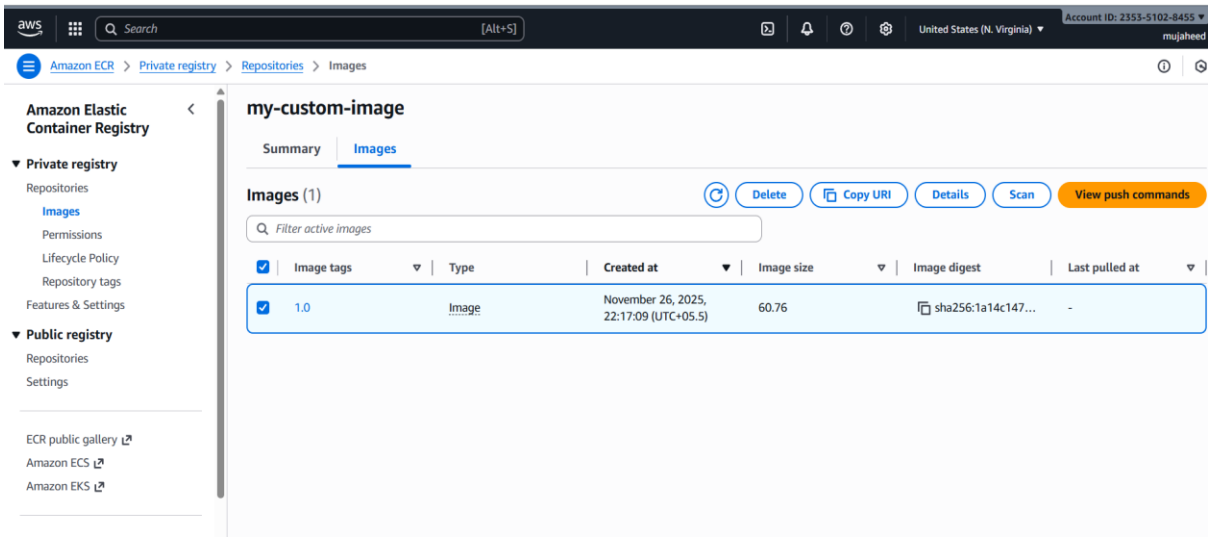
- docker push 235351028455.dkr.ecr.us-east-1.amazonaws.com/my-custom-image:1.0

```
[root@ip-172-31-119-6 ~]# docker push 235351028455.dkr.ecr.us-east-1.amazonaws.com/my-custom-image:1.0
The push refers to repository [235351028455.dkr.ecr.us-east-1.amazonaws.com/my-custom-image]
b3a1959b9926: Pushed
38d44e06fd01: Pushed
388bb4cadb9e: Pushed
5f0d4d15245b: Pushed
fe0771a36433: Pushed
1e79db1a7c1e: Pushed
008ba900efa1: Pushed
70a290c5e58b: Pushed
1.0: digest: sha256:1a14c1478781e500fdb5bf5d5aaa4304a8ff31ec1f847a06d630bc501d529d82 size: 1985
```

Go to ECR and select repositories.




A image ha been created.



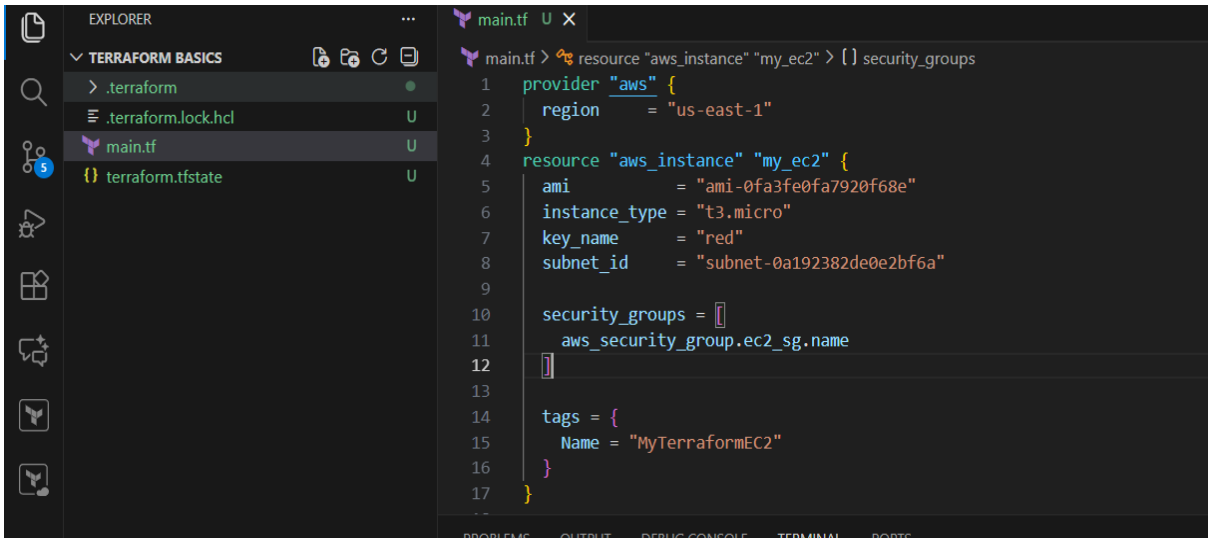

## 4. Provision one EC2 instance using Terraform and install Jenkins.

Give the script in main.tf

```
resource "aws_instance" "my_ec2" {
  ami           = "ami-0fa3fe0fa7920f68e"
  instance_type = "t3.micro"
  key_name      = "red"
  subnet_id     = "subnet-0a192382de0e2bf6a"
```

```
  vpc_security_group_ids = [
    aws_security_group.ec2_sg.id
  ]

  tags = {
    Name = "MyTerraformEC2"
  }
}

resource "aws_security_group" "ec2_sg" {
  name        = "ec2-basic-sg"
  description = "Allow SSH"

  ingress {
    description = "SSH"
    from_port   = 22
    to_port     = 22
    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"]
  }
}
```

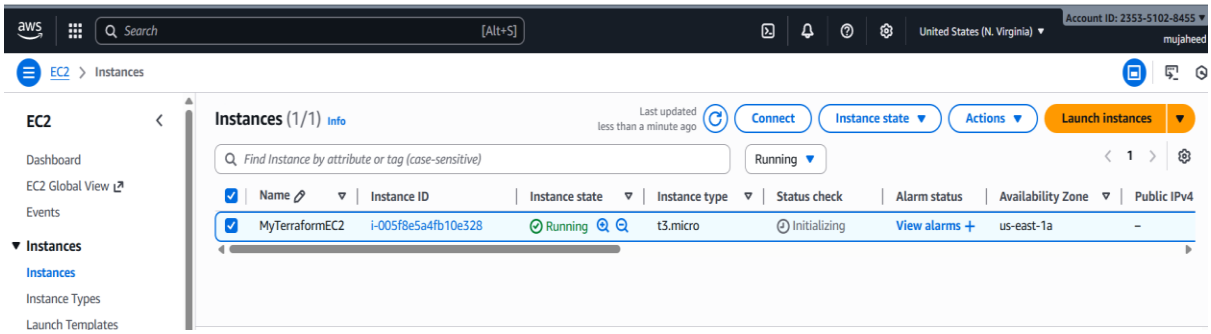



- terraform init
- terraform apply

```
PS C:\Users\Ashish\Desktop\Terraform basics> terraform init
Initializing the backend...
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/aws v6.23.0

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
PS C:\Users\Ashish\Desktop\Terraform basics> terraform validate
Success! The configuration is valid.
```

```
    }

Plan: 1 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_instance.my_ec2: Creating...
aws_instance.my_ec2: Still creating... [00m10s elapsed]
aws_instance.my_ec2: Creation complete after 16s [id=i-005f8e5a4fb10e328]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
PS C:\Users\Ashish\Desktop\Terraform basics>
```

An instance has been created.




To install Jenkins give this script as userdata.

**user_data = <<-EOF**

**#!/bin/bash**

**yum update -y**

**yum install java-17-amazon-corretto -y**

**wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo**

**rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key**

**yum install -y jenkins**

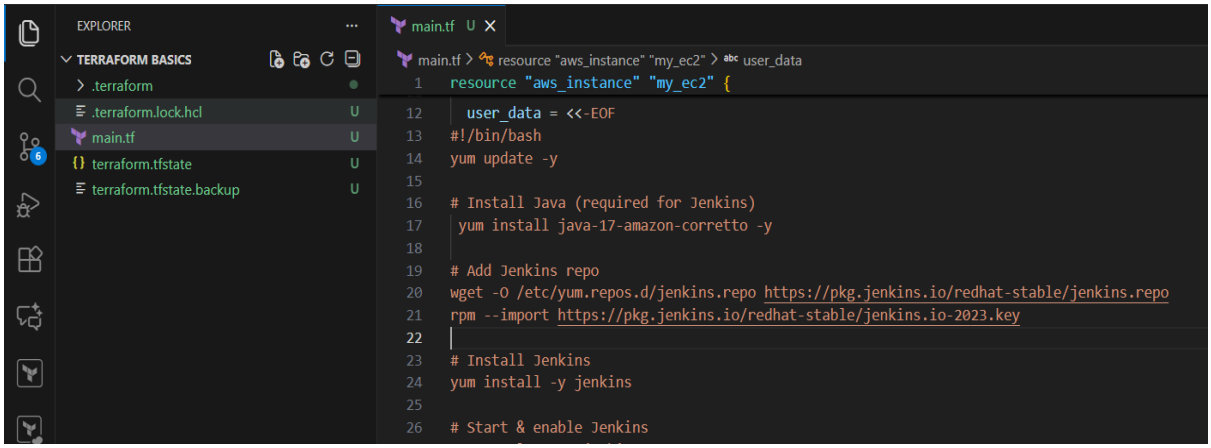
**systemctl start jenkins**

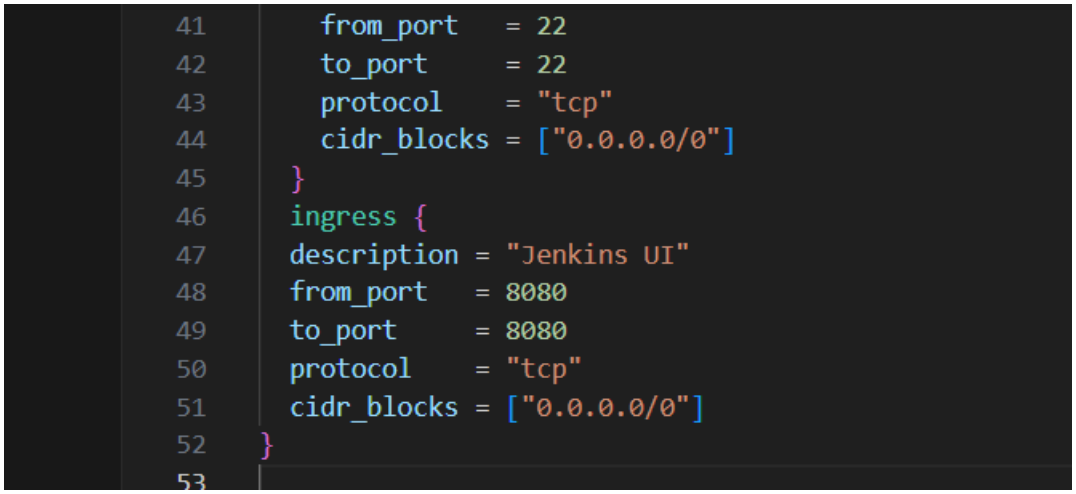
**systemctl enable jenkins**

**EOF**

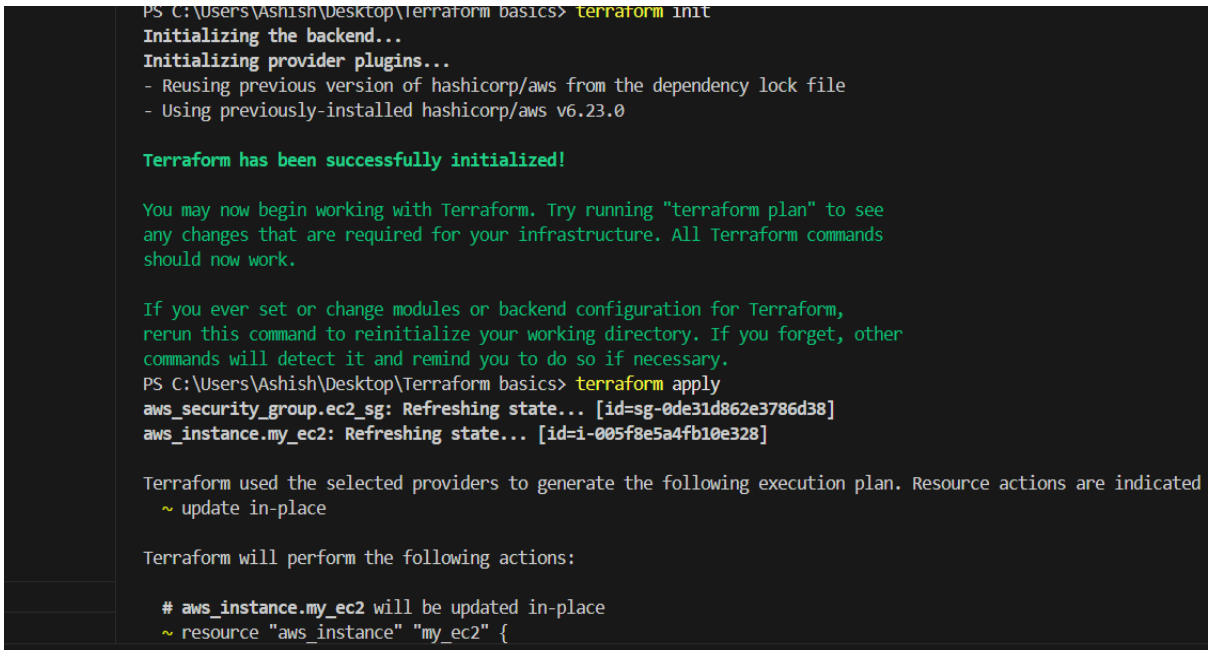
And also add open port for Jenkins.

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



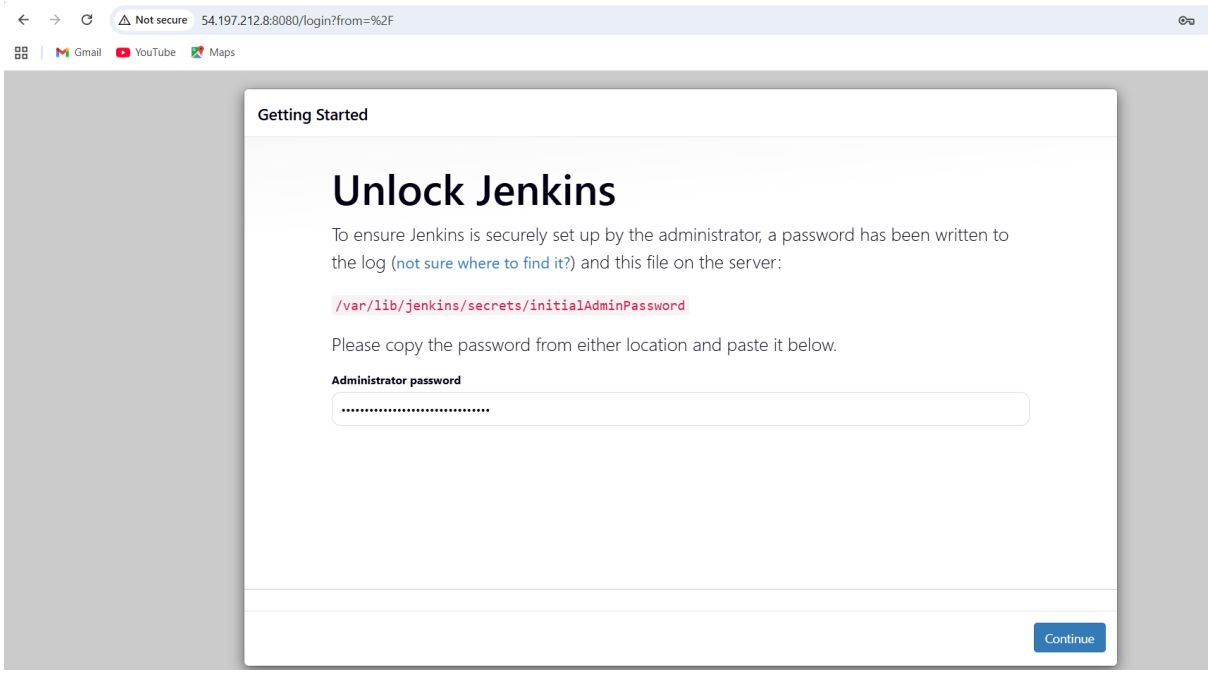



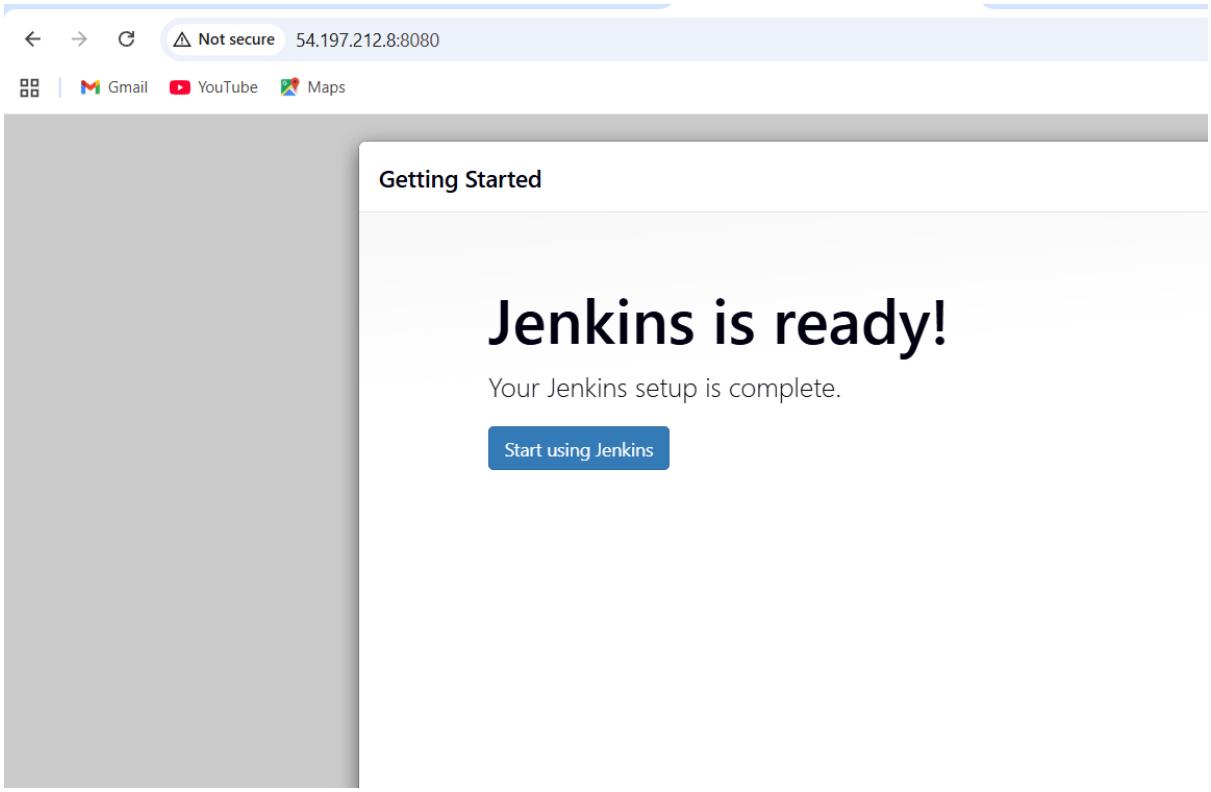

- terraform init
- terraform apply

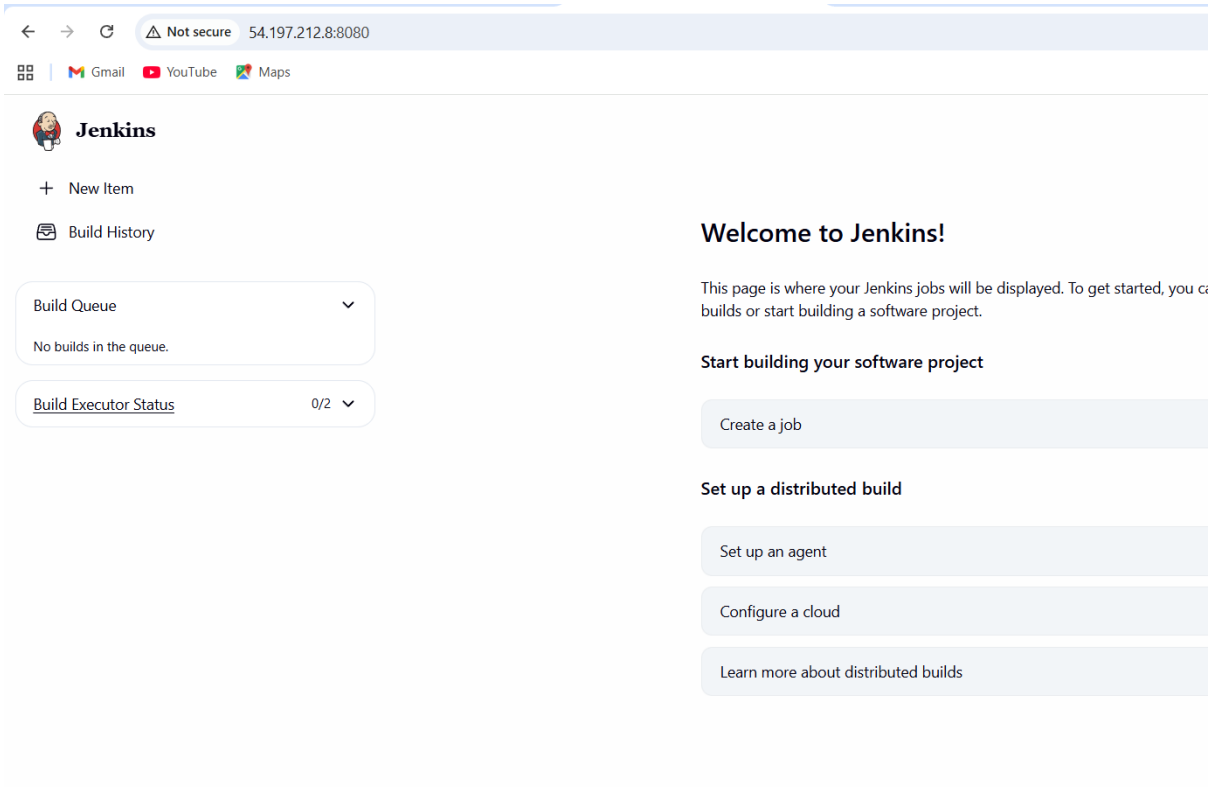


```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS

        # (9 unchanged attributes hidden)
    }

Plan: 0 to add, 2 to change, 0 to destroy.
Plan: 0 to add, 2 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_security_group.ec2_sg: Modifying... [id=sg-0de31d862e3786d38]
aws_security_group.ec2_sg: Modifications complete after 3s [id=sg-0de31d862e3786d38]
aws_instance.my_ec2: Modifying... [id=i-005f8e5a4fb10e328]
aws_instance.my_ec2: Still modifying... [id=i-005f8e5a4fb10e328, 00m10s elapsed]
aws_instance.my_ec2: Still modifying... [id=i-005f8e5a4fb10e328, 00m20s elapsed]
aws_instance.my_ec2: Still modifying... [id=i-005f8e5a4fb10e328, 00m30s elapsed]
aws_instance.my_ec2: Modifications complete after 37s [id=i-005f8e5a4fb10e328]

Apply complete! Resources: 0 added, 2 changed, 0 destroyed.
PS C:\Users\Ashish\Desktop\Terraform basics>
```

Search on browser by using public_ip and port number 8080.






## 5. Create one Jenkins job to build and push the Docker image to Docker Hub.

- **Source: https://github.com/betawins/Python-app.git**

 **Source Codes: https://github.com/betawins/docker-tasks.git**

- **From the frontend source code, write a Dockerfile, build a Docker image, run it, and push that image to your Docker registry.**
- **From the Java-based source code, write a Dockerfile, build, run, and push the image to the Docker registry.**
- **From the Node.js-based source code, write a Dockerfile, build with tag v1, run, and push it to the Docker registry.**
- **Write a docker-compose file to set up WordPress with a MySQL database.**

Make sure you have your  Jenkins server and docker server in the same instance.

- yum install docker -y
- systemctl start docker

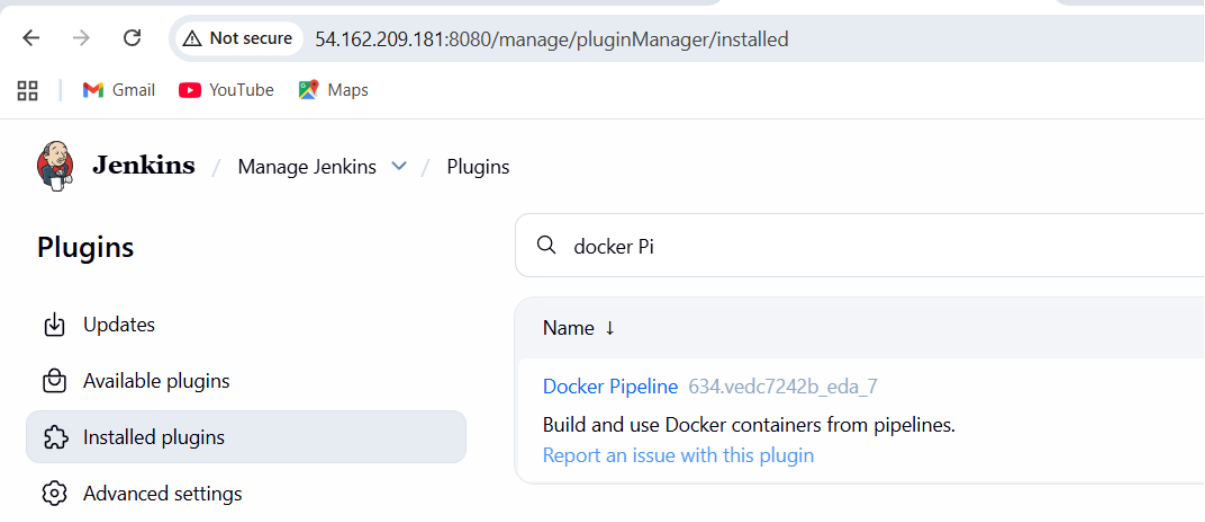
```
[root@ip-172-31-109-235 ~]# yum install docker -y
Last metadata expiration check: 0:45:23 ago on Thu Nov 27 09:16:4
Dependencies resolved.
================================================================
 Package                 Architecture              Version
================================================================
Installing:
 docker                  x86_64                    25.0.13-1.am

Transaction Summary
================================================================
Install  1 Package

Total size: 46 M
Installed size: 179 M
Downloading Packages:
[SKIPPED] docker-25.0.13-1.amzn2023.0.2.x86_64.rpm: Already downl
Running transaction check
```

- usermod -aG docker Jenkins
- systemctl restart jenkins

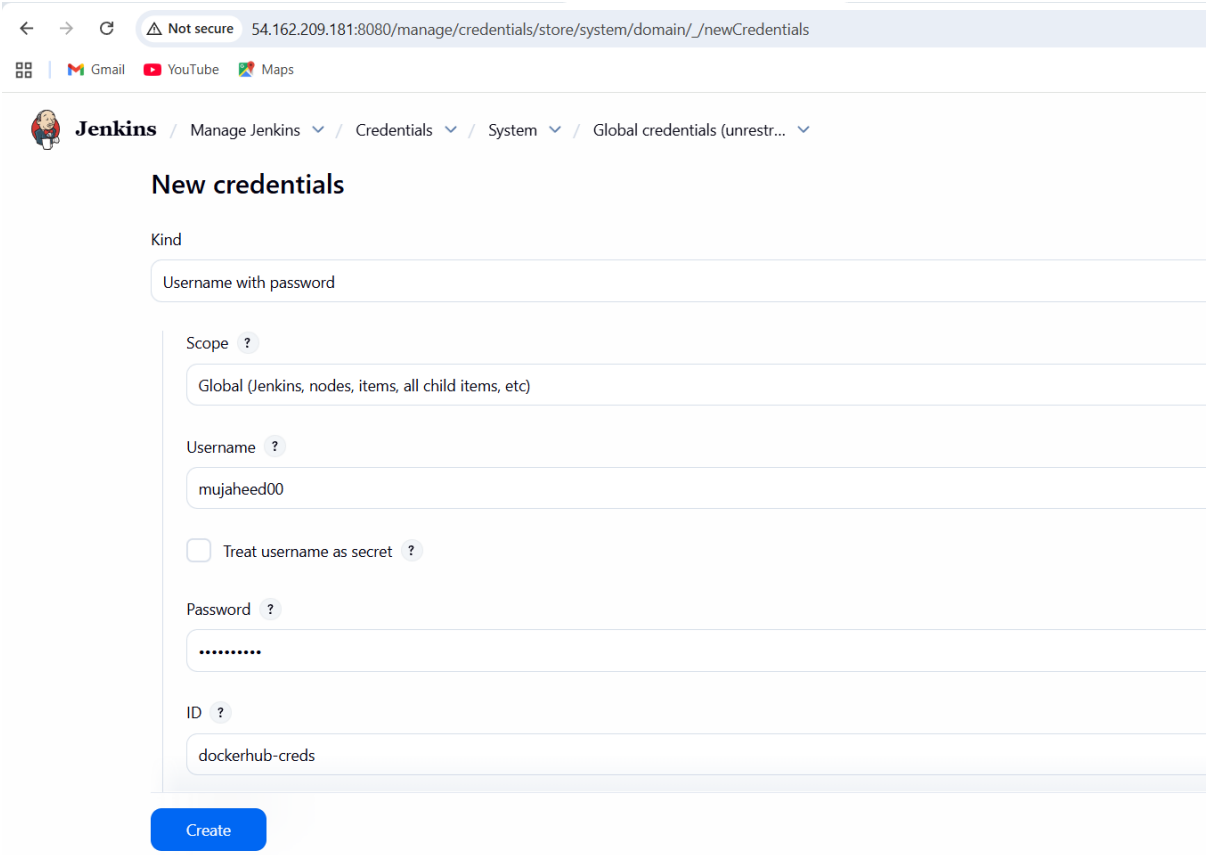
```
[root@ip-172-31-109-235 ~]# usermod -aG docker jenkins
[root@ip-172-31-109-235 ~]# systemctl restart jenkins
```

Go to Jenkins, manage Jenkins,plugins,available plugins.Install

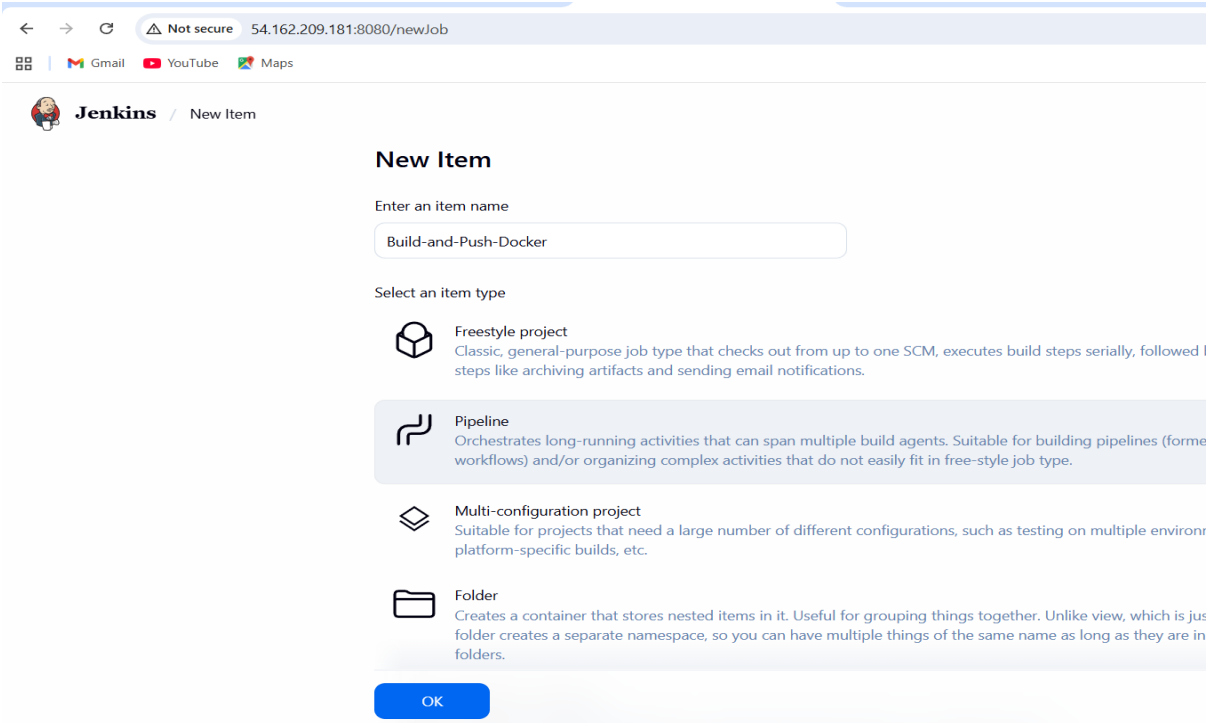
- Docker pipeline

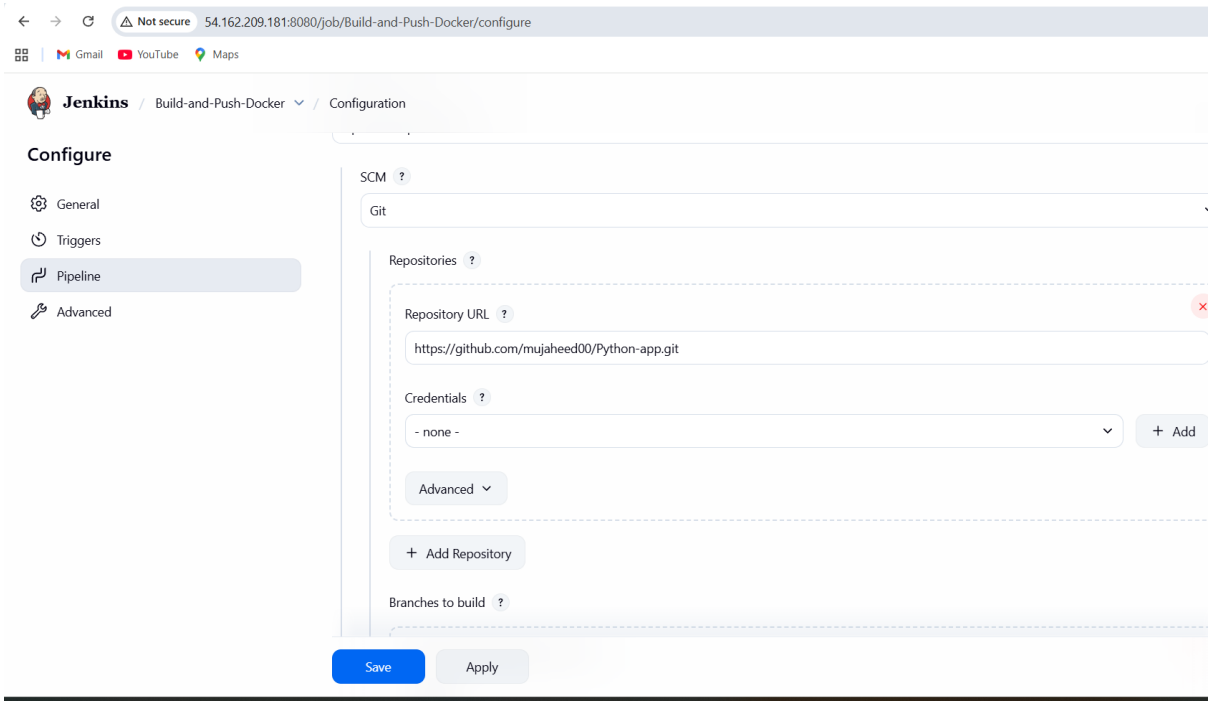



Go to manage Jenkins,credentials,system,global credentials and give the docker hub username and password.




Click on new item and name it as Build-and-Push-Docker and select type as pipeline.






- cd /var/lib/jenkins/workspace/Build-and-Push-Docker
- mkdir docker-tasks
- cd docker-tasks

```
[root@ip-172-31-109-235 ~]# cd /var/lib/jenkins/workspace/
[root@ip-172-31-109-235 workspace]# cd /var/lib/jenkins/workspace/Build-and-Push-Docker/
[root@ip-172-31-109-235 Build-and-Push-Docker]# cd docker-tasks
```

```
[root@ip-172-31-109-235 Build-and-Push-Docker]# git clone https://github.com/betawins/docker-tasks.git
Cloning into 'docker-tasks'...
remote: Enumerating objects: 146, done.
remote: Counting objects: 100% (146/146), done.
remote: Compressing objects: 100% (123/123), done.
remote: Total 146 (delta 12), reused 141 (delta 9), pack-reused 0 (from 0)
Receiving objects: 100% (146/146), 22.11 MiB | 72.79 MiB/s, done.
Resolving deltas: 100% (12/12), done.
[root@ip-172-31-109-235 Build-and-Push-Docker]# ls
docker-tasks
[root@ip-172-31-109-235 Build-and-Push-Docker]# cd docker-tasks
[root@ip-172-31-109-235 docker-tasks]# ls
Frontend_based_source  Java_based_source  NodeJs_based_source  README.md
[root@ip-172-31-109-235 docker-tasks]# mkdir frontend
mkdir java
mkdir node
[root@ip-172-31-109-235 docker-tasks]# mv Frontend_based_source frontend/
[root@ip-172-31-109-235 docker-tasks]# mv Java_based_source java/
[root@ip-172-31-109-235 docker-tasks]# mv NodeJs_based_source node/
[root@ip-172-31-109-235 docker-tasks]# ls -R
```

in that docker-tasks you need to create sub directories

- mkdir frontend java node

- mv Frontend_based_source frontend/
- mv Java_based_source java/
- mv NodeJs_based_source node/

```
[root@ip-172-31-109-235 docker-tasks]# mkdir frontend
mkdir java
mkdir node
[root@ip-172-31-109-235 docker-tasks]# mv Frontend_based_source frontend/
[root@ip-172-31-109-235 docker-tasks]# mv Java_based_source java/
[root@ip-172-31-109-235 docker-tasks]# mv NodeJs_based_source node/
[root@ip-172-31-109-235 docker-tasks]# ls -R
```

You need to have your directories and files in this structure.

**docker-tasks/**

**frontend/**

**Frontend_based_source/**

**Dockerfile.frontend**

**java/**

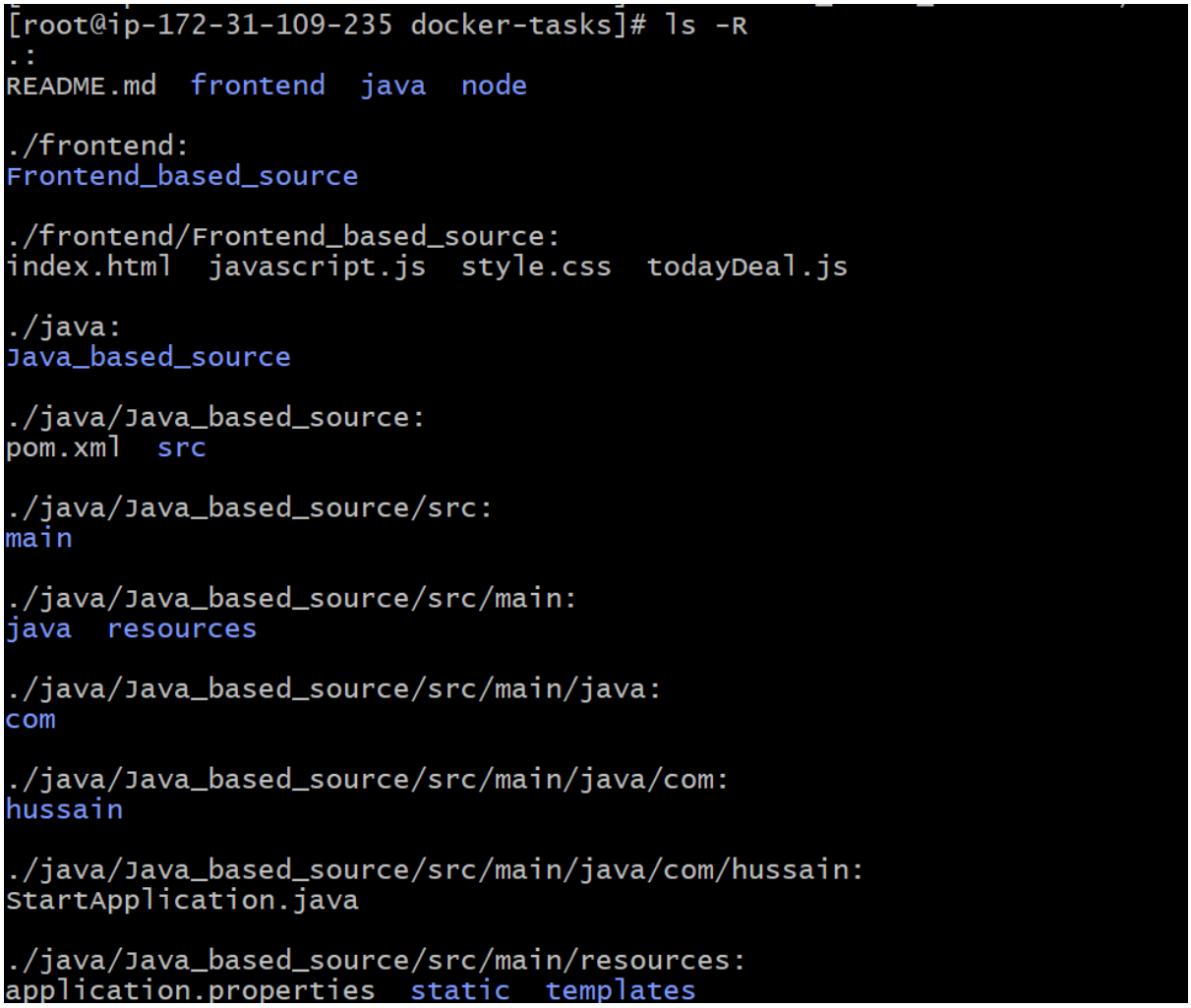
**Java_based_source/**

**Dockerfile.java**

**node/**

**NodeJs_based_source/**

**Dockerfile.node**




Go to frontend directory and create a file

- vi Dockerfile.frontend

**FROM nginx:latest**

**COPY Frontend_based_source /usr/share/nginx/html**

**EXPOSE 80**

go to java directory

- vi Dockerfile.java

**FROM maven:3.9.6-eclipse-temurin-17 AS build**

**WORKDIR /app**

**COPY Java_based_source /app**

**RUN mvn clean package -DskipTests**

**FROM eclipse-temurin:17-jdk**

**WORKDIR /app**

**COPY --from=build /app/target/*.jar app.jar**

**EXPOSE 8080**

**ENTRYPOINT ["java", "-jar", "app.jar"]**

go to node directory

- vi Dockerfile.node

**FROM node:18**

**WORKDIR /app**

**COPY NodeJs_based_source /app**

**RUN npm install**

**RUN npm run build**

**EXPOSE 3000**

**CMD ["npm", "start"]**

```
[root@ip-172-31-109-235 docker-tasks]# cd frontend
[root@ip-172-31-109-235 frontend]# vi Dockerfile.frontend
[root@ip-172-31-109-235 frontend]# cd ../java
[root@ip-172-31-109-235 java]# vi Dockerfile.java
[root@ip-172-31-109-235 java]# cd ../node
[root@ip-172-31-109-235 node]# vi Dockerfile.node
```

In your git repository your Jenkins file should be like this.

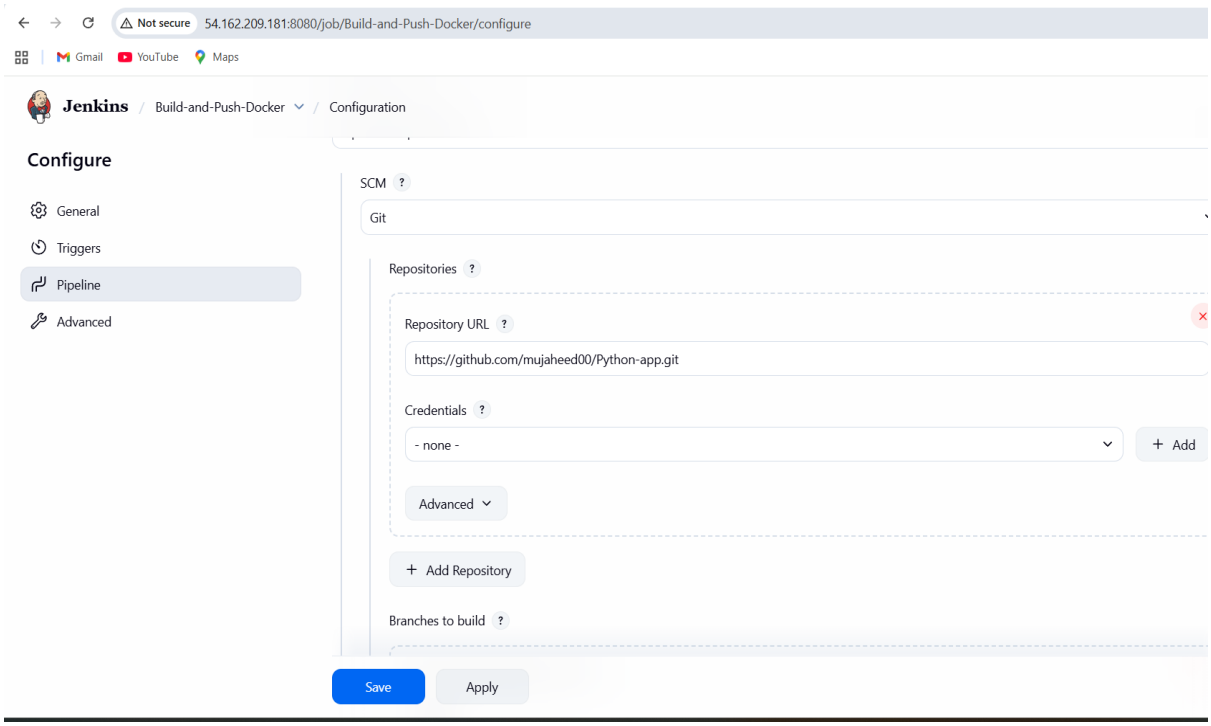
https://github.com/mujaheed00/Python-app.git

```
pipeline {
    agent any

    environment {
        DOCKERHUB_CREDENTIALS = credentials('dockerhub-creds')
        IMAGE_NAME = "mujaheed00/python-app"
    }

    stages {

        stage('Clone Repository') {
            steps {
                echo "Cloning repo..."
                git branch: 'main',
                    url: 'https://github.com/mujaheed00/Python-app.git'
            }
        }
```

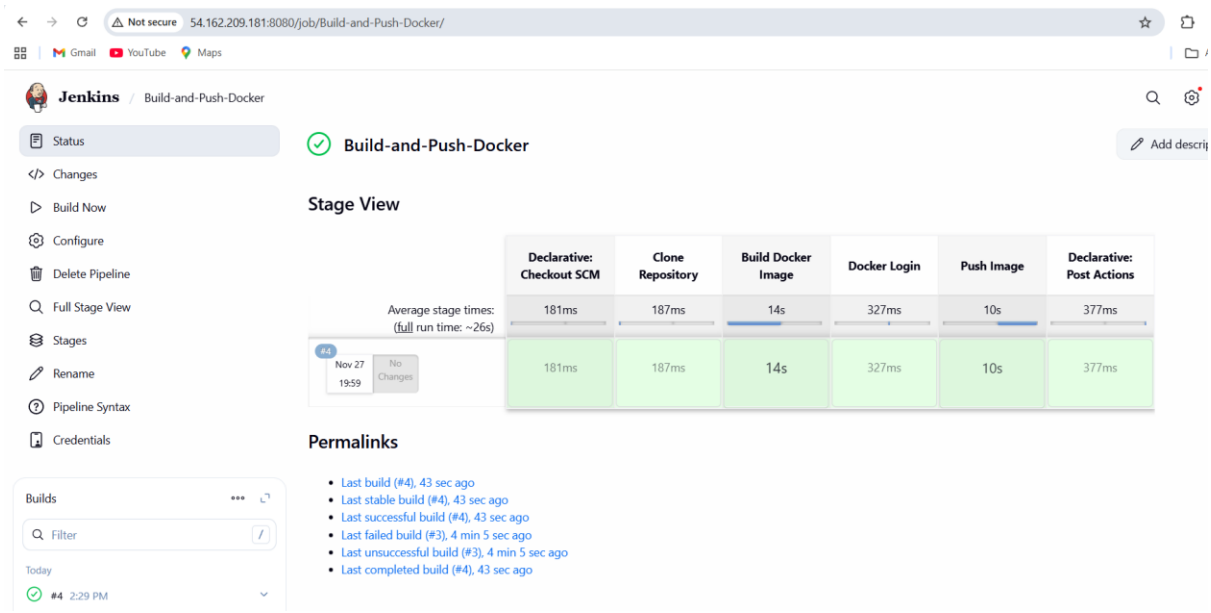
```
        stage('Build Docker Image') {
            steps {
                echo "Building Docker image..."
                sh """
                    docker build -t ${IMAGE_NAME}:latest .
                """
            }
        }

        stage('Docker Login') {
            steps {
                echo "Logging into Docker Hub..."
                sh """
                    echo ${DOCKERHUB_CREDENTIALS_PSW} | docker login -u ${DOCKERHUB_CREDENTIALS_USR} --password-stdin
                """
            }
        }
```

```
        stage('Push Image') {
            steps {
                echo "Pushing Docker image..."
                sh """
                    docker push ${IMAGE_NAME}:latest
                """
            }
        }
    }

    post {
        always {
            script {
                echo "Pipeline finished!"
                sh "docker images"
            }
        }
    }
}
```

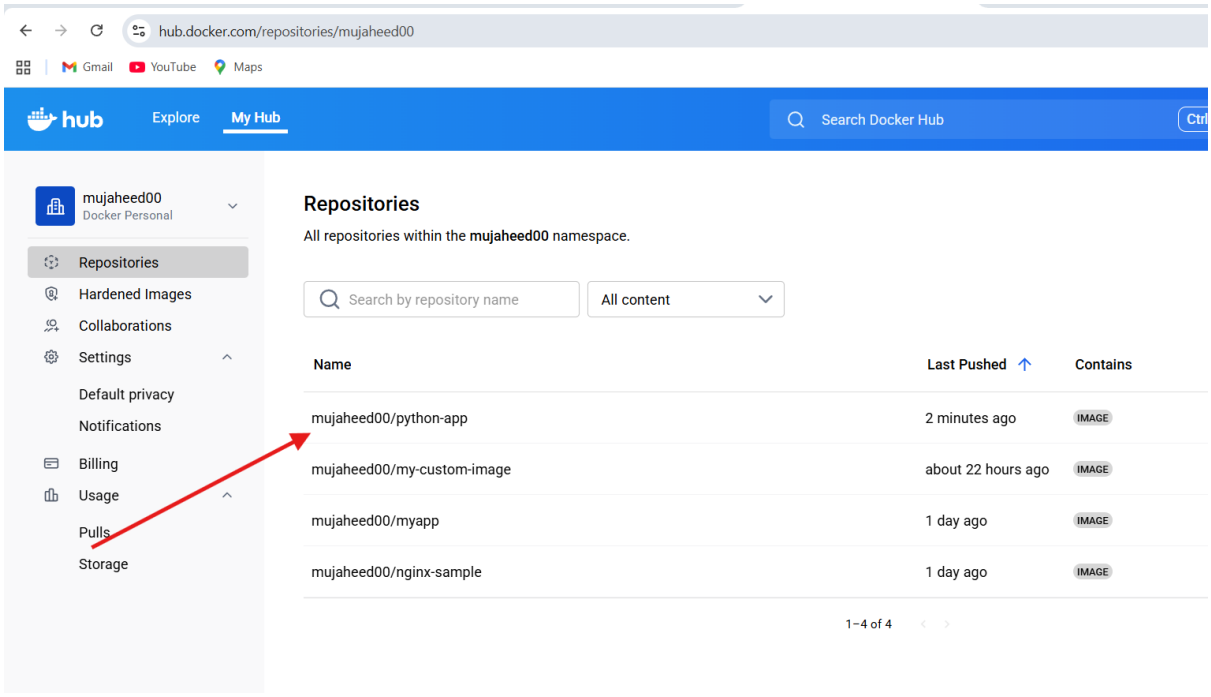
Go to your job select scm and give your repository.

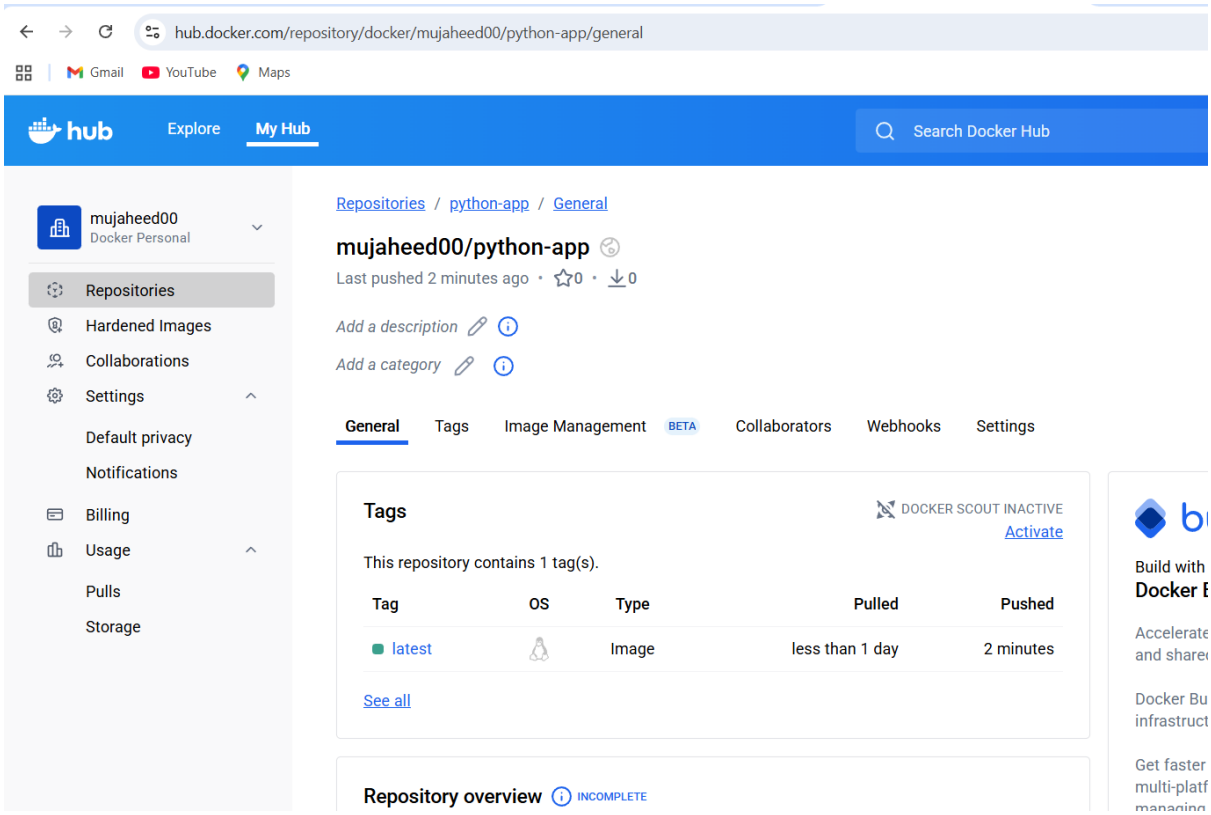



Click on build now.




An repository and image has been created in your dockerhub.



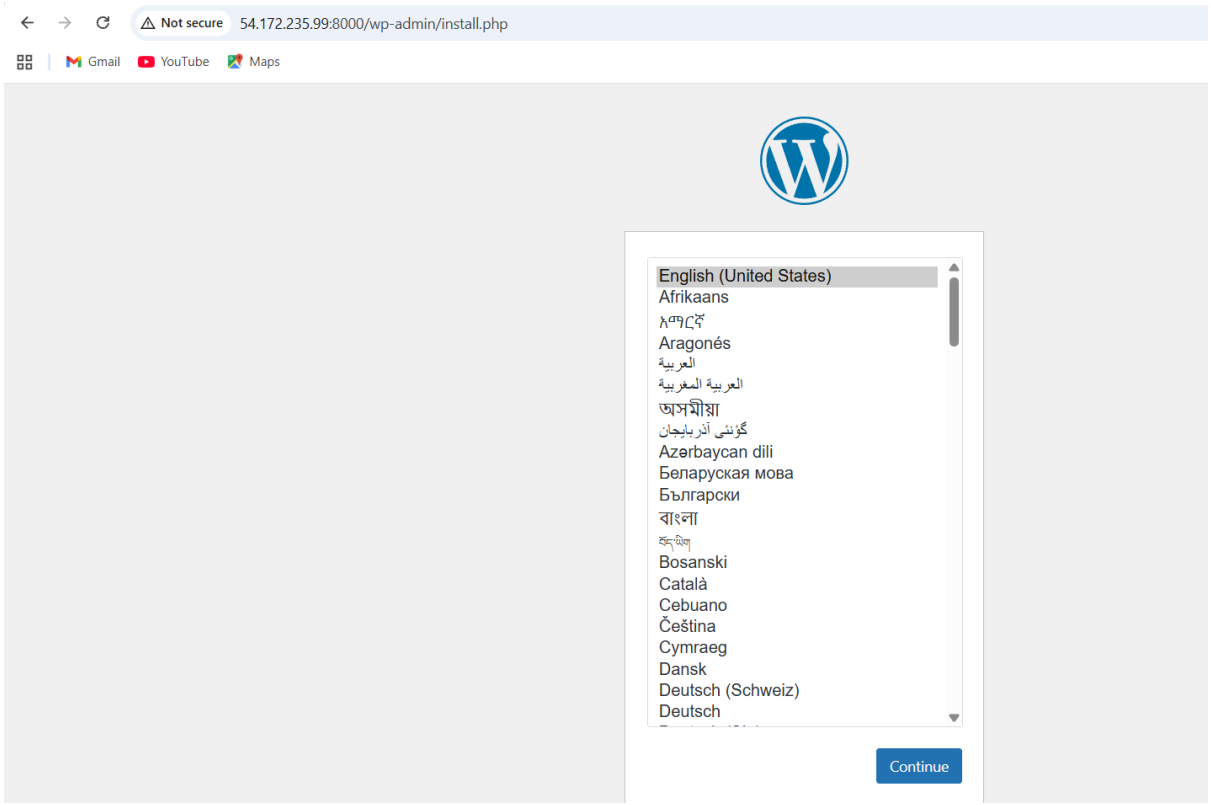

```
[root@ip-172-31-109-235 ~]# cd /var/lib/jenkins
[root@ip-172-31-109-235 jenkins]# vi docker-compose.yml
[root@ip-172-31-109-235 jenkins]# docker-compose up -d
```

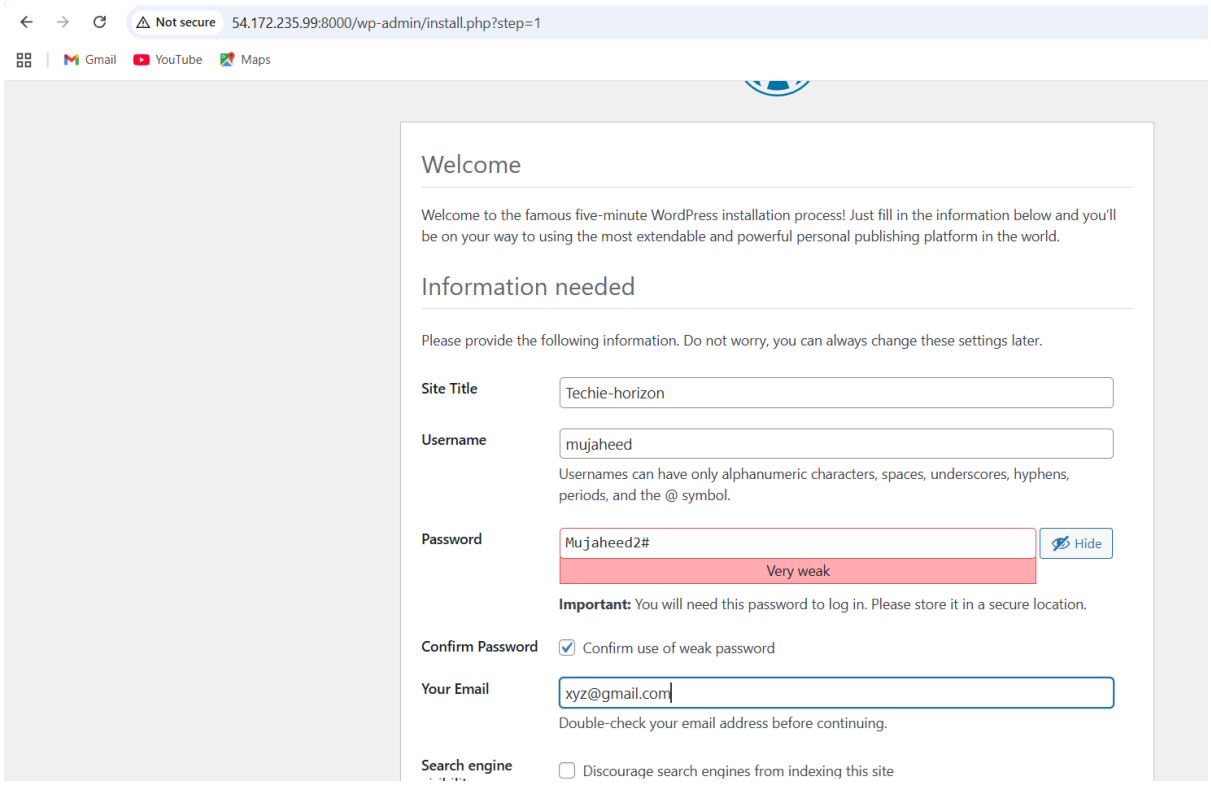
- vi docker-compose.yml

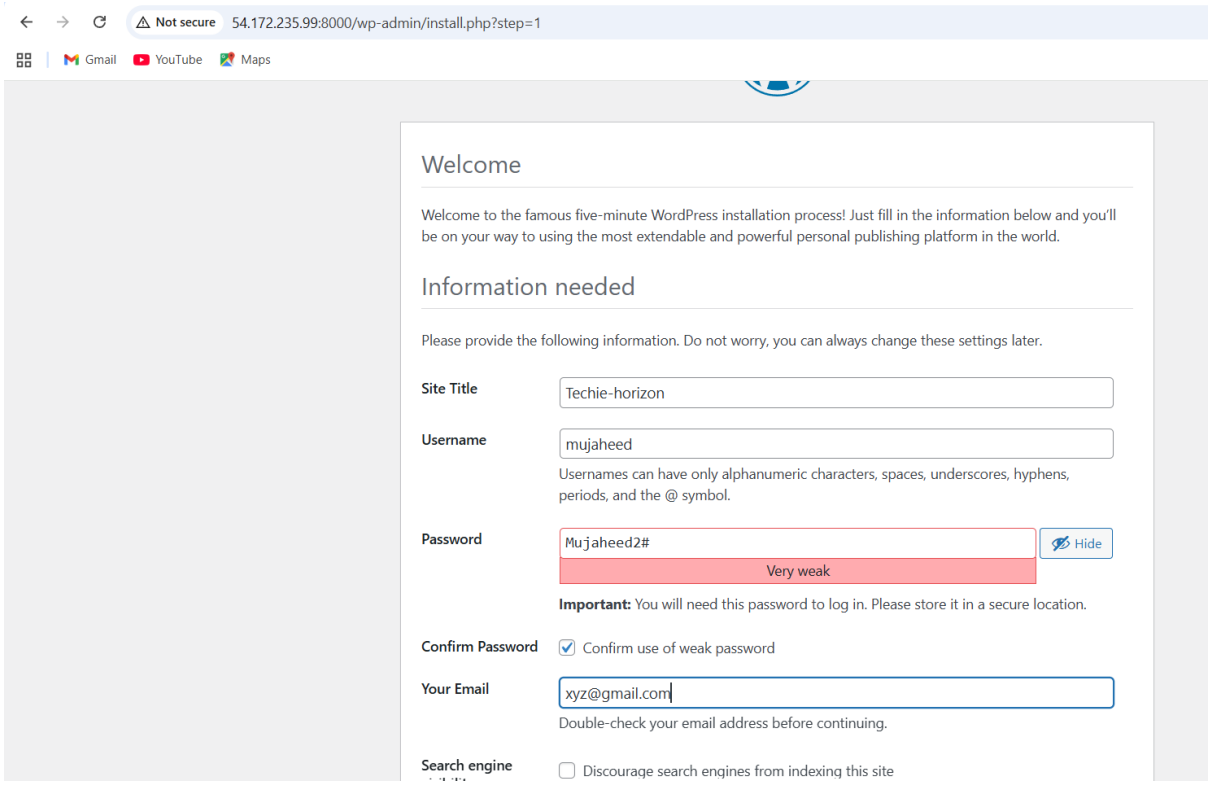
```yaml
version: '3.8'

services:
  db:
    image: mysql:5.7
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: root123
      MYSQL_DATABASE: wpdb
      MYSQL_USER: wpuser
      MYSQL_PASSWORD: wppass
    volumes:
      - db_data:/var/lib/mysql

  wordpress:
    image: wordpress:latest
    restart: always
    ports:
      - "8080:80"
    environment:
      WORDPRESS_DB_HOST: db:3306
      WORDPRESS_DB_USER: wpuser
      WORDPRESS_DB_PASSWORD: wppass
      WORDPRESS_DB_NAME: wpdb
    depends_on:
      - db

volumes:
  db_data:

~
```

- docker-compose up -d

```
[root@ip-172-31-109-235 jenkins]# sudo chmod +x /usr/libexec/docker/cli-plugins/docker-compose
[root@ip-172-31-109-235 jenkins]# docker compose up -d
WARN[0000] /var/lib/jenkins/docker-compose.yml: the attribute `version` is obsolete, it will be ignore
void potential confusion
[+] Running 37/2
 ✔ wordpress Pulled
 ✔ db Pulled
[+] Running 3/4
 ✔ Network jenkins_default         Created
 ✔ Volume "jenkins_db_data"        Created
 ✔ Container jenkins-db-1          Started
 ⠙ Container jenkins-wordpress-1   Starting
Error response from daemon: driver failed programming external connectivity on endpoint jenkins-wordp
```


Not secure
54.172.235.99:8000/wp-admin/install.php
Gmail
YouTube
Maps
English (United States)
Afrikaans
አማርኛ
Aragonés
العربية
العربية المغربية
অসমীয়া
گؤنئی آذربایجان
Azərbaycan dili
Беларуская мова
Български
বাংলা
Bosanski
Català
Cebuano
Čeština
Cymraeg
Dansk
Deutsch (Schweiz)
Deutsch
Continue


Not secure
54.172.235.99:8000/wp-admin/install.php?step=1
Gmail
YouTube
Maps
Welcome
Welcome to the famous five-minute WordPress installation process! Just fill in the information below and you'll be on your way to using the most extendable and powerful personal publishing platform in the world.
Information needed
Please provide the following information. Do not worry, you can always change these settings later.
Site Title
Techie-horizon
Username
mujaheed
Usernames can have only alphanumeric characters, spaces, underscores, hyphens, periods, and the @ symbol.
Password
Mujaheed2#
Hide
Very weak
Important: You will need this password to log in. Please store it in a secure location.
Confirm Password
Confirm use of weak password
Your Email
xyz@gmail.com
Double-check your email address before continuing.
Search engine
Discourage search engines from indexing this site


Not secure
54.172.235.99:8000/wp-admin/install.php?step=1
Gmail
YouTube
Maps
Welcome
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Site Title
Techie-horizon
Username
mujaheed
Usernames can have only alphanumeric characters, spaces, underscores, hyphens, periods, and the @ symbol.
Password
Mujaheed2#
Hide
Very weak
Important: You will need this password to log in. Please store it in a secure location.
Confirm Password
Confirm use of weak password
Your Email
xyz@gmail.com
Double-check your email address before continuing.
Search engine
Discourage search engines from indexing this site