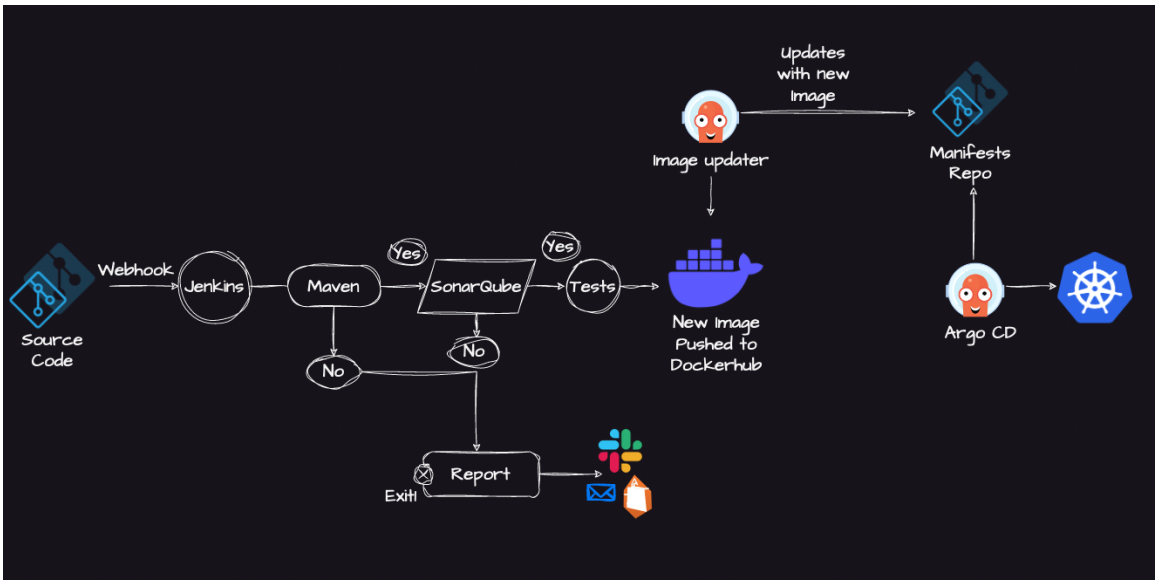
Jenkins Pipeline for Java based application using Maven, SonarQube, Argo CD, AWS EKS, GIT AND GITHUB.



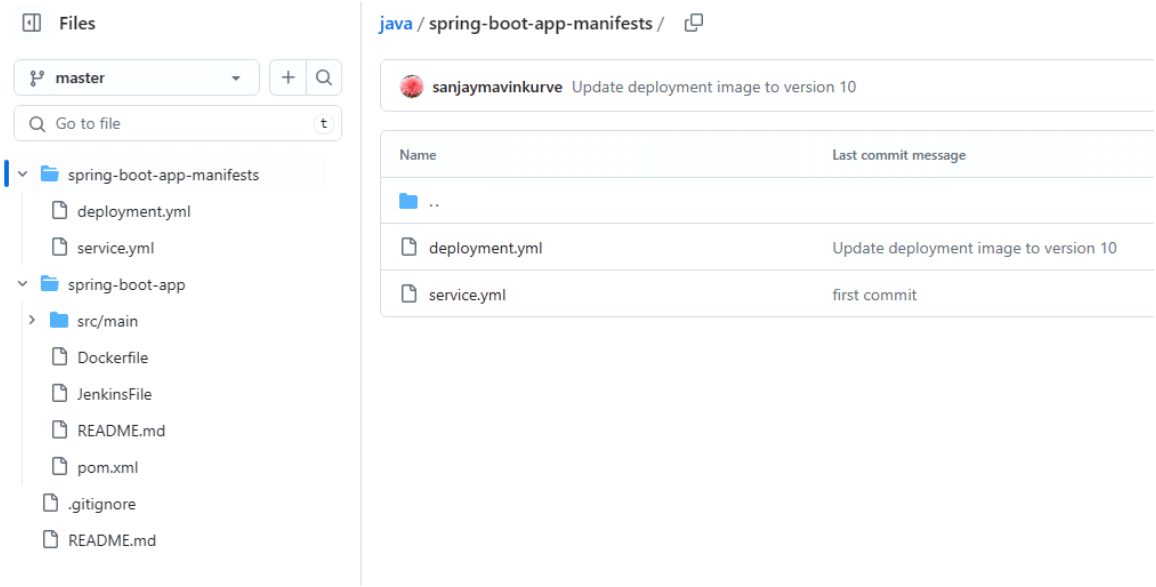
Prerequisites:

1. Basic knowledge of Jenkins, Docker, Kubernetes, Maven, SonarQube, Git, GitHub, and ArgoCD, AWS.

2. DockerHub and GitHub accounts are required.

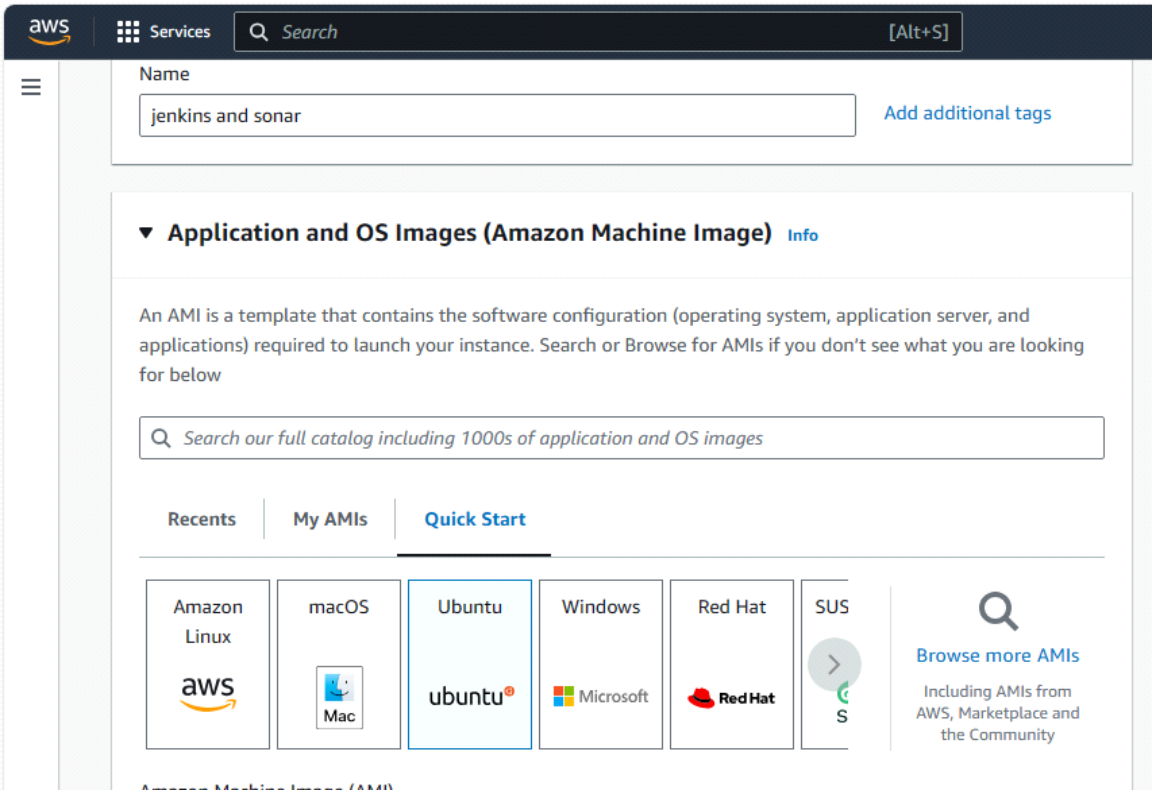
3. Fork my repository https://github.com/Sanjay6372/java.git.

code hierarchy



1. Create a t2 or t3 medium type of EC2 instance with Ubuntu OS for jekins and sonarqube.

Go to your aws account---> Type EC2 in search---> Click on Launch instance---> Fill info like name , select AMI to Ubuntu, create new Key for login and select storage to 20GB. Create new security group. Others options take as default.


aws
Services
Search
[Alt+S]
Name
jenkins and sonar
Add additional tags
Application and OS Images (Amazon Machine Image)
Info
An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below
Search our full catalog including 1000s of application and OS images
Recents
My AMIs
Quick Start
Amazon Linux
macOS
Ubuntu
Windows
Red Hat
SUS
Mac
ubuntu
Microsoft
Red Hat
Browse more AMIs
Including AMIs from AWS, Marketplace and the Community

Create key pair

Key pair name

Key pairs allow you to connect to your instance securely.

keyy

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

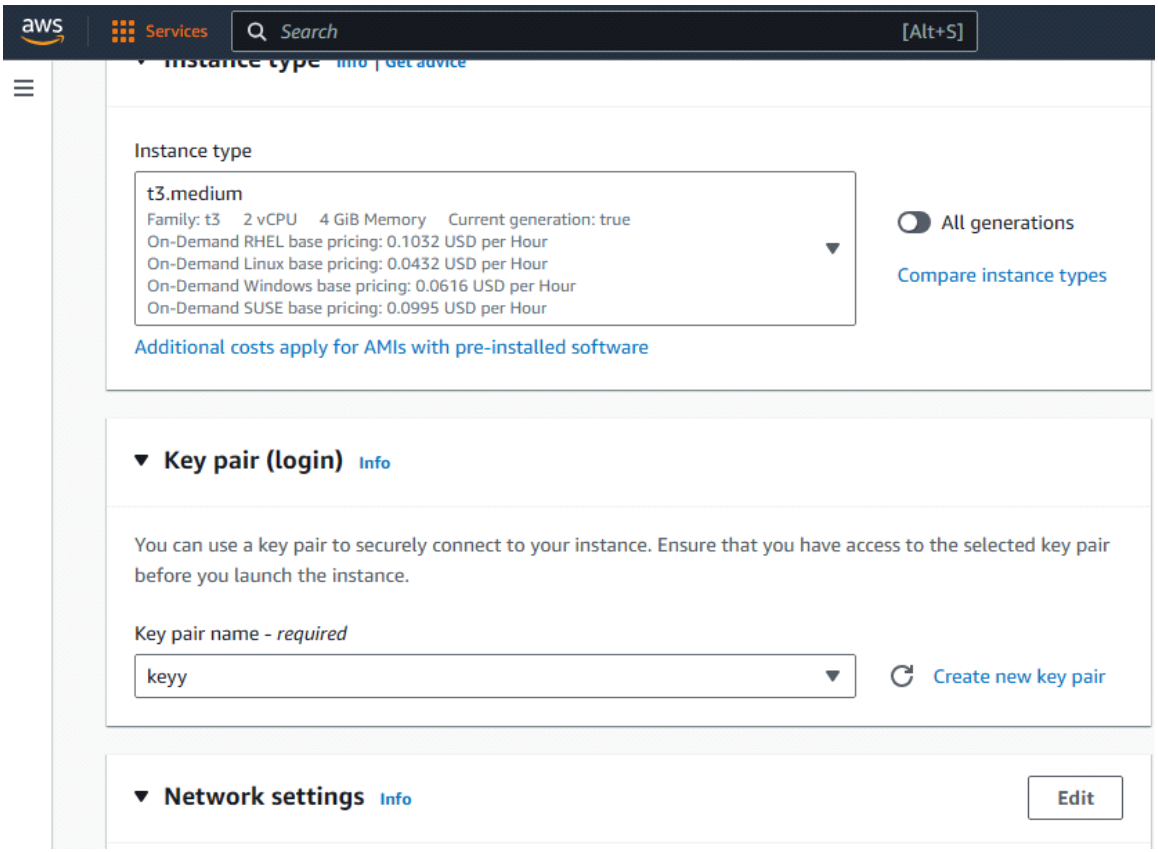
- RSA
  RSA encrypted private and public key pair
- ED25519
  ED25519 encrypted private and public key pair

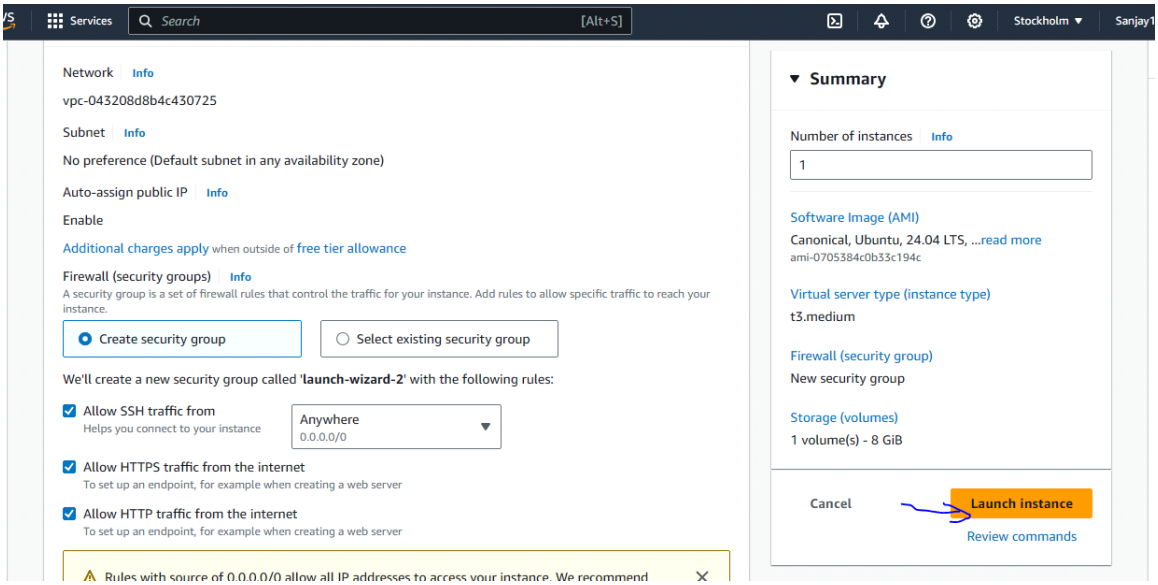
Private key file format

- .pem
  For use with OpenSSH
- .ppk
  For use with PuTTY

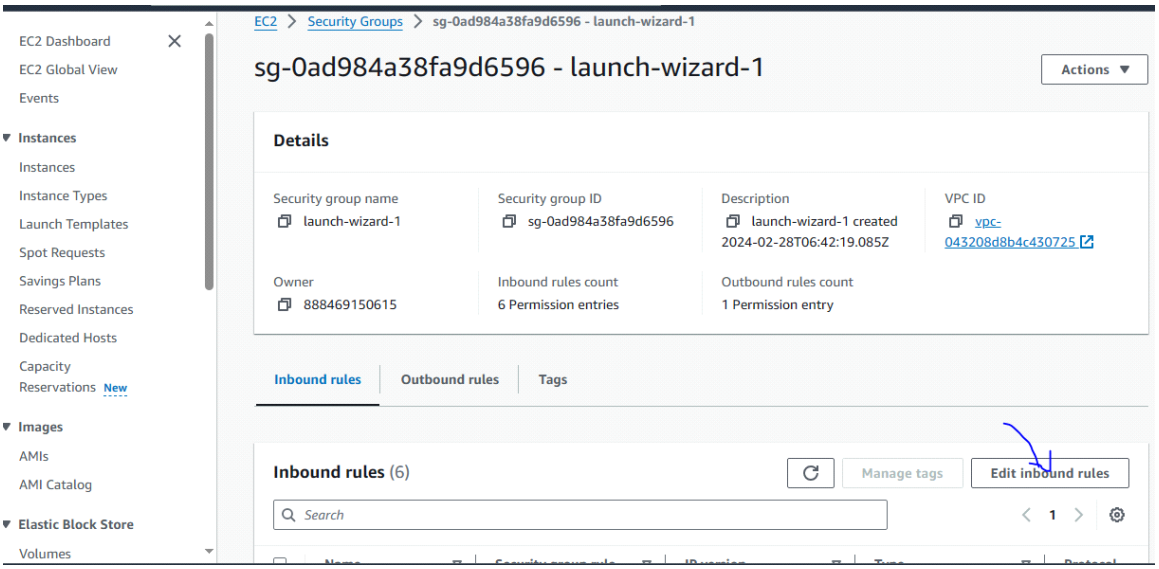
⚠ When prompted, store the private key in a secure and accessible location on your computer. **You will need it later to connect to your instance.** Learn

Cancel | Create key pair

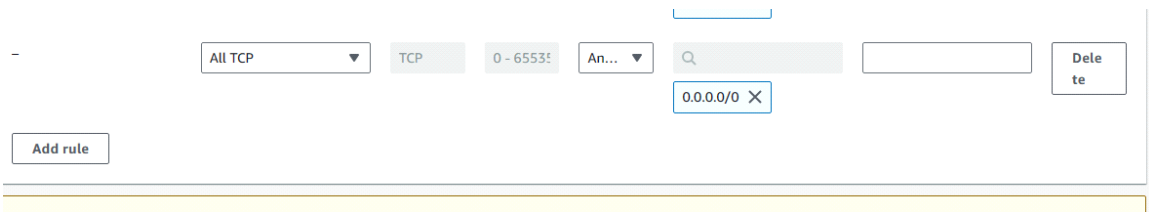




After launch, wait for sometime then go to instance ---> go to security group and edit inbound rule.



allow all tcp ports and save it.



2. Install Mobaxterm for window and ssh to our newly created AWS machine.

open mobaxterm and run command" ssh -i 'private key path' ubuntu@ip-of-aws-machine"

use key that we have generated and put in place of private key path and take public ip of instance from aws consule.

```
07/05/2024  10:37.46  /home/mobaxterm  ssh -i 'C:\Users\Sanjay\Downloads\key (1).pem'  ubuntu@16.171.171.44
```

3. Install Jenkins by run below commands.

. apt update

. apt install openjdk-11-jre

. java -version

. sudo wget -O /usr/share/keyrings/jenkins-keyring.asc \

https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key

```
  echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \
    <https://pkg.jenkins.io/debian-stable binary/> | sudo tee \
    /etc/apt/sources.list.d/jenkins.list > /dev/null
```

. apt update

. apt-get install jenkins

. systemctl enable jenkins

. systemctl start jenkins

. systemctl status jenkins

4. Install sonarQube and start by run below commands.

. apt install unzip wget

. sudo apt install default-jdk

. adduser sonarqube

. Usermod -Ga sudo sonarqube

. su - sonarqube

. wget https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-9.4.0.54424.zip

. unzip *

. chmod -R 755 /home/sonarqube/sonarqube-9.4.0.54424

. chown -R sonarqube:sonarqube /home/sonarqube/sonarqube-9.4.0.54424

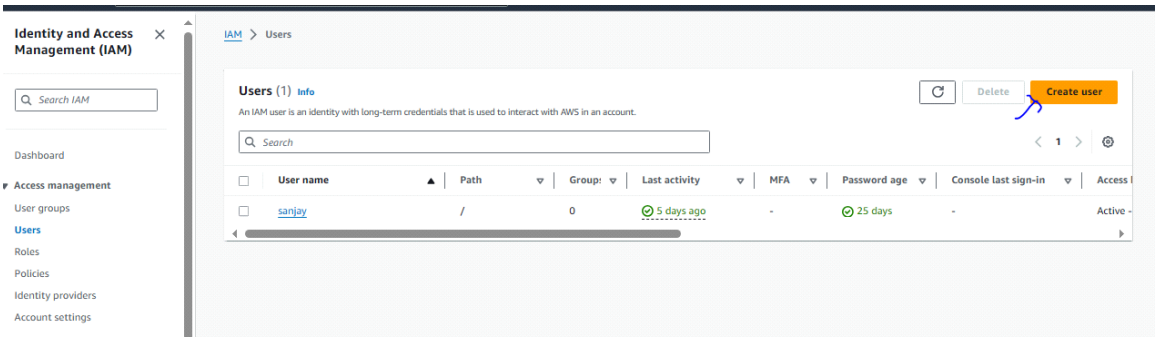
. cd sonarqube-9.4.0.54424/bin/linux-x86-64/

. ./sonar.sh start

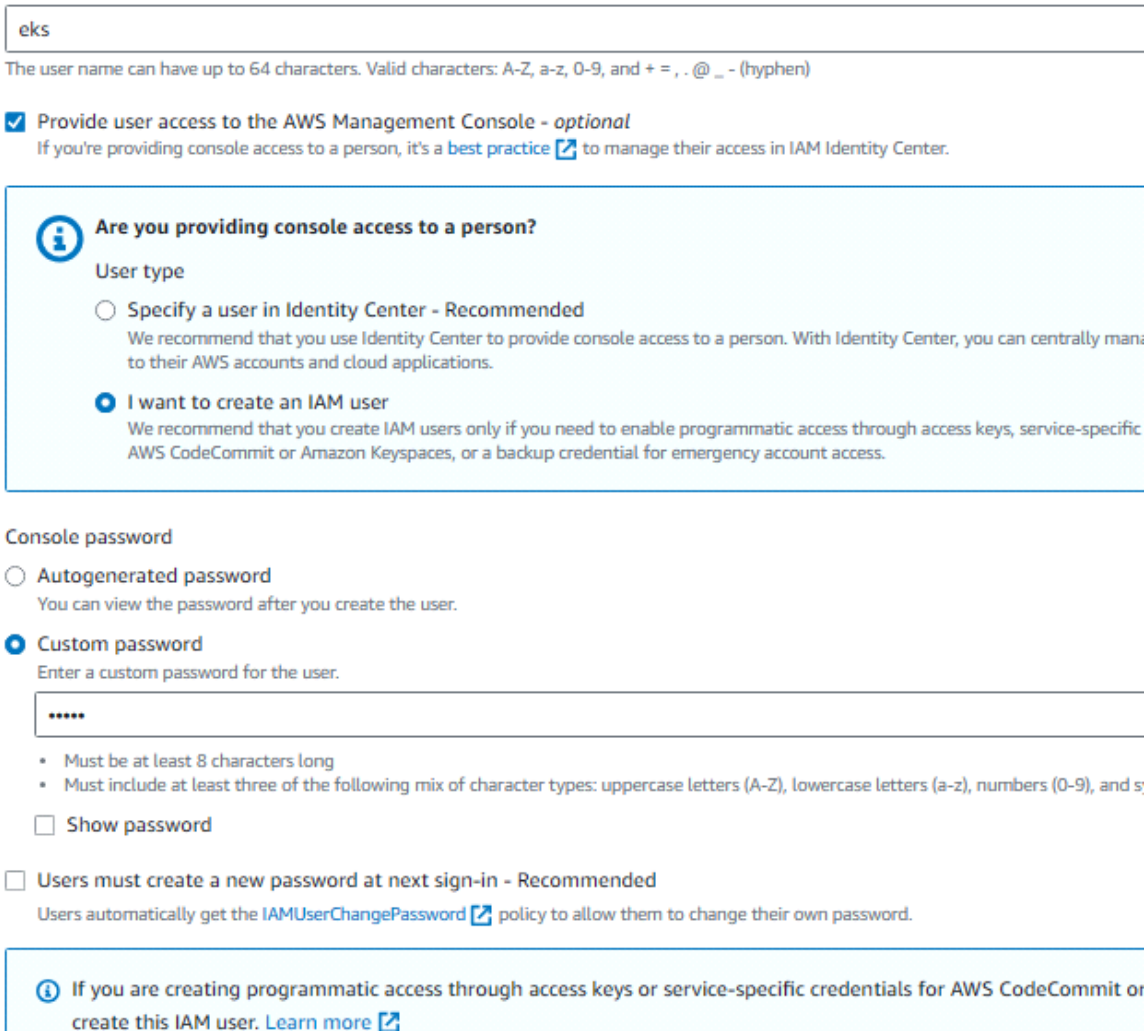
3. EKS setup on AWS

First Create a user in AWS IAM with name EKS.

Go to IAM ---> user ---> create user



Fill same info like below



Click on next and Select attach policy option and select below permission and save it.

AmazonEC2FullAccess

AmazonEKS_CNI_Policy

AmazonEKSClusterPolicy

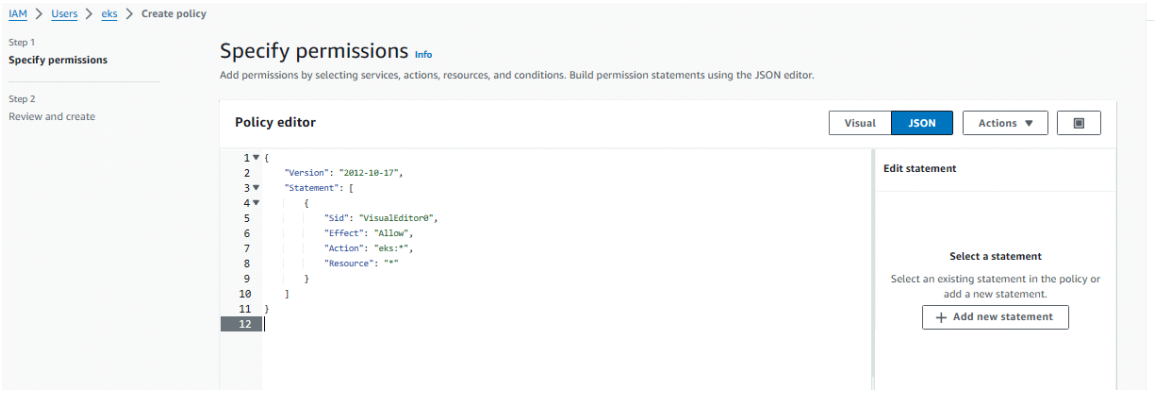
AmazonEKSWorkerNodePolicy

AWSCloudFormationFullAccess

IAMFullAccess

Then click back to newly created user ---> add policy ---> add inline policy ---> put below code and save it

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "VisualEditor0",
            "Effect": "Allow",
            "Action": "eks:*",
            "Resource": "*"
        }
    ]
}
```



 # Create one more EC2 instace to control our EKS, use ubuntu AMI.

#Login to newly created EC2 instance by mobaxtreme then run below commands

#INSTALL AWS CLI

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

. sudo apt install unzip

. unzip awscliv2.zip

. sudo ./aws/install

. aws configure # this command will ask access key and secret key so put here your newly created user access and secret key

#INSTALL KUBECTL

.curl -o kubectl https://amazon-eks.s3.us-west-2.amazonaws.com/1.19.6/2021-01-05/bin/linux/amd64/kubectl

. chmod +x ./kubectl

. sudo mv ./kubectl /usr/local/bin

. kubectl version --short --client

#INSTALL EKS CTL

. curl --silent --location "<https://github.com/weaveworks/eksctl/releases/latest/download/eksctl_$(uname -s)_amd64.tar.gz>" | tar xz -C /tmp

. sudo mv /tmp/eksctl /usr/local/bin

. eksctl version

Create EKS CLUSTER by run below commands

. eksctl create cluster --name=EKS-1 \

--region=ap-south-1 \ **# change region with your current aws selected region**

--zones=ap-south-1a,ap-south-1b \ **# put zones of same region you have selected above**

--without-nodegroup

. eksctl utils associate-iam-oidc-provider \

--region ap-south-1 \

--cluster EKS-1 \

--approve

. eksctl create nodegroup --cluster=EKS-1 \

--region=ap-south-1 \

--name=node2 \

--node-type=t3.medium \

--nodes=3 \

--nodes-min=2 \

--nodes-max=2 \

--node-volume-size=20 \

--ssh-access \

--ssh-public-key=DevOps \ **# change Devops name with key name that u are using for login on aws machines**

--managed \

--asg-access \

--external-dns-access \

--full-ecr-access \

--appmesh-access \

--alb-ingress-access

remove all line that are in bold before run above command

4. Follow below steps to Install ArgoCD on same machine where you have ran above EKS commands.

 # Install Operator Lifecycle Manager (OLM), a tool to help manage the Operators running on your cluster by following command.

. curl -sL https://github.com/operator-framework/operator-lifecycle-manager/releases/download/v0.27.0/install.sh | bash -s v0.27.0

 # Install the operator by running the following command.

. kubectl create -f https://operatorhub.io/install/argocd-operator.yaml

#After install, watch your operator come up using next command.

. kubectl get csv -n operators

```
root@ip-172-31-46-226:~# kubectl get csv -n operators
NAME                      DISPLAY   VERSION   REPLACES                  PHASE
argocd-operator.v0.9.1    Argo CD   0.9.1     argocd-operator.v0.9.0    Succeeded
```

 # create file with name argo.yml and put below code in it.

apiVersion: argoproj.io/v1alpha1

kind: ArgoCD

metadata:

  name: example-argocd

  labels:

    example: basic

spec: {}

 # save above file and run below commad

. kubectl apply -f argo.yml

 # Run below command to see your Argocd running pods

. kubectl get pods

```
root@ip-172-31-46-226:~# kubectl get pods
NAME                                          READY   STATUS    RESTARTS   AGE
example-argocd-application-controller-0       1/1     Running   0          13d
example-argocd-redis-68bb584d8b-vn2bg         1/1     Running   0          13d
example-argocd-repo-server-b79657885-2qfnq    1/1     Running   0          13d
example-argocd-server-5876566c6b-q4fdj        1/1     Running   0          13d
```

 # Run below command to get password for login on Argocd

. kubectl edit secret example-argocd-cluster

then copy the password , hightlighted below in yellow color

```
# Please edit the object below. Lines beginning with a '#' will be ignored,
# and an empty file will abort the edit. If an error occurs while saving this file will be
# reopened with the relevant failures.
#
apiVersion: v1
data:
  admin.password: bllpY3pQNTZ4UlNnd3E3eTFyVGJHbGRVWDNqa0JOdVo=
kind: Secret
metadata:
  creationTimestamp: "2024-04-11T22:16:51Z"
  labels:
    app.kubernetes.io/managed-by: example-argocd
    app.kubernetes.io/name: example-argocd-cluster
    app.kubernetes.io/part-of: argocd
  name: example-argocd-cluster
  namespace: default
  ownerReferences:
```

 # run below command, change <put password here> with password you have just copied.

. echo <put password here> | base64 -d

```
root@ip-172-31-46-226:~# echo bllpY3pQNTZ4UlNnd3E3eTFyVGJHbGRVWDNqa0JOdVo= | base64 -d
```

 # Run below command

. kubectl edit svc example-argocd-server **# change service : clusterIp to service: nodeport**

 # Run below command to get ip and port no to access our ArgoCd

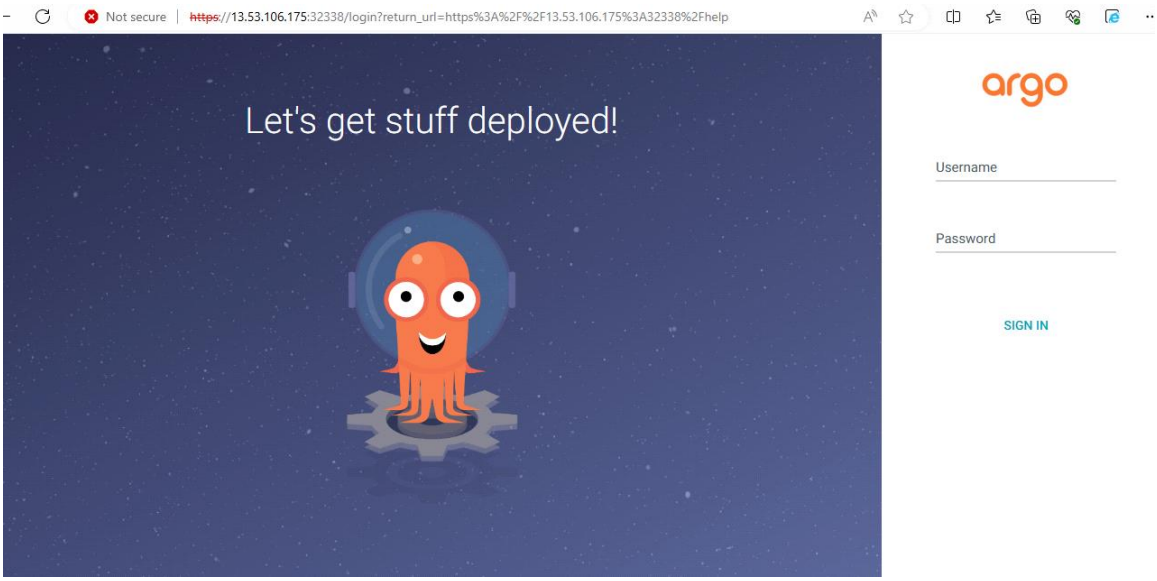
. kubectl get nodes -o wide # copy any one external ip

```
INTERNAL-IP      EXTERNAL-IP

192.168.23.91    13.53.106.175

192.168.58.142   16.171.254.253
```

. kubectl get svc **# copy the port no of example-argocd-server like hightlighted below**

```
example-argocd-server          NodePort    10.100.79.236    <none>        80:32338/TCP,443:31951/TCP   20d
```

Then put Externalip:port no on browser like 13.53.106.175:32338, you will see below login page....



put id as "admin " and put pass that you have got by ran above command "echo | base64"

Our infrastructure is ready now.

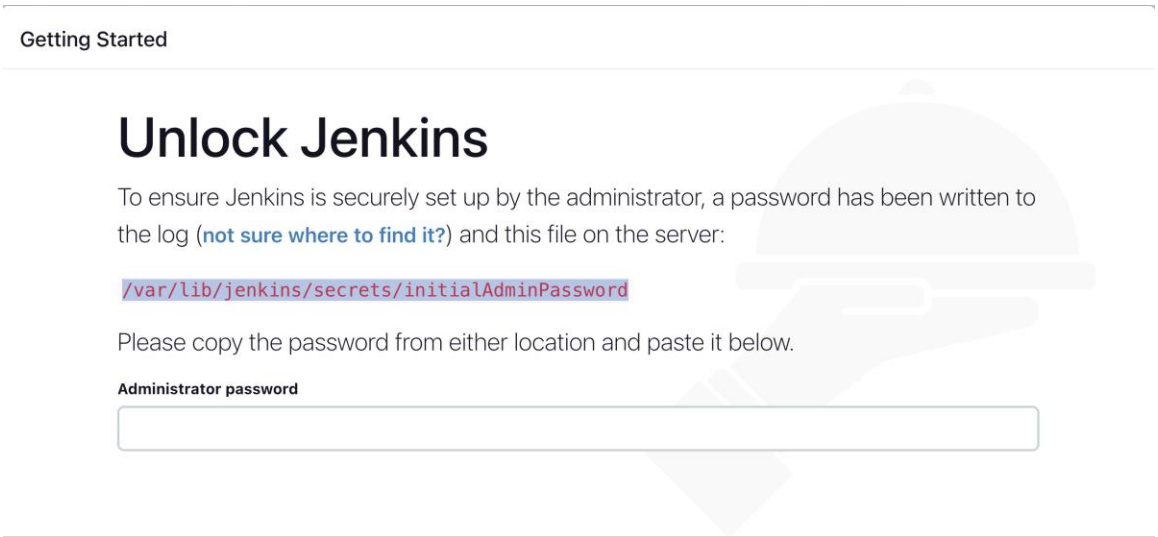
Lets' login on each tool that we have installed

Before login, go to your AWS account click on your Jenkins machine and enable all ports and do same for others machine as well.

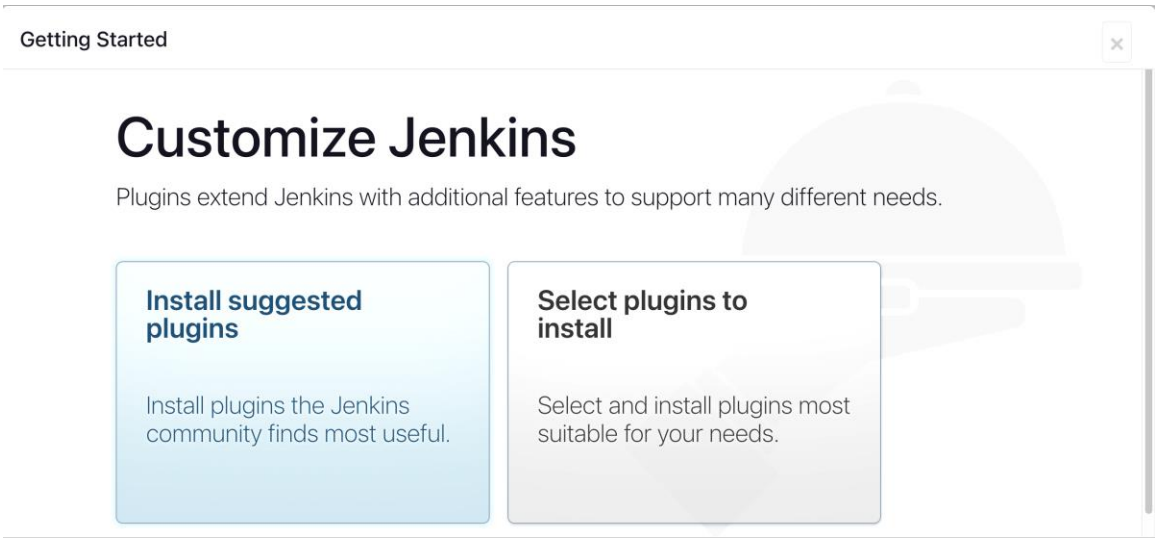
1. Login to jenkin's

. Go to your AWS account click on your Jenkins machine and copy the pulic ip. Paste the public with colon 8080. Ex 2.3.5.6:8080

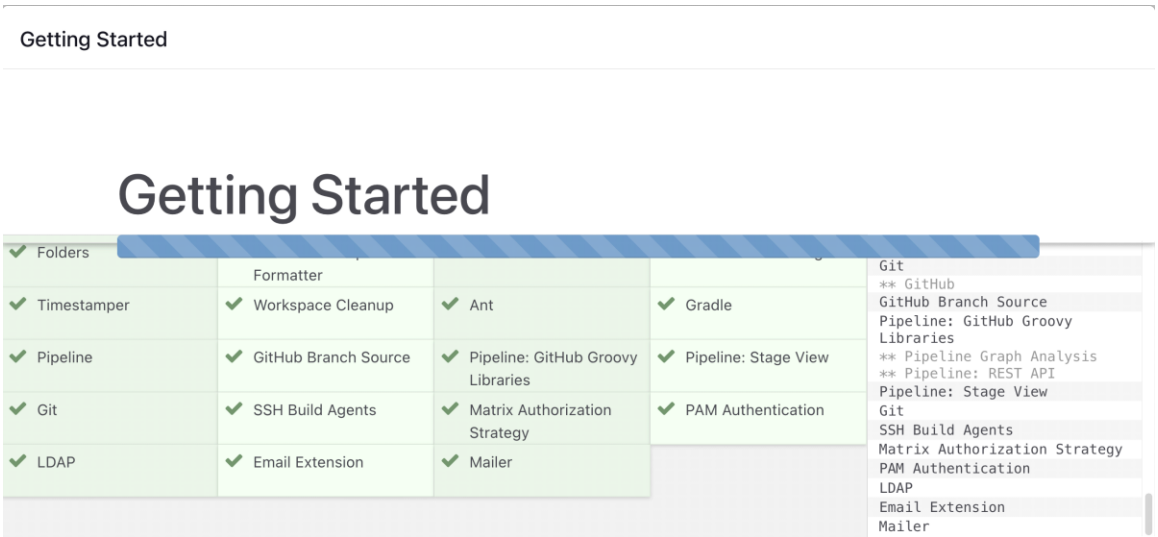
. After that login to your jenkins machine, - Run the command to copy the Jenkins Admin Password - sudo cat /var/lib/jenkins/secrets/initialAdminPassword - then Enter the Administrator password in Jenkins appliaction



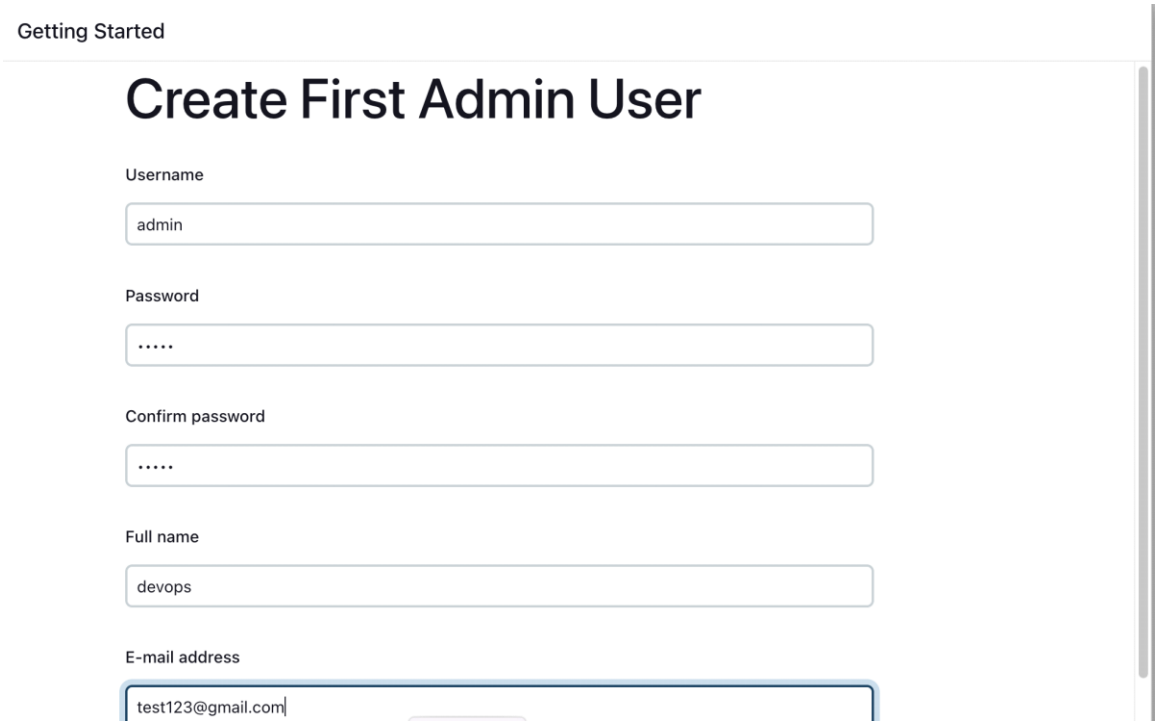
. Click on install suggested plugins



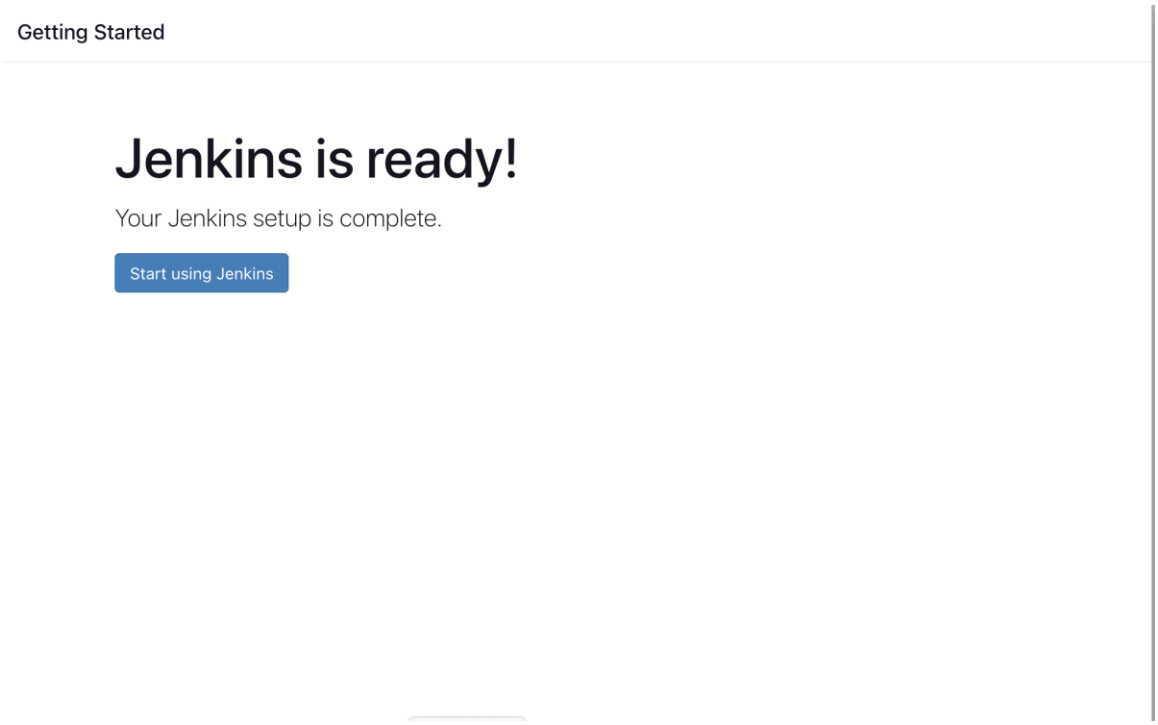
. Wait for the Jenkins to Install suggested plugins



. Create First Admin User or Skip the step [If you want to use this Jenkins instance for future use-cases as well, better to create admin user]



. Jenkins Installation is Successful. You can now use the Jenkins



 # let's follow some more steps.

Go to Manage Jenkins > Manage Plugins.

In the Available tab, search for "Docker Pipeline, SonarQube Scanner for Jenkins".

Select the plugin and click the Install button.

Restart Jenkins after the plugin is installed.

 # Then go to your jenkin machine CLI and run below commands.

. sudo apt update

. sudo apt install docker.io

. sudo -i

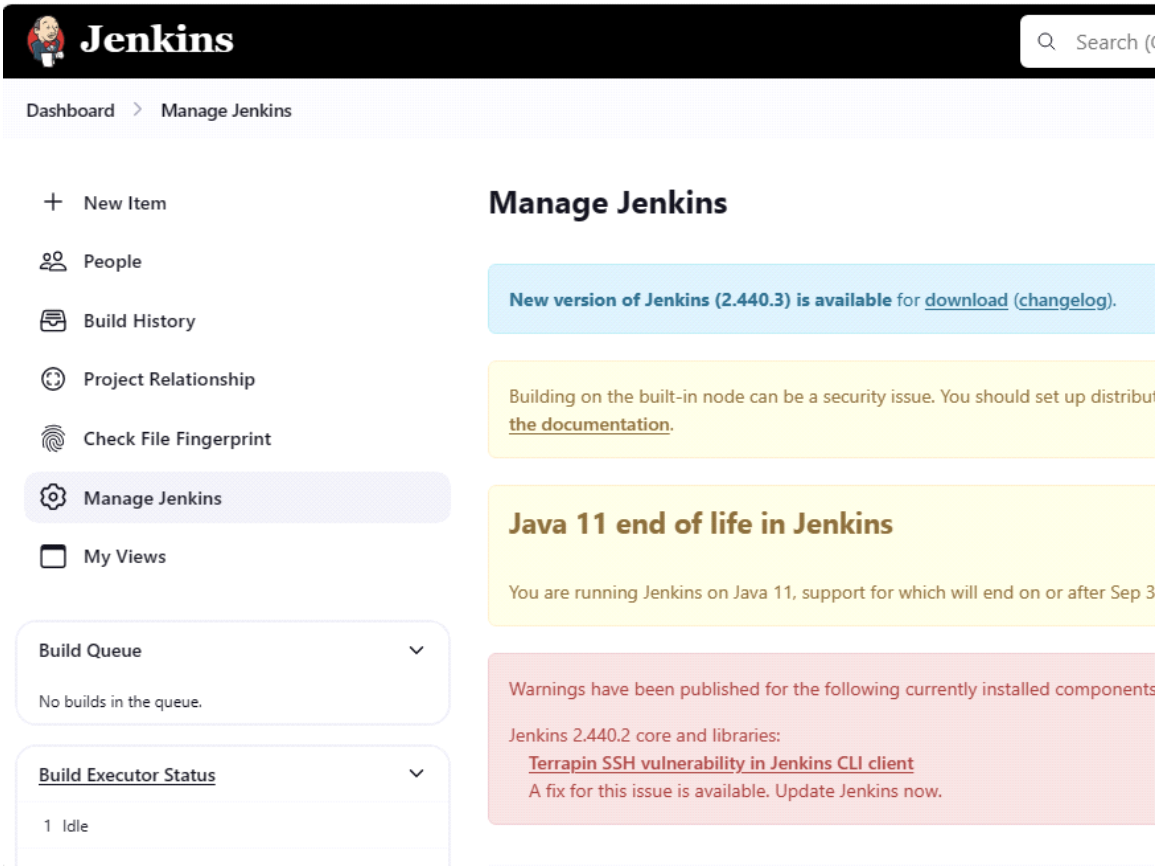
. usermod -aG docker jenkins

. usermod -aG docker ubuntu

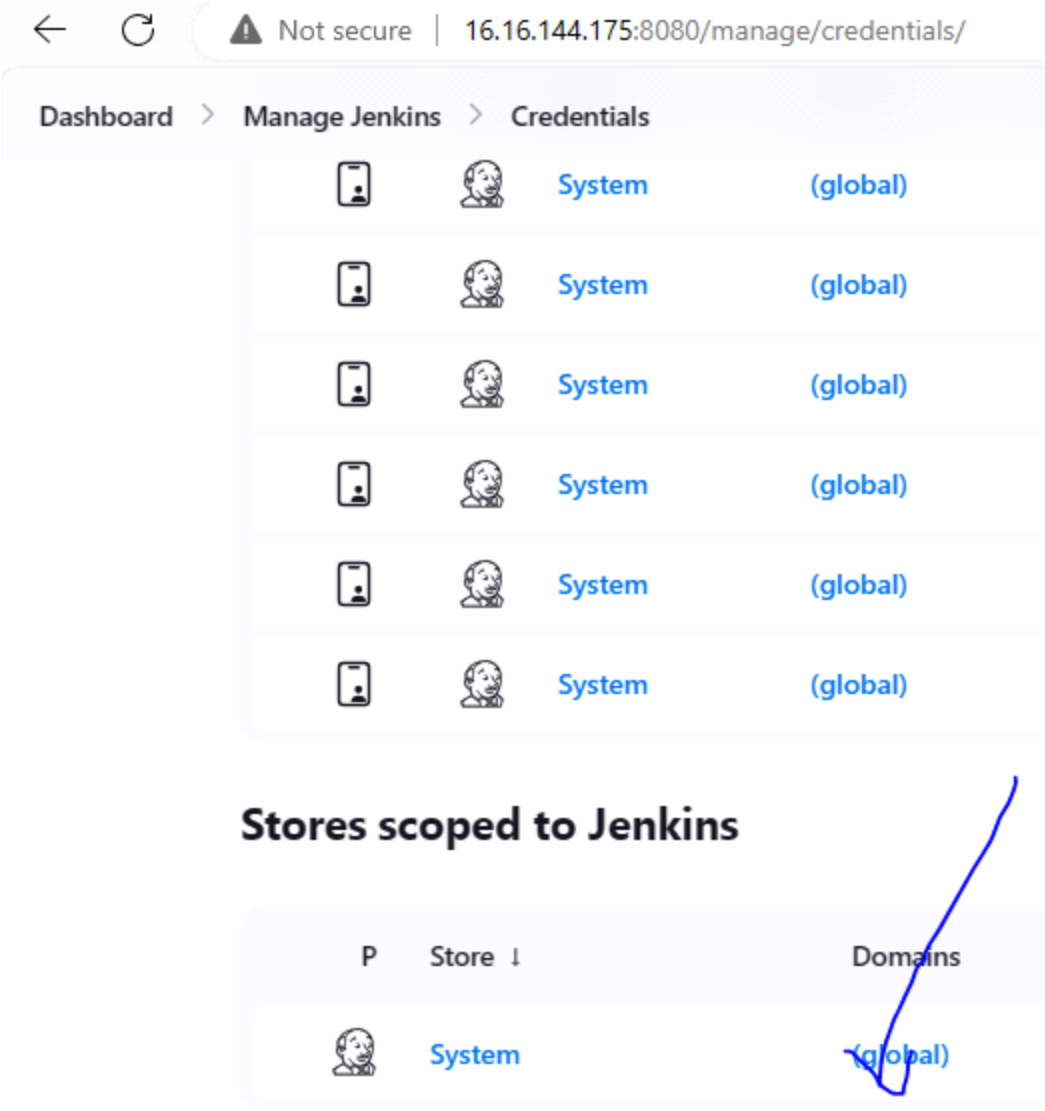
. systemctl restart docker

 # Go to jekins GUI again....

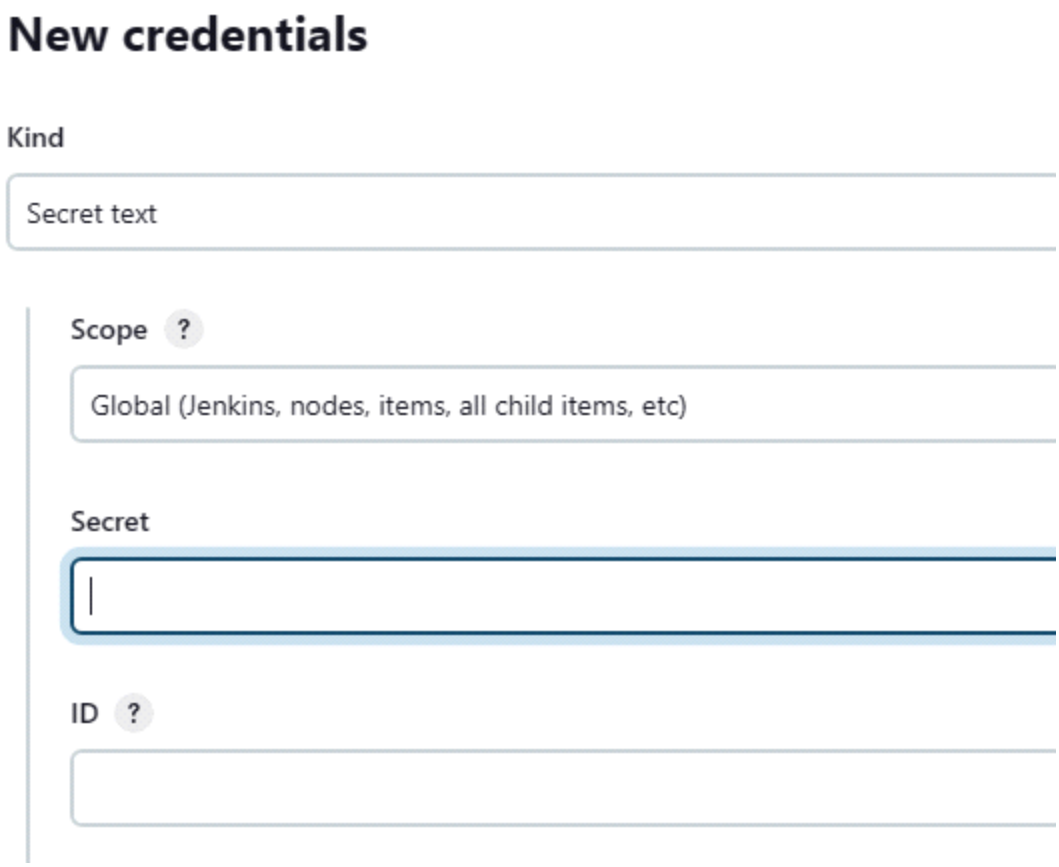
. Click on manage Jenkins



. Scroll down then click on crendtails then click on global



. Click on ADD crendentils then add below credentials one by one



 # Credential for sonar login

select kind as 'secret text'.

Id as 'sonarqube'

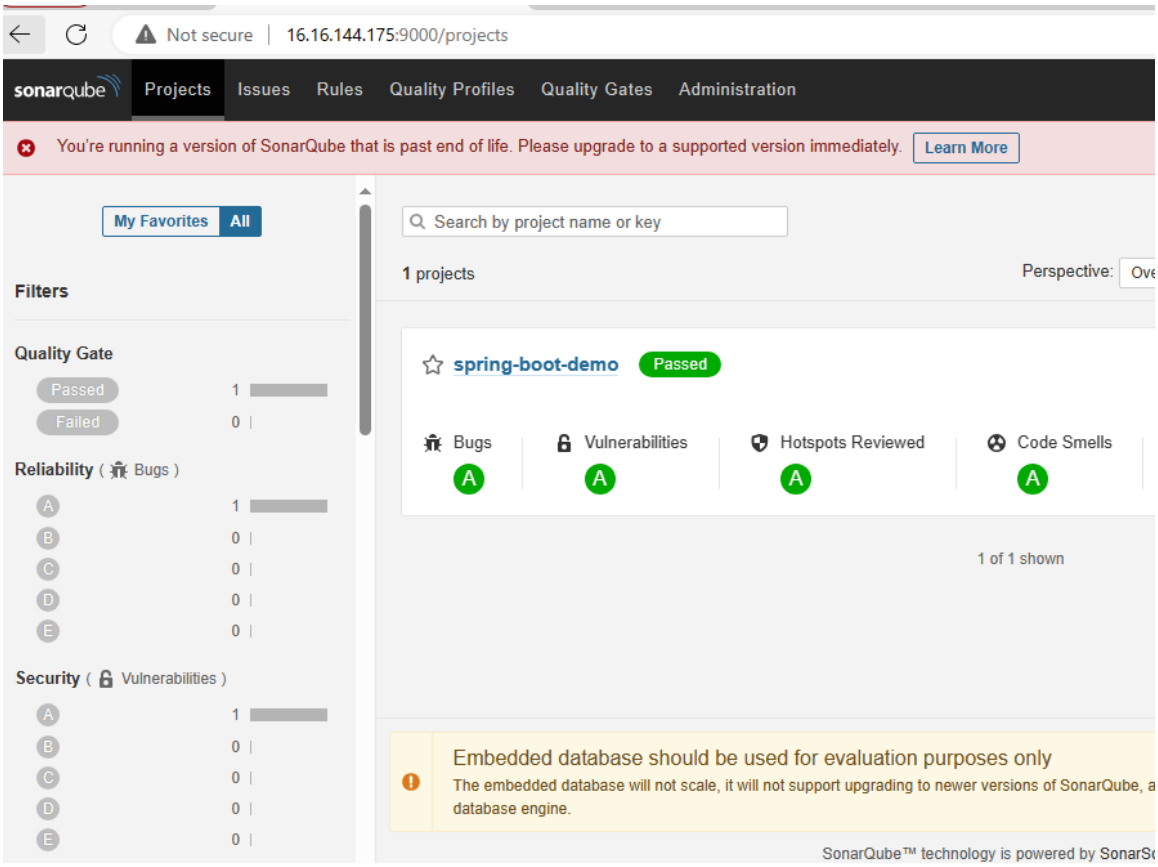
In secret need to put sonarqube secret for this follow below steps

. login to sonar qube

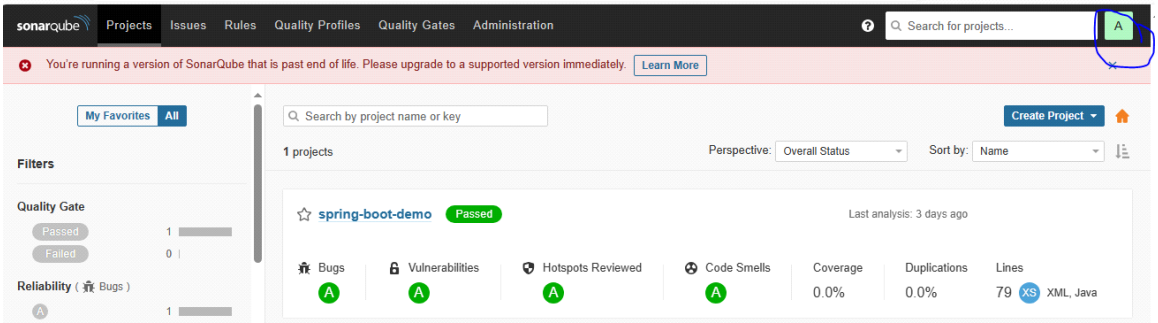
To login, take ip of your jenkins machine and paste it to broswer with :9000

example: 12.3.4.2:9000

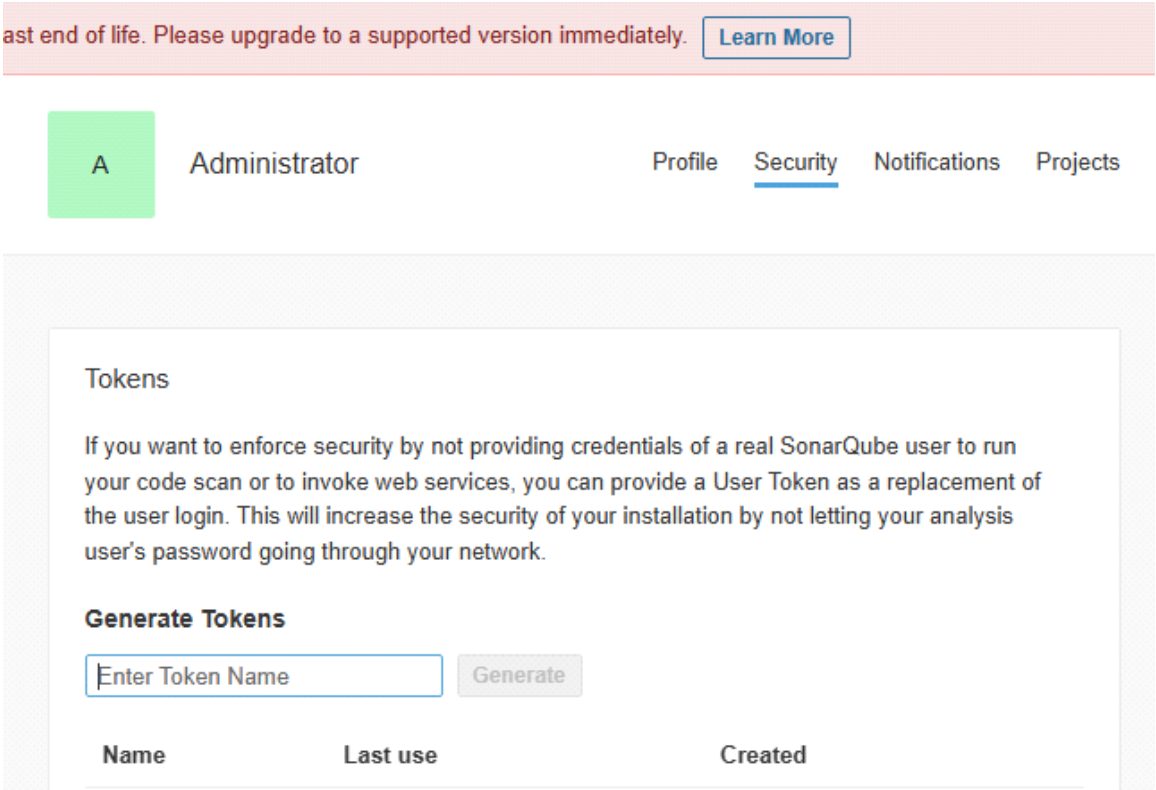
use user 'admin', password as 'admin'



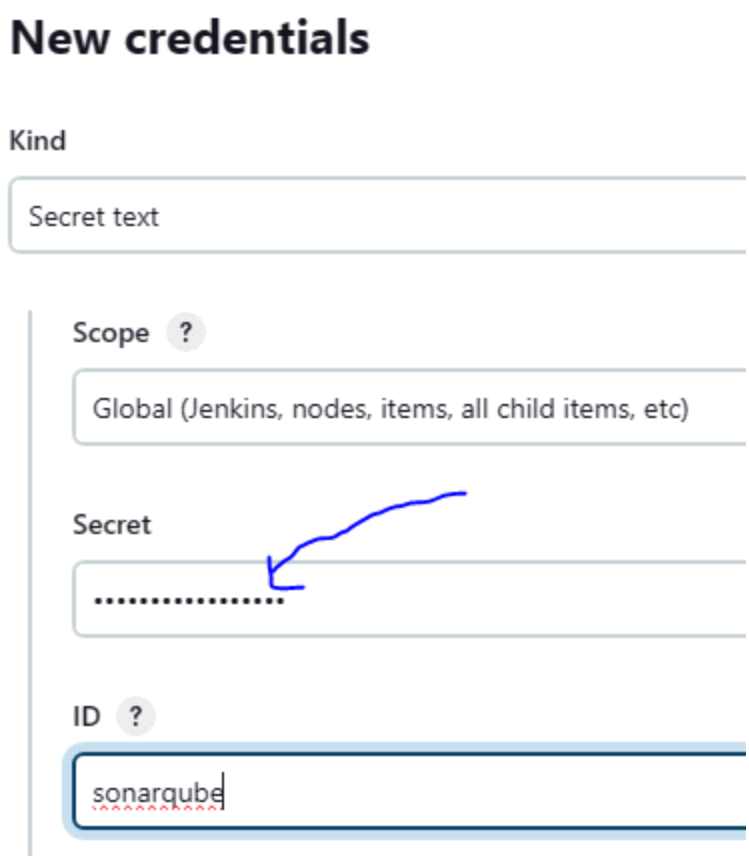
. After login to sonar GUI, Click on 'A' icon present on top right corner on Sonar GUI



. Click on my account ----> security -----> put the name under the generate token section ----> Generate.



. Copy the token and put in secret tab of jenkins



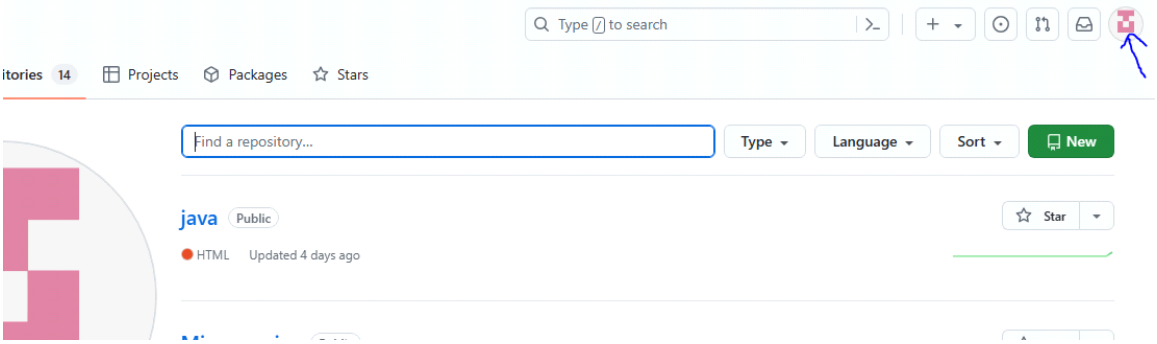
2. let's add Git crendtials, click on add button again.

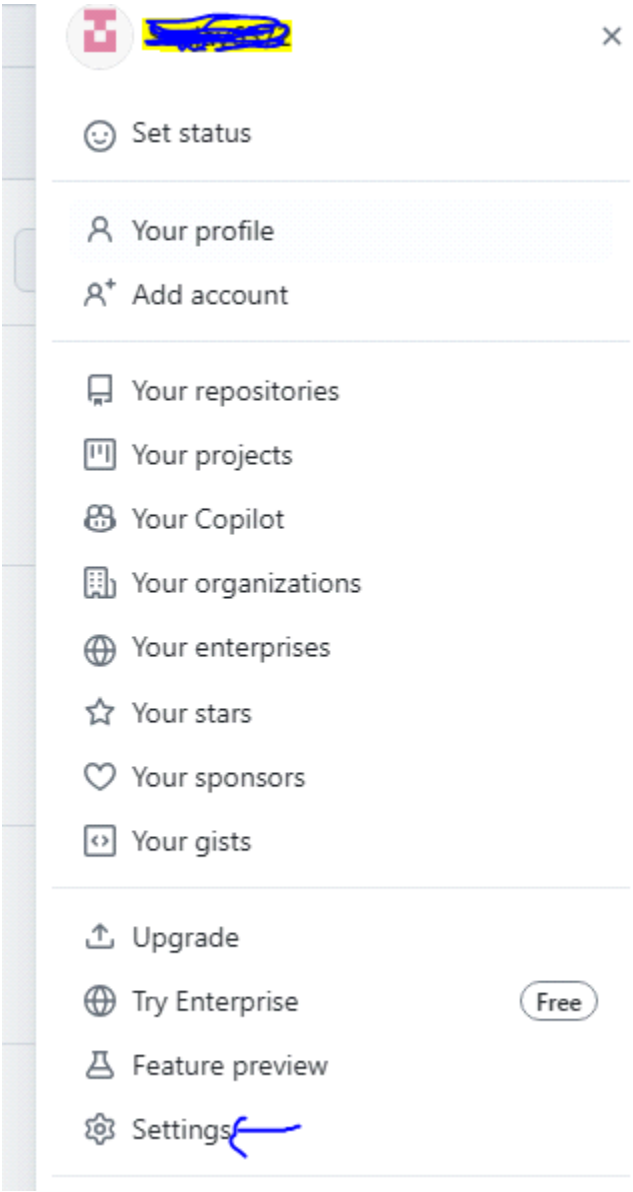
select kind as 'secret text'.

Id as 'sanjugithub'

In secret need to put git secret, for this follow below steps

. login to your git account ---> click on settings ---> at right side button click on devloper option ---> personal token ---> token classic ---> generate new token ---> give any name, select all permisssions, generate it, copy it and put in secret box of jenkins.




Set status
Your profile
Add account
Your repositories
Your projects
Your Copilot
Your organizations
Your enterprises
Your stars
Your sponsors
Your gists
Upgrade
Try Enterprise
Free
Feature preview
Settings

Moderation

Code, planning, and automation

- Repositories
- Codespaces
- Packages
- Copilot
- Pages
- Saved replies

Security

- Code security and analysis

Integrations

- Applications
- Scheduled reminders

Archives

- Security log
- Sponsorship log

- Developer settings

Don't specify

URL

ORCID iD

ORCID provides a persistent identifier - an ORC
ORCID.org.

Connect your ORCID iD

Social accounts

Link to social profile

Link to social profile

Link to social profile

Link to social profile

Company

You can @mention your company's GitHub org

Location

Display current local time

Settings / Developer Settings

Type / to search

- GitHub Apps
- OAuth Apps
- Personal access tokens
  - Fine-grained tokens Beta
  - Tokens (classic)

Personal access tokens (classic)

Generate new token

Tokens you have generated that can be used to access the Gi

Generate new token Beta
Fine-grained, repo-scoped

Generate new token (classic)
For general use

jenis — admin:enterprise, admin:gpg_key, admin:org, admin:org_hook,
admin:repo_hook, admin:ssh_signing_key, audit_log, codespace, copilot,
repo, user, workflow, write:discussion, write:packages

Expires on Fri, May 24 2024.

3. let's add Dockerhub crendtials, click on add button again.

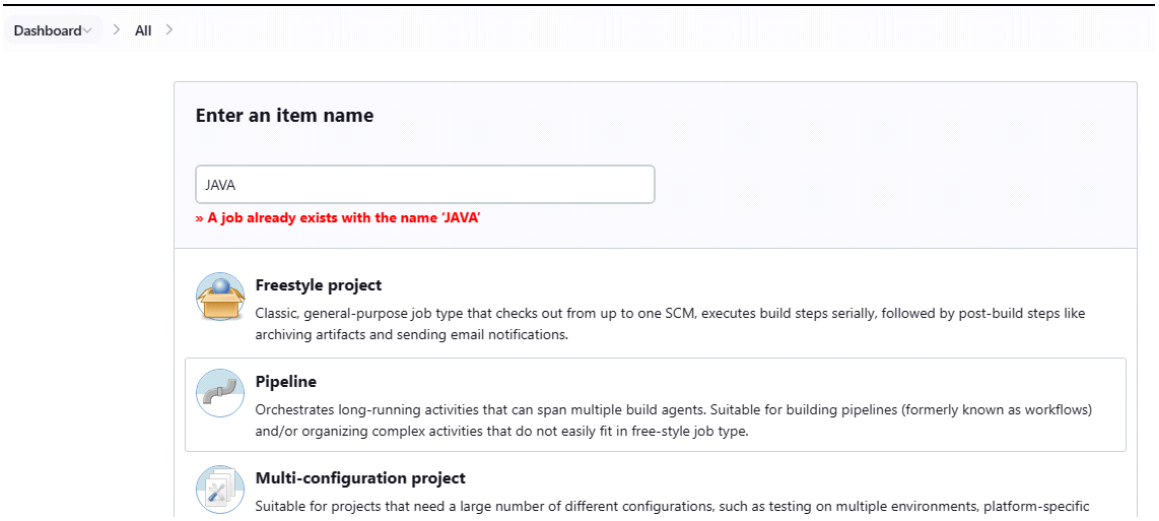
select kind as 'username and pass'. Give you user id and pass of dockerhub

Id as 'docker-cred' then save it.

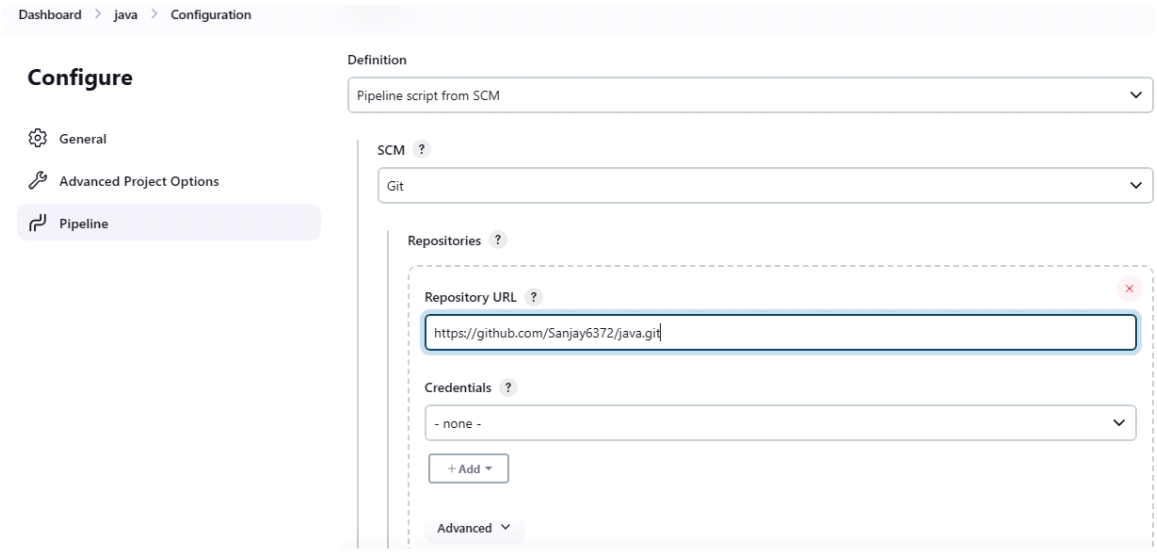
Use the ids name same as i used

Let's start building CI pipline

1. Login to jenkins GUI ---> click on new item ---> click on pipeline, give name and click on OK



2. go to botom ---> under pipeline section select defination as SCM ---> SCM as git ---> put link your repo where the jenkin file is present ---> click on apply an save.



step to copy repo link

Go to your git account ---> click on repo ---> click on code ---> then copy the url

3. Go to your jenkins and follow below step to configure email notificaiton

go to jenkins ---> Manage jenkins ---> systems ---> fill the below info in email notification and in Extended E-mail Notification section

In E-mail Notification

SMTP server = smtp.gmail.com

SMTP Port = 465

In advance put your email id and get password by following below steps

go to your manage google account settings ---> search app password ---> create app password and copy it.

App passwords

App passwords are less secure than using up-to-date apps and services that use modern security standards. Before you create an app password, you should check to see if your app needs this in order to sign in.
Learn more

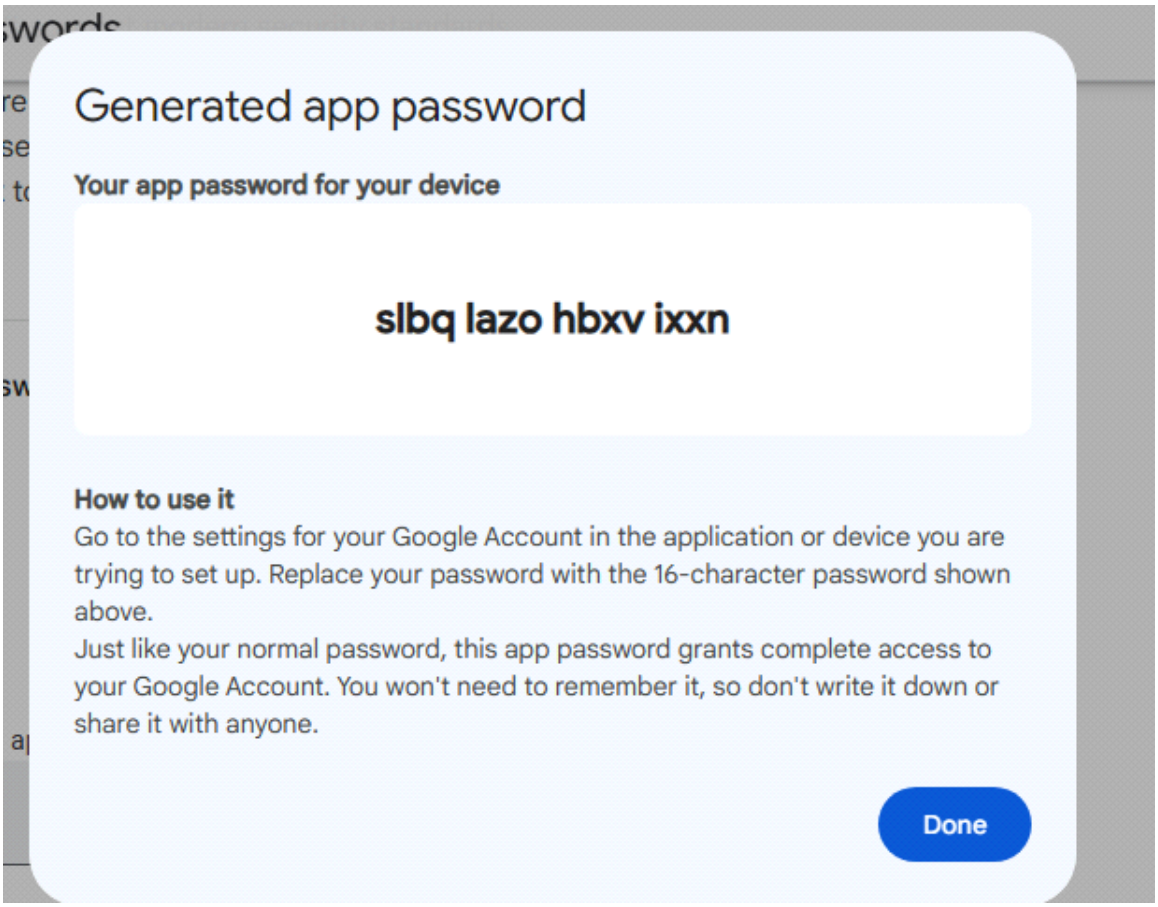
Your app passwords

jenkins Created at 24 Apr, last used at 28 Apr

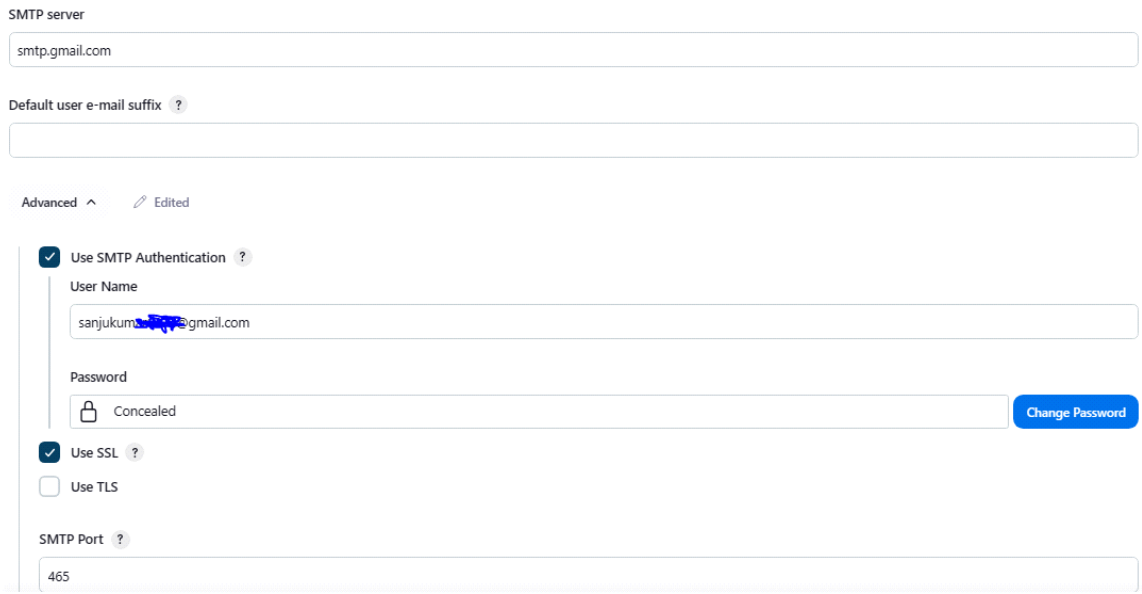
To create a new app-specific password, type a name for it below...

App name
jenkins

Create



Put info like below

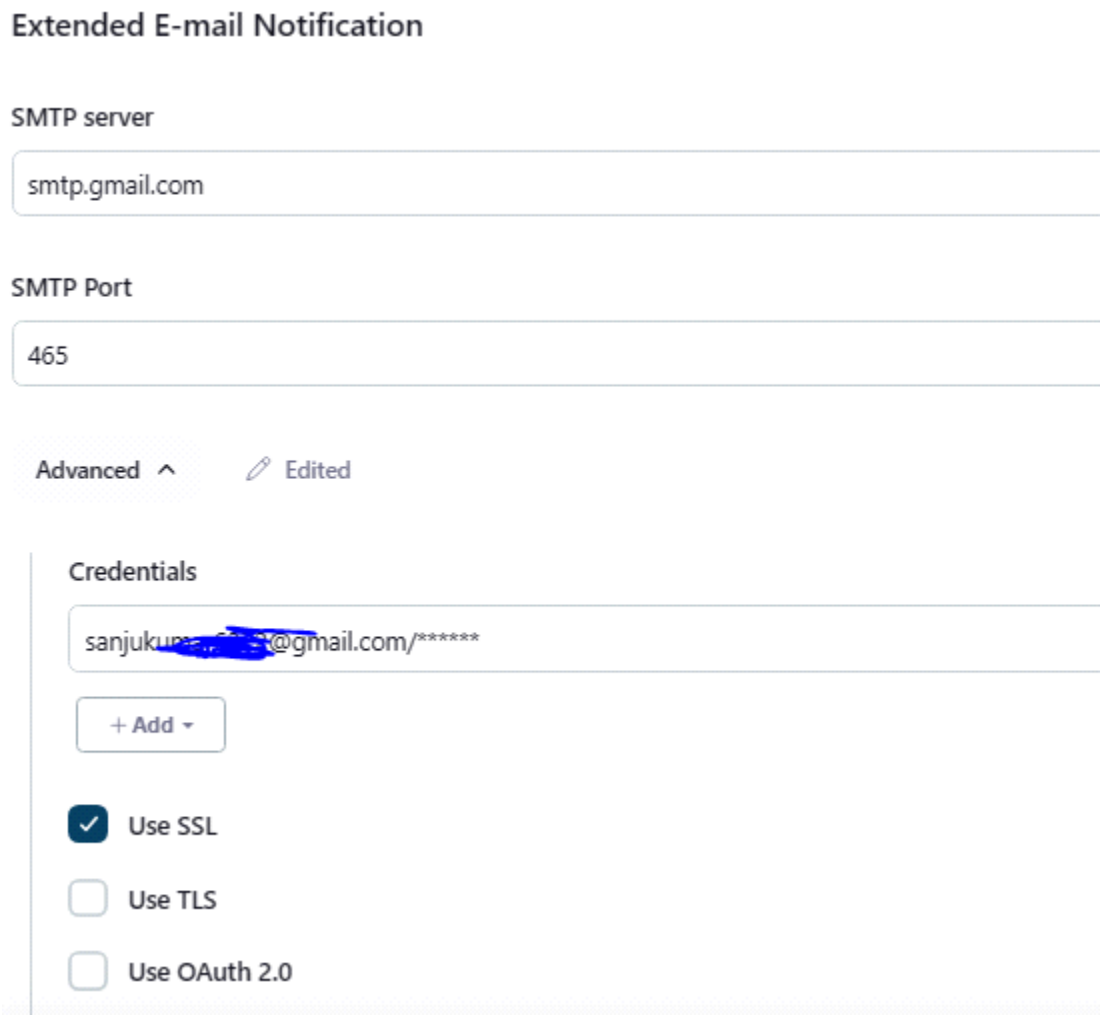


Extended E-mail Notification section

SMTP server = smtp.gmail.com

SMTP Port = 465

In credentails click on add then create crendentails with username as 'your email id' and use same pass that we have used above.



After that click on save button

<u>Open jenkins file from github and make some below changes then save it</u>

```
pipeline {

    agent {
```

```
        docker {
            image 'abhishekf5/maven-abhishek-docker-agent:v1'
            args '--user root -v /var/run/docker.sock:/var/run/docker.sock'
        }
    }
    stages {
        stage('Checkout') {
            steps {
                git branch: 'master', url: 'https://github.com/Sanjay6372/java.git'     # change link
with your git repo link
            }
        }
        stage('Build and Test with Maven') {
            steps {
                sh 'cd spring-boot-app && mvn clean package'
            }
        }
        stage('Static Code Analysis with SonarQube') {
            environment {
                SONAR_URL = "http://16.16.198.24:9000"       # only change ip with your
Sonarqube machine IP
            }
            steps {
                withCredentials([string(credentialsId: 'sonarqube', variable:
'SONAR_AUTH_TOKEN')]) {
                    sh 'cd spring-boot-app && mvn sonar:sonar
-Dsonar.login=$SONAR_AUTH_TOKEN -Dsonar.host.url=${SONAR_URL}'
                }
            }
```

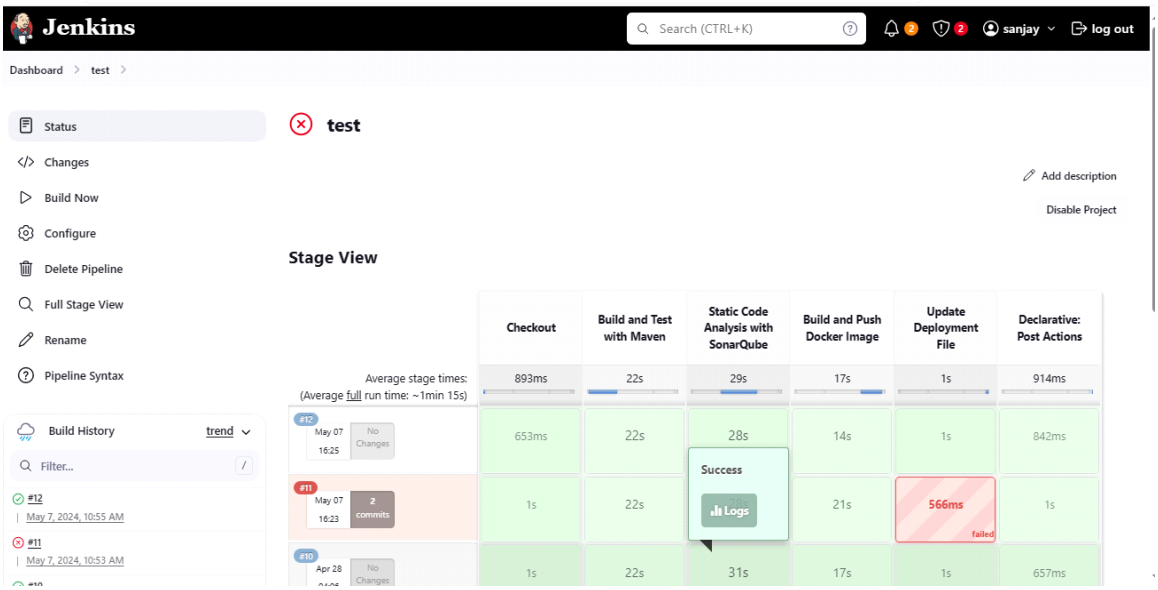
```
        }
        stage('Build and Push Docker Image') {
            environment {
                DOCKER_IMAGE = "sanjay9888/javagapp:${BUILD_NUMBER}"     # change
sanjay9888 with your docker hub user name
                REGISTRY_CREDENTIALS = credentials('docker-cred')
            }
            steps {
                script {
                    sh 'cd spring-boot-app && docker build -t ${DOCKER_IMAGE} .'
                    def dockerImage = docker.image("${DOCKER_IMAGE}")
                    docker.withRegistry('https://index.docker.io/v1/', "docker-cred") {
                        dockerImage.push()
                    }
                }
            }
        }
        stage('Update Deployment File') {
            environment {
                GIT_REPO_NAME = "java"          # change java with your git repo name where code
is it.
                GIT_USER_NAME = "Sanjay6372" # change sanjay6372 with your git repo usr
name.

            }
            steps {
                withCredentials([string(credentialsId: 'sanjugithub', variable: 'GITHUB_TOKEN')]) {
                    sh '''
                        rm -rf spring-boot-app/target/
```

```
                    git config --global user.email "sanjay@gmail.com"

                    git config --global user.name "sanjay"

                    sed -i "s/5/${BUILD_NUMBER}/g"
spring-boot-app-manifests/deployment.yml

                    git add spring-boot-app-manifests/deployment.yml

                    git commit -m "Update deployment image to version ${BUILD_NUMBER}"

                    git push
https://${GITHUB_TOKEN}@github.com/${GIT_USER_NAME}/${GIT_REPO_NAME} HEAD:master

                '''

            }

        }

    }

    post {

        always {

            emailext (

                subject: "Pipeline Status: ${BUILD_NUMBER}",

                body: '''

                    <html>

                        <body>

                            <p>Build Status: ${BUILD_STATUS}</p>

                            <p>Build Number: ${BUILD_NUMBER}</p>

                            <p>Check the <a href="${BUILD_URL}">console output</a>.</p>

                        </body>

                    </html>

                ''',

                to: 'sanjukumar62@gmail.com',    # change sanjukumar62@gmail.com with your
email id

                from: 'jenkins@example.com',
```

```
                    replyTo: 'jenkins@example.com',
                    mimeType: 'text/html'
                )
            }
        }
}
```

Remove all the lines that are in bold before run above command

Now click on your job then click on Build now



Horrey!! your CI part is successfully completed, let's move onto deployment part

Login to ArgoCD ann follow the below step.

1. click on application

2. click on new app

    enter name as 'java'

    project as 'default'

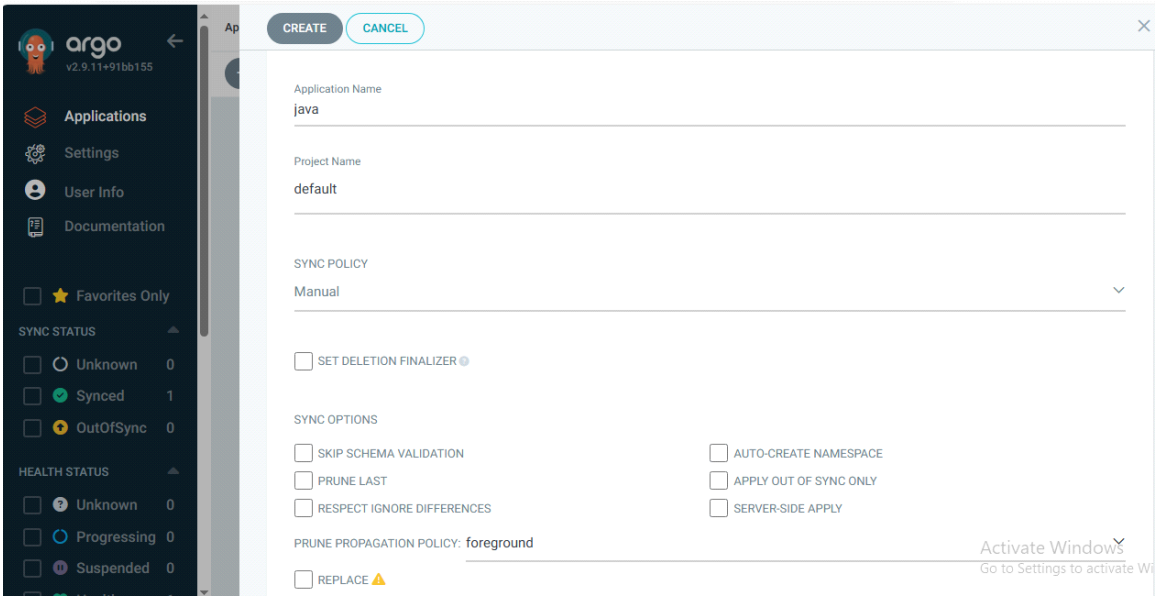
in source put your code repo link

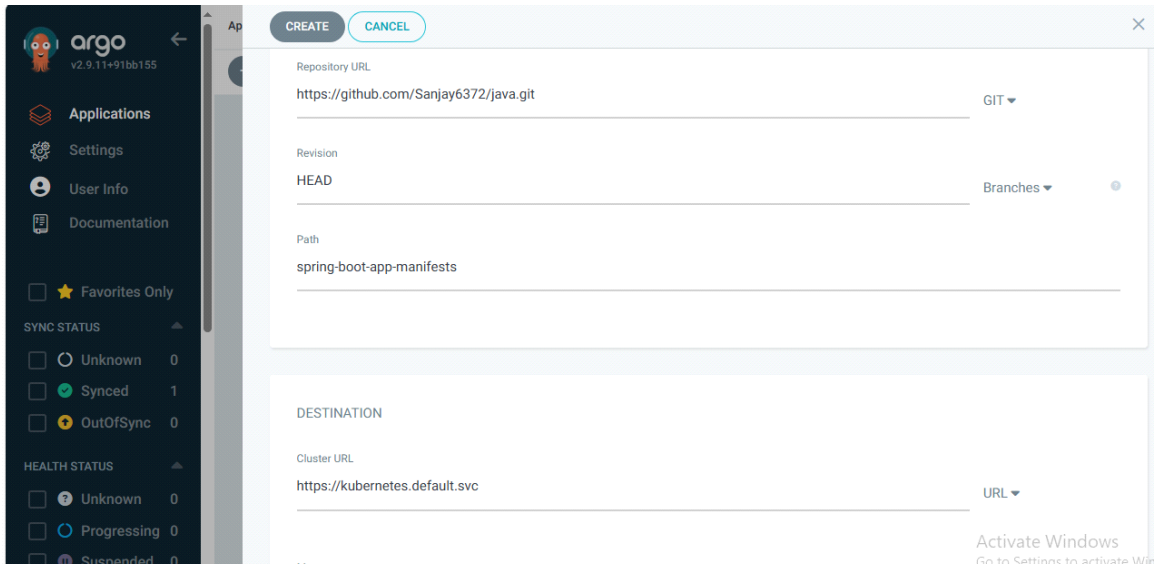
in path put 'spring-boot-app-manifests'

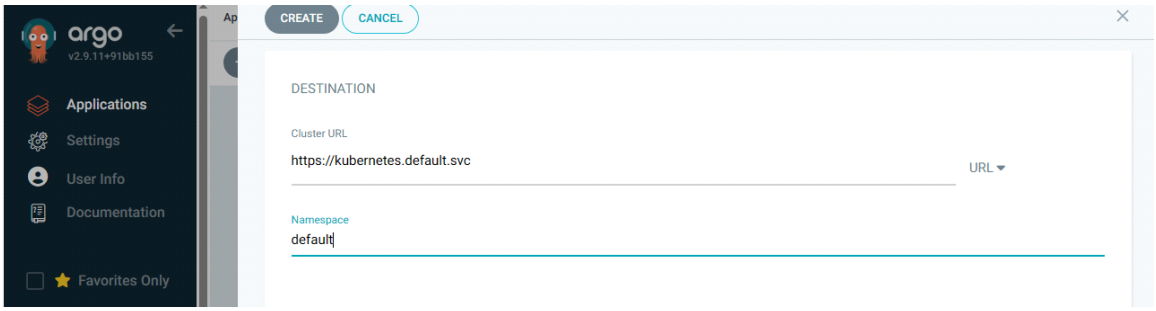
in destination section

select path as 'https://kubernetes.default.svc'

namespace as 'default' and click on create

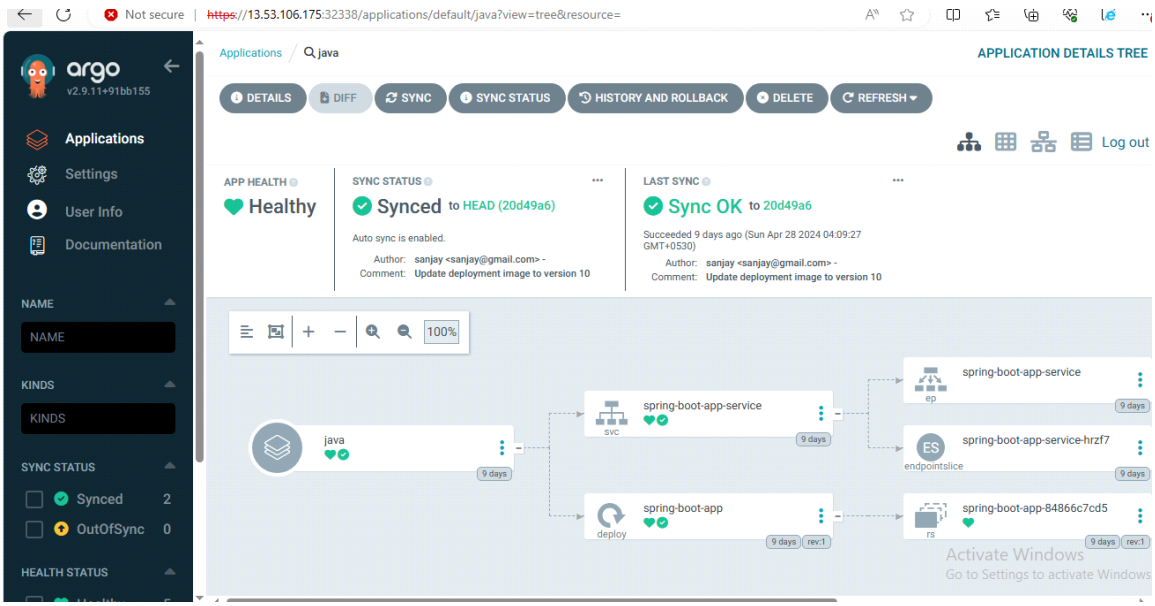






After click on create it will take few minutes to complete the process

After complition it will look like below



Horrey! you have successfuly deployed your application on aws EKS, let's access our application

. Login to your EKS machine through mobaxterm

. Run below command to see port no of your application and copy it

kubectl get svc spring-boot-app-service

```
root@ip-172-31-46-226:~# kubectl get svc spring-boot-app-service
NAME                    TYPE       CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
spring-boot-app-service   NodePort   10.100.113.137   <none>        80:30856/TCP   9d
```

Copy the port no, here port no is 30856

. Run below command to get external ip to access our app

kubectl get nodes -o wide

```
root@ip-172-31-46-226:~# kubectl get nodes -o wide
NAME                                                STATUS   ROLES    AGE   VERSION               INTERNAL-IP      EXTERNAL-IP      OS-IMAGE
        KERNEL-VERSION                  CONTAINER-RUNTIME
ip-192-168-23-91.eu-north-1.compute.internal    Ready    <none>   19d   v1.29.0-eks-5e0fdde   192.168.23.91    13.53.106.175    Amazon Li
nux 2   5.10.213-201.855.amzn2.x86_64   containerd://1.7.11
ip-192-168-58-142.eu-north-1.compute.internal   Ready    <none>   19d   v1.29.0-eks-5e0fdde   192.168.58.142   16.171.254.253   Amazon Li
nux 2   5.10.213-201.855.amzn2.x86_64   containerd://1.7.11
```

Copy the any node external ip and paste it on broswer along with our app port no

Example: 13.53.106.175:30856

I have successfuly built a sprint boot application using Maven

This application is deployed on to Kubernetes using Argo CD

Our project is finished here

Thanks