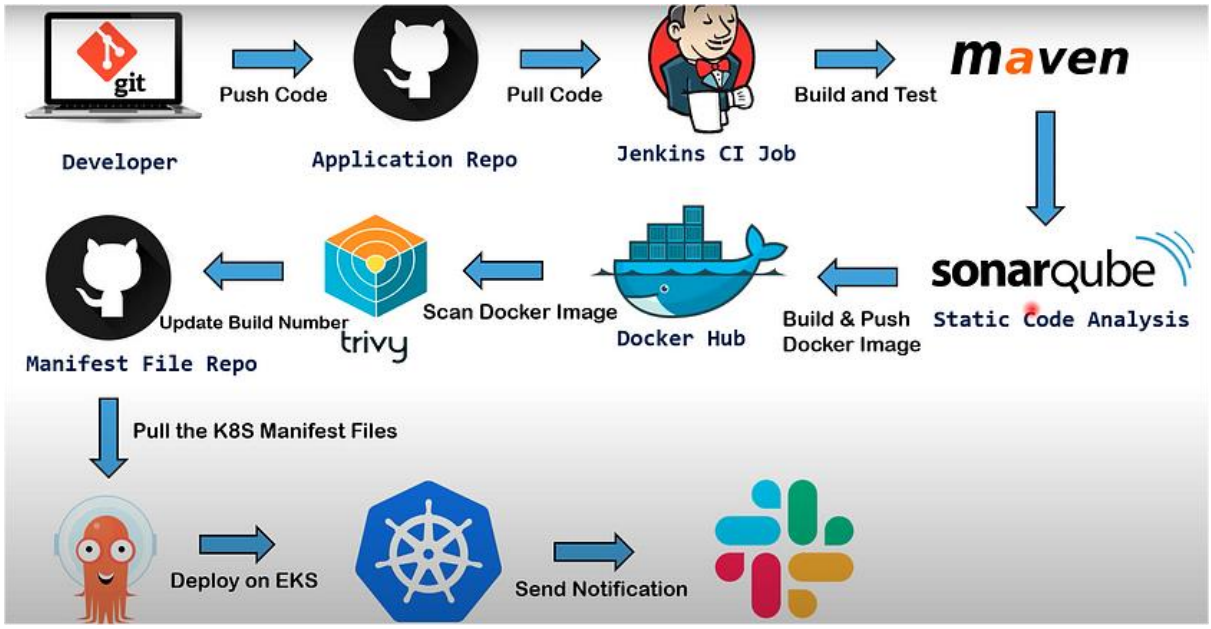
End to End DevOps Project | CICD



Requirements : CI/CD pipeline System:

Pre-requisites

- Login to GitHub, Docker Hub and AWS Accouts
- Launch EC2 instances 3: Jenkins Master, Agent Machine and EKS Machine

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
Agent-Machine	i-004fc23b7fd777621	Running	t2.medium	2/2 checks passed	View alarms +	us-east-1a	ec2-34-227-97-216.co...
EKS-Machine	i-02d12f18efebee723	Running	t2.medium	2/2 checks passed	View alarms +	us-east-1a	ec2-54-162-254-141.co...
Jenkins-Master	i-0b206f301ba6cda1b	Running	t2.medium	2/2 checks passed	View alarms +	us-east-1a	ec2-52-90-249-4.comp...

Note:

- ⇨ It is possible take t3.medium for cpu purposes
- ⇨ Security Group: create new group with open All traffic- No recommended in Prod environment, its just for practice
- ⇨ Default VPC , RAM 15GB

Setup and Configuration:

Jenkins Master Server:

sudo apt update
sudo apt install openjdk-17-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

sudo apt-get update
sudo apt-get install jenkins
sudo systemctl enable jenkins
sudo systemctl status Jenkins

Optional:

open file : sudo vim /etc/ssh/sshd_config - remove comment for below keys
PubkeyAuthentication yes
AuthorizedKeysFile .ssh/authorized_keys .ssh/authorized_keys2

sudo service sshd reload
Generate ssh key : ssh-keygen

Execute it when you setup agent machine
Copy id_rsa.pub file content to agent - <User>/.ssh/authorized_keys (do not remove exisiting content just add it to new line)

Agent Machine Setup:

sudo apt update
sudo apt install openjdk-17-jre
sudo apt-get install docker.io
docker --version
sudo usermod -aG docker $USER

Optional:
sudo init 6

open file : sudo vim /etc/ssh/sshd_config remove comment for below values
PubkeyAuthentication yes
AuthorizedKeysFile .ssh/authorized_keys .ssh/authorized_keys2
sudo service sshd reload

- Open Jenkins UI : http:<Public_IP_of_jenkinsmaster>:8080
- Copy initial password from cat /var/lib/jenkins/secrets/initialAdminPassword and install suggested plugins
- **Install Below plugins**

1]Docker
2]Docker Commons
3]Docker Pipeline
4]Docker API
5]docker-build-step
6]CloudBees Docker Build and Publish
7]Maven Integration Pipeline
8]Maven Integration

9]Eclipse Temurin installer
10]Maven Integration Pipeline
11]Maven Integration
12] Eclipse Temurin installer
13]onarQube Scanner
14]Sonar Quality Gates
15]Quality Gates

Master/Slave configuration:

####### This is the one method ##############################

Manage jenkins - nodes - Build in node- configuration - no of executor - change to 0 and save it
Create new node- name(jenkins-Agent) - Number of executors 2
Remote root directory: /root/jenkins1
Usage: Use this node as much as possible
Launch Method : Launch agents via SSH ()
Host: Jenkins-Agent private IP
Credentials : add jenkins
    kind: ssh Username with private key
    ID: Jenkins-Agent
    Description: Jenkins-Agent
    Username: root (as i generated ssh key for this user)
    credentials :
    Host Key Verification Strategy : non verifying

#########This is another method #######################

Manage jenkins - nodes - Build in node- configuration - no of executor - change to 0 and save it
Create new node- name(jenkins-Agent) - Number of executors 2
Remote root directory: /root/jenkins1
Usage: Use this node as much as possible
Launch Method : Launch agent by connecting it to the controller

We need to run this command in agent machine

curl -sO <Ip_address>agent.jar

java -jar agent.jar -url ip_address:8080/ -secret <secret_here> -name "jenkins-Agent" -webSocket -workDir "/root/jenkins1"

Integrate Maven to Jenkins and Add GitHub Credentials to Jenkins

- Manage jenkins — tools — **Maven installations** — Name : Maven3 , Version: 3.9.4 Install automatically
- **JDK installations** — Name: Java17 , Install from adoptium.net — Version: jdk-17.0.5+8
- Add credentials for github — Credentials — new credentials
  — kind: Username with password
  — Scope: Global
  — Usermame: github username

— password: github passwrd
— id: github

Install and Configure the SonarQube(On Jenkins Agent Machine)

```
sudo apt update
sudo apt install apt-transport-https ca-certificates curl software-properties-common
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu focal stable"
apt-cache policy docker-ce
sudo apt install docker-ce
sudo systemctl status docker
sudo usermod -aG docker ${USER}
docker run -d --name sonarqube -p 9000:9000 sonarqube
docker ps
```

Integrate SonarQube with Jenkins

- Login to sonarqube UI — <Server_public_IP>:9000
- default credentials: admin/admin
- Go to my account- security — Generate Token — **Name:** jenkins sonarqube-token **Type:** Global analysis token
- Jenkins — manage jenkins- credentials
  — kind: Secret text
  — scope: global
  — secret : copy token which is generated in sonarqube-token
  — ID: jenkins-sonarqube-token
- Manage jenkins — system — SonarQube servers- SonarQube installations
- Name: sonarqube-server
- Server URL:
- credentials : token
- apply and save
- Manage jenkins — Tools — SonarQube Scanner installations — Add SonarQube Scanner
- name: sonarqube-scanner
- tick on — install automatically
- version: sonarqube scanner 5.0.1.3006
- apply and save

- Add sonarqube webhook configuration — Sonarqube — Administration- configuration — webhooks — create name : sonarqube-webhook
- URL: http://<Jenkins_master_private_IP>:8080/sonarqube-webhook/

Build and Push Docker Image using Pipeline Script

Add Docker hub credentials
Manage Jenkins — Credentials — Kind: Username with Password

Create JENKINS_API_TOKEN

go to Jenkins — User login — configure — API Token — JENKINS_API_TOKEN

Copy token and keep on notepad

Manage jenkins- credentials —

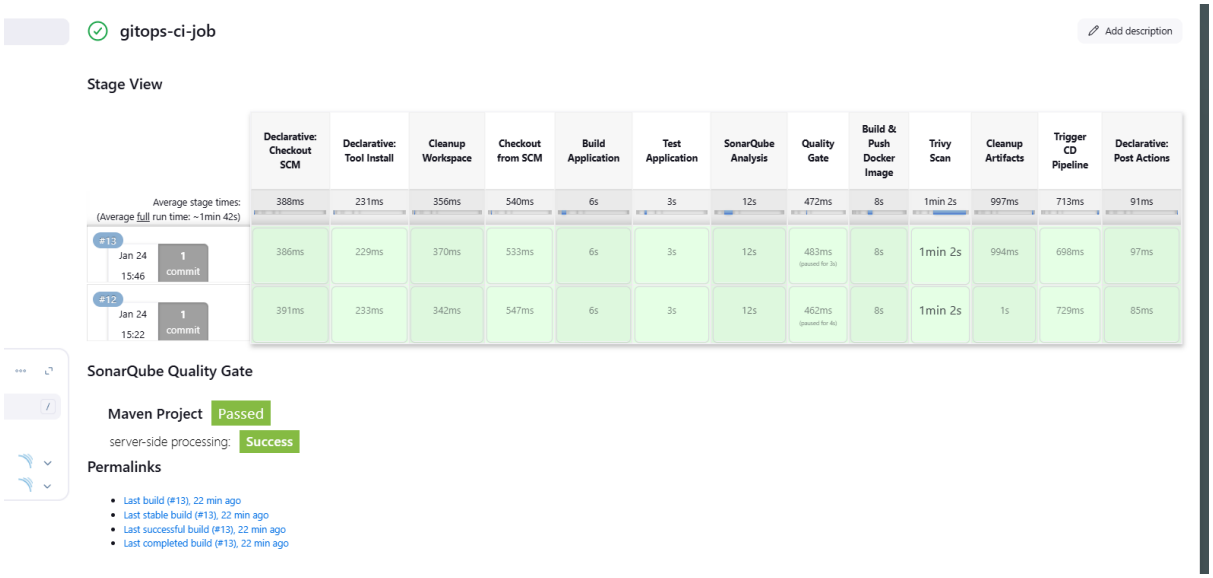
Kind : secret text
Secret : provide token
ID and description: JENKINS_API_TOKEN
Save it

Create a CI JOB :

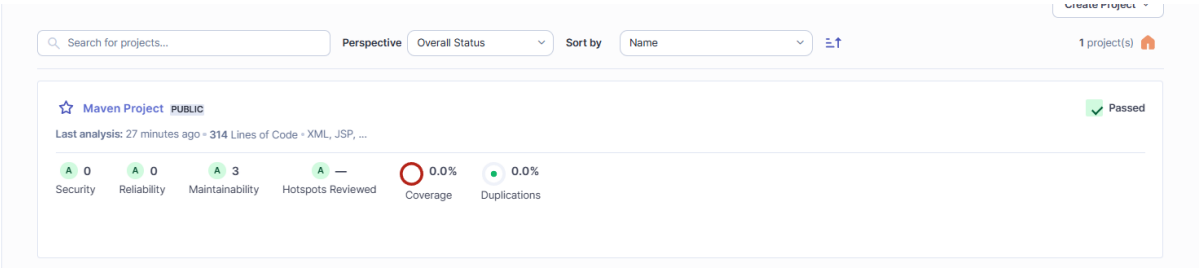
Jenkins create new job -pipeline

name: gitops-register-app-ci
Discard old builds : Max # of builds to keep 2
Pipeline: pipeline script from SCM

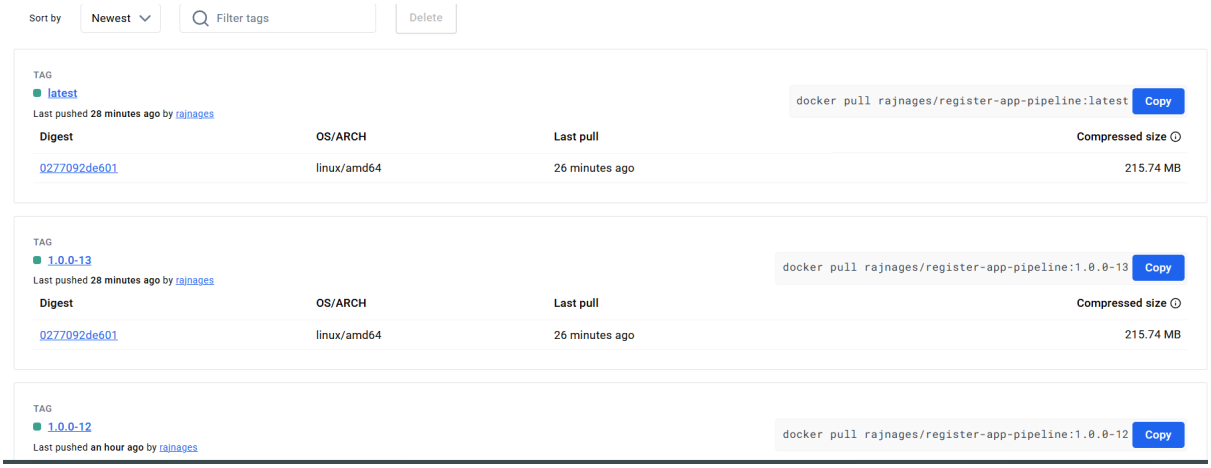
: https://github.com/rajnages/register-app.git



Sonarqube checks:



Docker hub checks:



Setup Kubernetes using eksctl(EKS Machine):

```
# Install AWS CLI
sudo curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
apt install unzip
sudo unzip awscliv2.zip
sudo ./aws/install
aws --version

# install kubectl
curl -LO "https://dl.k8s.io/release/$(curl -L -s
https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl"
chmod +x kubectl
sudo mv kubectl /usr/local/bin
kubectl version --output=yaml

# Install eksctl
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 a IAM Role and assign it to Bootstrap server

- AWS console — IAM — Roles- create role — AWS service — Service or use case — EC2 Add permissions — **AdministratorAccess** Role name : **ekscluster_role**
- Go to EC2 instance- Bootstrap server — Action security — **Modify IAM role** — add newly created role

Create a cluster

```
eksctl create cluster --name DevOps-Demo\
--region ap-south-1 \
--node-type t2.small \
--nodes 3 \

##It will take 10min to spin up cluster. for our practical we need 3 nodes
```

ArgoCD Installation on EKS Cluster and Add EKS Cluster to ArgoCD:

```
#First, create a namespace
$ kubectl create namespace argocd

#let's apply the yaml configuration files for ArgoCd
kubectl apply -n argocd -f https://raw.githubusercontent.com/argoproj/argo-cd/stable/manifests/install.yaml

#Now we can view the pods created in the ArgoCD namespace.
kubectl get pods -n argocd

#To interact with the API Server we need to deploy the CLI:
$ curl --silent --location -o /usr/local/bin/argocd https://github.com/argoproj/argo-cd/releases/download/v2.4.7/argocd-linux-amd64
$ chmod +x /usr/local/bin/argocd

#Expose argocd-server
$ kubectl patch svc argocd-server -n argocd -p '{"spec": {"type": "LoadBalancer"}}'

#Wait about 5 minutes for the LoadBalancer creation
kubectl get svc -n argocd

# Get pasword and decode it

$ kubectl get secret argocd-initial-admin-secret -n argocd -o yaml
$ echo WXVpLUg2LWxoWjRkSHFmSA== | base64 --decode   ## password value can change

#Login to argocd - using load_balancer URL: admin/password(generated from previous step)

go to userinfo - change password

#Add EKS Cluster to ArgoCD
```

login to ArgoCD from CLI
$ argocd login a2255bb2bb33f438d9addf8840d294c5-785887595.ap-south-1.elb.amazonaws.com --username admin

$ argocd cluster list

# Below command will show the EKS cluster
$ kubectl config get-contexts

# Add above EKS cluster to ArgoCD with below command
$ argocd cluster add i-08b9d0ff0409f48e7@DevOps-Demo.us-east-1.eksctl.io --name DevOps-Demo

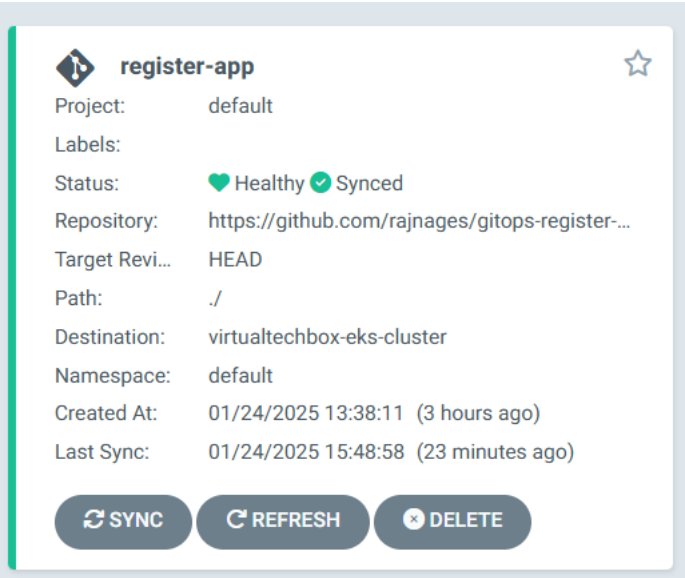
Configure ArgoCD to Deploy Pods on EKS and Automate ArgoCD Deployment Job using GitOps GitHub Repository

Login to argocd load balancer URL— **Settings**- **Repositories** — **Connect Repo — VIA HTTPS** Type git Project default Repsitory URL :

https://github.com/rajnages/gitops-register-app.git

password : Generate personal access token and add here

Applications- New APP -
Application Name: register-app
Project Name : default
SYNC POLICY: Automatic
tick on **PRUNE RESOURCES and SELF HEAL**
Repository URL: select from drop-down
Revison : HEAD
Path: ./
Destination : Cluster URL : from drop-down
namespace: default



kubectl get pods
kubectl get svc

Access the application
load-balancer URL:8080/webapp

Create a Jenkins CD Job

name: gitops-register-app-cd
Discard old builds : Max # of builds to keep 2
This project is parameterized : String parameterized: Name: IMAGE_TAG
Trigger builds remotely (e.g., from scripts): Authentication Token: gitops-token
Pipeline: pipeline script from SCM :

https://github.com/rajnages/gitops-register-app.git