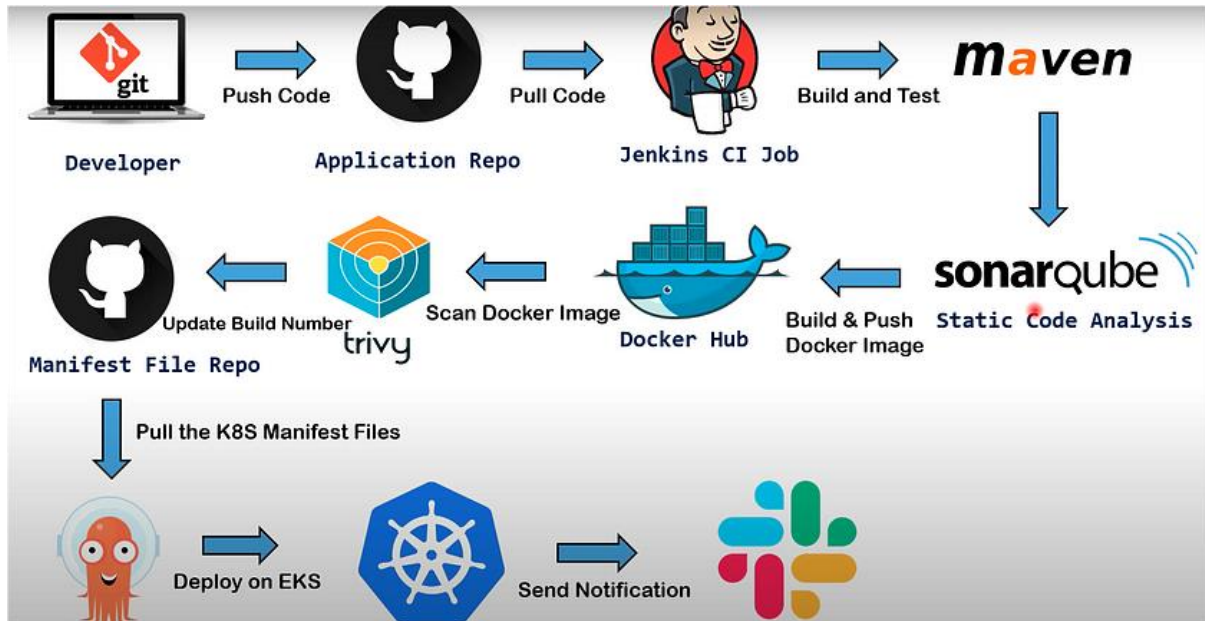


## End to End DevOps Project | CICD



### 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

<input type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
<input type="checkbox"/>	Agent-Machine	i-004fc23b7fd777621	Running	t2.medium	2/2 checks passed	View alarms +	us-east-1a	ec2-34-227-97-216.co...
<input type="checkbox"/>	EKS-Machine	i-02d12f18efebec723	Running	t2.medium	2/2 checks passed	View alarms +	us-east-1a	ec2-54-162-254-141.co...
<input type="checkbox"/>	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 existing 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](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  
     — Username: github username

— password: github passwrđ  
— 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>

gitops-ci-job

Add description

Stage View

	Declarative: Checkout SCM	Declarative: Tool Install	Cleanup Workspace	Checkout from SCM	Build Application	Test Application	SonarQube Analysis	Quality Gate	Build & Push Docker Image	Trivy Scan	Cleanup Artifacts	Trigger CD Pipeline	Declarative: Post Actions
Average stage times: (Average full run time: ~1min 42s)	388ms	231ms	356ms	540ms	6s	3s	12s	472ms	8s	1min 2s	997ms	713ms	91ms
#13 Jan 24 15:46 1 commit	386ms	229ms	370ms	533ms	6s	3s	12s	403ms (passed for 3s)	8s	1min 2s	994ms	698ms	97ms
#12 Jan 24 15:22 1 commit	391ms	233ms	342ms	547ms	6s	3s	12s	462ms (passed for 4s)	8s	1min 2s	1s	729ms	85ms

SonarQube Quality Gate

Maven Project

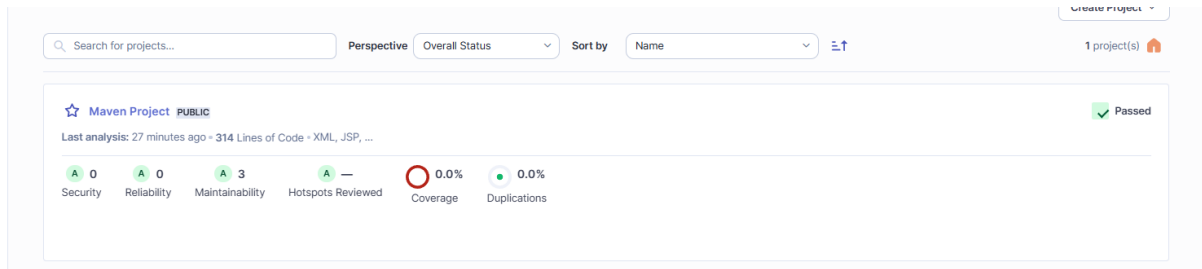
Passed

server-side processing: Success

Permalinks

- Last build (#13), 22 min ago
- Last stable build (#13), 22 min ago
- Last successful build (#13), 22 min ago
- Last completed build (#13), 22 min ago

# Sonarqube checks:



## # Docker hub checks:

Sort by	Newest	Filter tags	Delete
<div> <div>TAG</div> <div> <div>latest</div> <div>Last pushed 28 minutes ago by <a href="#">rainages</a></div> </div> <div> <div>Digest</div> <div>0277092de601</div> </div> <div> <div>OS/ARCH</div> <div>linux/amd64</div> </div> <div> <div>Last pull</div> <div>26 minutes ago</div> </div> <div> <div>Compressed size</div> <div>215.74 MB</div> </div> <div>docker pull rainages/register-app-pipeline:latest <a href="#">Copy</a></div> </div>			
<div> <div>TAG</div> <div> <div>1.0.0-13</div> <div>Last pushed 28 minutes ago by <a href="#">rainages</a></div> </div> <div> <div>Digest</div> <div>0277092de601</div> </div> <div> <div>OS/ARCH</div> <div>linux/amd64</div> </div> <div> <div>Last pull</div> <div>26 minutes ago</div> </div> <div> <div>Compressed size</div> <div>215.74 MB</div> </div> <div>docker pull rainages/register-app-pipeline:1.0.0-13 <a href="#">Copy</a></div> </div>			
<div> <div>TAG</div> <div> <div>1.0.0-12</div> <div>Last pushed an hour ago by <a href="#">rainages</a></div> </div> <div> <div>Digest</div> <div>0277092de601</div> </div> <div> <div>OS/ARCH</div> <div>linux/amd64</div> </div> <div> <div>Last pull</div> <div>26 minutes ago</div> </div> <div> <div>Compressed size</div> <div>215.74 MB</div> </div> <div>docker pull rainages/register-app-pipeline:1.0.0-12 <a href="#">Copy</a></div> </div>			

## 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 password 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 Repository 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**

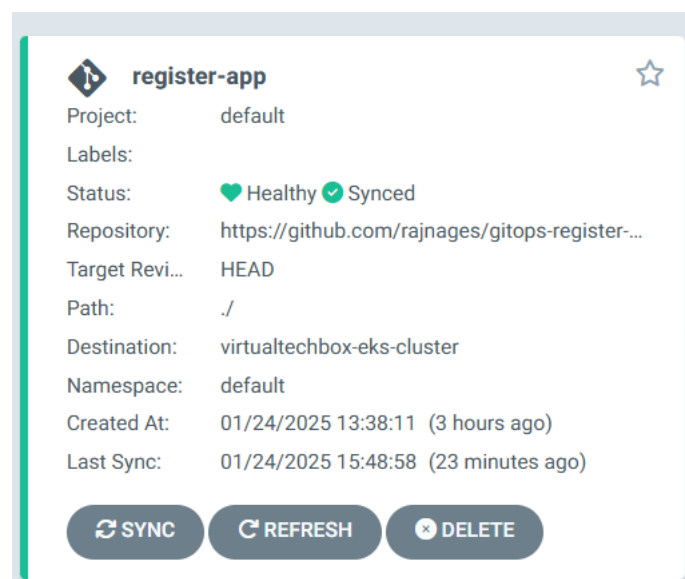
**Repository URL:** select from drop-down

**Revision :** HEAD

**Path:** ./

**Destination :** Cluster URL : from drop-down

**namespace:** default



The screenshot shows the ArgoCD application details for 'register-app'. The interface includes a star icon in the top right corner. The application is configured with the following details:

- Project:** default
- Labels:**
- Status:** Healthy (green heart icon) and Synced (green checkmark icon)
- Repository:** https://github.com/rajnages/gitops-register-...
- Target Revision:** HEAD
- Path:** ./
- Destination:** virtualtechbox-eks-cluster
- Namespace:** default
- Created At:** 01/24/2025 13:38:11 (3 hours ago)
- Last Sync:** 01/24/2025 15:48:58 (23 minutes ago)

At the bottom, there are three buttons: **SYNC** (with a circular arrow icon), **REFRESH** (with a circular arrow icon), and **DELETE** (with an 'X' icon).



kubectl get pods

kubectl get svc

# Access the application

load-balancer [URL:8080/webapp](http://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>

### Stage View

