**Assignment:**

Create a CICD pipeline in Jenkins or AWS CodePipeline or AWS CodeBuild / CodeDeploy or GitHub Actions to fetch code (any tech stack / code e.g Python, Java, DotNet, Node etc) from GitHub repository, Build it, dockerize / containerize and deploy to ECS / EKS or AWS Lambda, S3 so that users can access the application viz URL.

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**Technology Used:**

Docker, ECR, EKS, GitHub Actions

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**Folder structure:**

**|\_** src

**|\_** .github

**|\_**workflows

**|\_** deploy.yml

**|\_** Dockerfile

**|\_** pom.xml

|\_ k8s/

**|\_** deployment.yaml

**|\_** service.yaml

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**Java Project**

* Install JDK & verify

$ java -version

* Install Apache Maven, Add path in environment variable (Environment variable > Path > C:\Program Files\apache-maven-3.9.9\bin) & verify

$ mvn -version

* Install Intel J
* Spring Initializr

Browse – <https://start.spring.io/>

Project – Maven

Language – Java

Spring Boot – 3.5.3

Group – com.example

Artifact – java-hello-world

Name – java-hello-world

Description – Demo project for Spring Boot

Package name – com.example.java-hello-world

Packaging – Jar

Java – 17

Dependencies – Spring Web

Generate

* Extract downloaded zip file and drag into Intel J
* Verify project java version in Intel J

Settings > Project structure > Project > SDK – 17 > Apply > OK

* Navigate into source folder "src/main/java/com.example.java\_hello\_world".
* JavaHelloWorldApplication.java

package com.example.java\_hello\_world;

import org.springframework.boot.SpringApplication;

import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication

public class JavaHelloWorldApplication {

public static void main(String[] args) {

SpringApplication.run(JavaHelloWorldApplication.class, args);

}

}

* HomeController.java

package com.example.java\_hello\_world;

import org.springframework.stereotype.Controller;

import org.springframework.web.bind.annotation.GetMapping;

@Controller

public class HomeController {

@GetMapping("/")

public String display() {

return "index";

}

}

* src/main/resources/templates/index.html

<!DOCTYPE html>

<html xmlns:th="http://www.thymeleaf.org">

<head>

<title>Homepage</title>

<link rel="stylesheet" href="/style.css">

</head>

<body>

<div class="container">

<h1>Hello World</h1>

<h2>LTIMindtree</h2>

<h3>Shivam Thakur</h3>

</div>

</body>

</html>

* src/main/resources/static/style.css

body {

font-family: Arial, sans-serif;

background-color: #f0f8ff;

text-align: center;

padding-top: 50px;

}

.container h1 {

color: #2e8b57;

font-size: 3em;

}

.container h2 {

color: #4682b4;

font-size: 2.5em;

}

.container h3 {

color: #8a2be2;

font-size: 2em;

}

* pom.xml

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-thymeleaf</artifactId>

</dependency>

* Run below commands

$ mvn clean package

$ mvn spring-boot:run or java -jar target/\*.jar

* Verify

Browse – http://localhost:8080/ > "It will show Hello World

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**Setup**

* Create new repository in GitHub.
* Git Configuration

1. Configure Git user info in local

$ git config --global user.name "shivam"

$ git config --global user.email [shivamthakur0567@gmail.com](mailto:shivamthakur0567@gmail.com)

1. Initialize Git Repository

$ git init

1. Add files to Git:

$ git add .

1. Commit changes:

$ git commit -m "Initial commit"

1. Check current local branch

$ git branch

Master

1. Rename local branch to main

$ git branch -m main

1. Add our remote repository

$ git remote add origin https://github.com/shivam-th/java-hello-world.git

1. Push the code from local to remote repository

$ git push -u origin main --force

* AWS Configuration

$ aws configure

AWS Access Key ID [None]:

AWS Secret Access Key [None]:

Default region name [None]:

Default output format [None]:

* Install EKS & create cluster

1. Browse – <https://eksctl.io/installation/> > download required zip file
2. Create "eksctl" folder in C drive, extract the downloaded zip file and place .exe file in a "C:\eksctl".
3. Add folder path to Environment Variable
4. Edit Environment Variables > Path
5. Verify

$ eksctl version

1. Create EKS cluster

$ eksctl create cluster \

--name my-cluster \

--region us-east-1 \

--nodegroup-name linux-nodes \

--node-type t3.medium \

--nodes 2 \

--nodes-min 1 \

--nodes-max 3 \

--managed

1. Append below block under mapRoles

$ kubectl edit configmap aws-auth -n kube-system

- rolearn: arn:aws:iam::471112745159:role/GitHubActionsOIDCRole

      username: github-actions

      groups:

        - system:masters

1. Dfs

{

"Version": "2012-10-17",

"Statement": [

{

"Effect": "Allow",

"Action": [

"eks:DescribeCluster",

"eks:ListClusters"

],

"Resource": "\*"

}

]

}

* Create ECR

$ aws ecr create-repository \

    --repository-name my-java-app \

    --region us-east-1

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**Containerization**

* Dockerfile

# Use maven image to build the application

FROM maven:3.8.5-openjdk-17 AS builder

# Set the working directory

WORKDIR /app

# Copy the source code

COPY . .

# Build the application

RUN mvn clean package

##################################################

# Use a JDK image to run the application

FROM openjdk:17-jdk-slim

# Set the working directory

WORKDIR /app

# copy build file from stage1

COPY --from=builder /app/target/\*.jar app.jar

# Expose the port

EXPOSE 8080

# Run the application

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

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**Kubernetes Manifests**

* k8s/deployment.yaml

apiVersion: apps/v1

kind: Deployment

metadata:

name: java-app-deployment

spec:

replicas: 2

selector:

matchLabels:

app: java-app

template:

metadata:

labels:

app: java-app

spec:

containers:

- name: java-app

image: <ECR\_IMAGE\_URI>

ports:

- containerPort: 8080

* k8s/service.yaml

apiVersion: v1

kind: Service

metadata:

name: java-app-service

spec:

type: LoadBalancer

selector:

app: java-app

ports:

- port: 80

targetPort: 8080

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**GitHub Action Workflow**

* .github/workflows/ci-cd.yml

name: CI/CD Pipeline

# Trigger the workflow on push to the main branch

on:

push:

branches: [main]

# Define environment variables

env:

AWS\_REGION: us-east-1

ECR\_REGISTRY: 471112745159.dkr.ecr.us-east-1.amazonaws.com

ECR\_REPOSITORY: my-java-app

CLUSTER\_NAME: my-cluster

IMAGE\_TAG: ${{ github.sha }}

jobs:

deploy:

runs-on: ubuntu-latest

steps:

# Checkout the source code from the repository

- name: Checkout code

uses: actions/checkout@v4

# Configure AWS credentials using GitHub Secrets

- name: Configure AWS credentials

uses: aws-actions/configure-aws-credentials@v2

with:

aws-access-key-id: ${{ secrets.AWS\_ACCESS\_KEY }}

aws-secret-access-key: ${{ secrets.AWS\_SECRET\_ACCESS\_KEY }}

aws-region: ${{ env.AWS\_REGION }}

# Log in to Amazon ECR to allow pushing Docker images

- name: Login to Amazon ECR

id: login-ecr

uses: aws-actions/amazon-ecr-login@v2

# Build the Docker image and push it to ECR

- name: Build and Push Docker image

run: |

ECR\_URI=$ECR\_REGISTRY/$ECR\_REPOSITORY:$IMAGE\_TAG

docker build -t $ECR\_URI .

docker push $ECR\_URI

# Update kubeconfig to interact with the EKS cluster

- name: Update kubeconfig

run: |

aws eks update-kubeconfig --name $CLUSTER\_NAME

# Deploy the application to EKS using Kubernetes manifests

- name: Deploy to EKS

run: |

ECR\_URI=$ECR\_REGISTRY/$ECR\_REPOSITORY:$IMAGE\_TAG

sed "s|<ECR\_IMAGE\_URI>|$ECR\_URI|g" k8s/deployment.yaml| kubectl apply -f -

kubectl apply -f k8s/service.yaml

# Fetch External LoadBalancer IP

- name: Get LoadBalancer IP

run: |

echo "Waiting for External LoadBalancer External IP..."

sleep 10

kubectl get svc java-app-service

kubectl get pods

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* Create OIDC Identity Provider

IAM > Identity providers > Add provider

Provider type – OpenID Connect

Provider URL – <https://token.actions.githubusercontent.com>

Audience – sts.amazonaws.com

* Create IAM Role for GitHub OIDC

IAM > Roles > Create role

Trusted entity type – Web identity > Identity provider – <https://token.actions.githubusercontent.com> > Audience – sts.amazonaws.com

GitHub organization – Anonymous

Permission Policies – AdministratorAccess (AmazonEKSFullAccess) > Next

Role name – GitHubActionsOIDCRole

**Cleanup**

* Delete node groups

$ aws eks delete-nodegroup --cluster-name my-cluster --nodegroup-name linux-nodes --region us-east-1

* Delete cluster

$ aws eks delete-cluster --name my-cluster