Task : Deploy Dockerized 3-Tier Architecture with Angular Frontend, Java Backend, and RDS on Kubernetes.

Prerequisites:

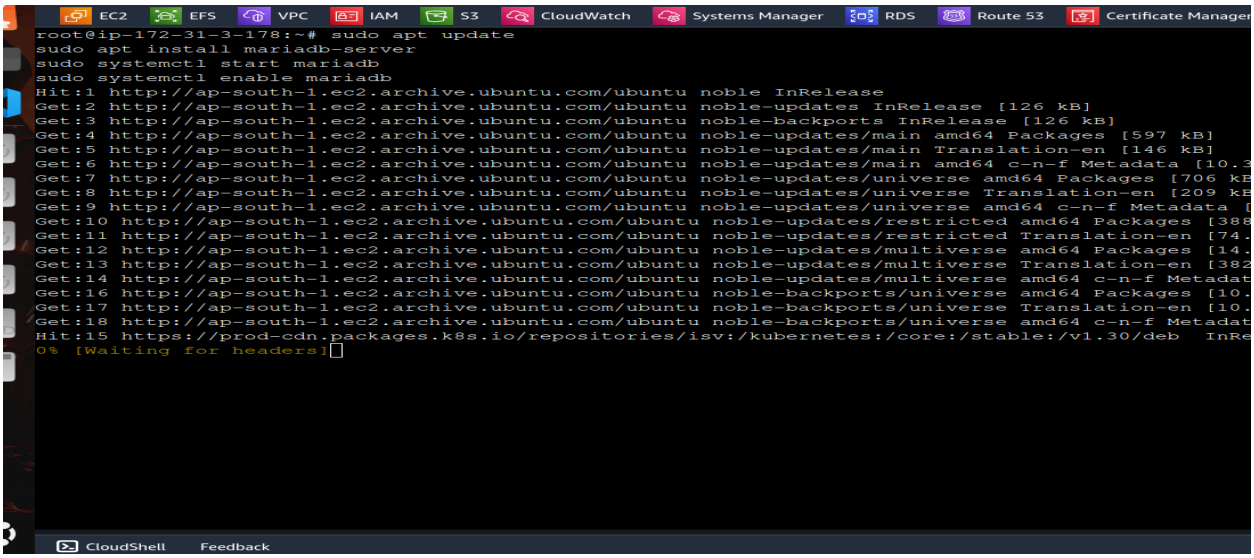
- **Ensure Kubeadm, Kubelet, Kubectl, and Docker are installed on both master and worker nodes. Initialize the cluster on the master node with `kubeadm init` and join the worker nodes using `kubeadm join`.**
- **Reference link for installing and setup kubeadm →https://github.com/Gaurav1251/Devops_Tasks/tree/main/K8s/Kubeadm%20Installation%20and%20Configuration**

Note: Perform the below steps only on master node.

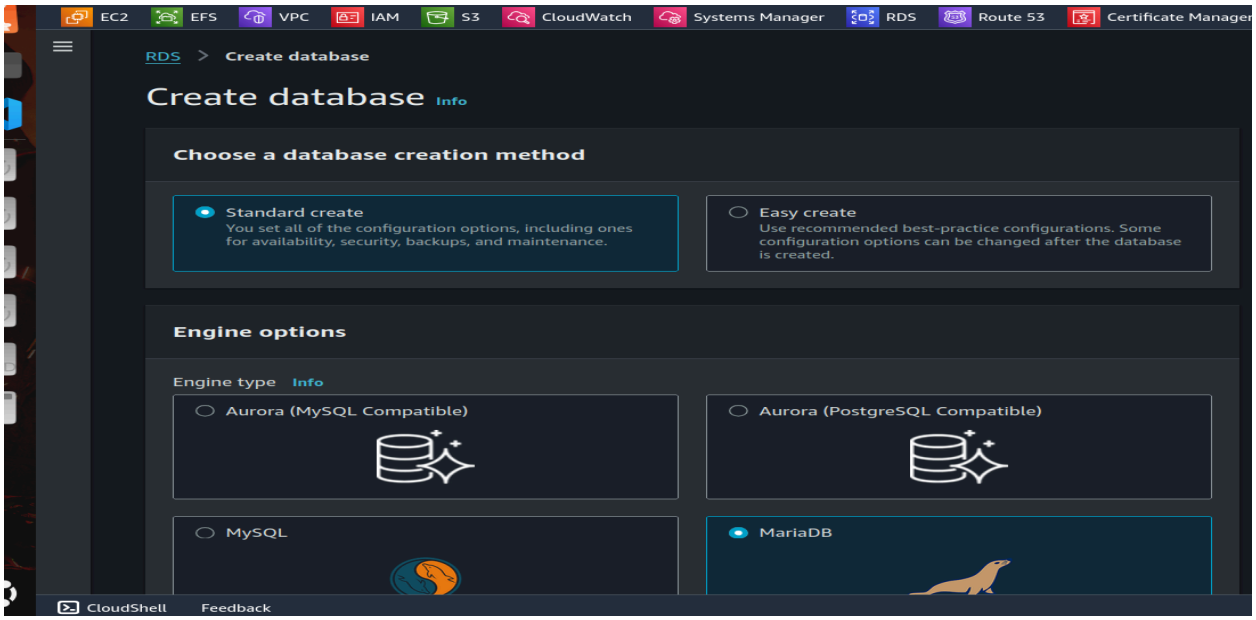
Step 1: Install mariadb server on system (master node).

Commands

→sudo apt update
sudo apt install mariadb-server
sudo systemctl start mariadb
sudo systemctl enable mariadb



Step 2: Create a RDS database with engine as mariadb.



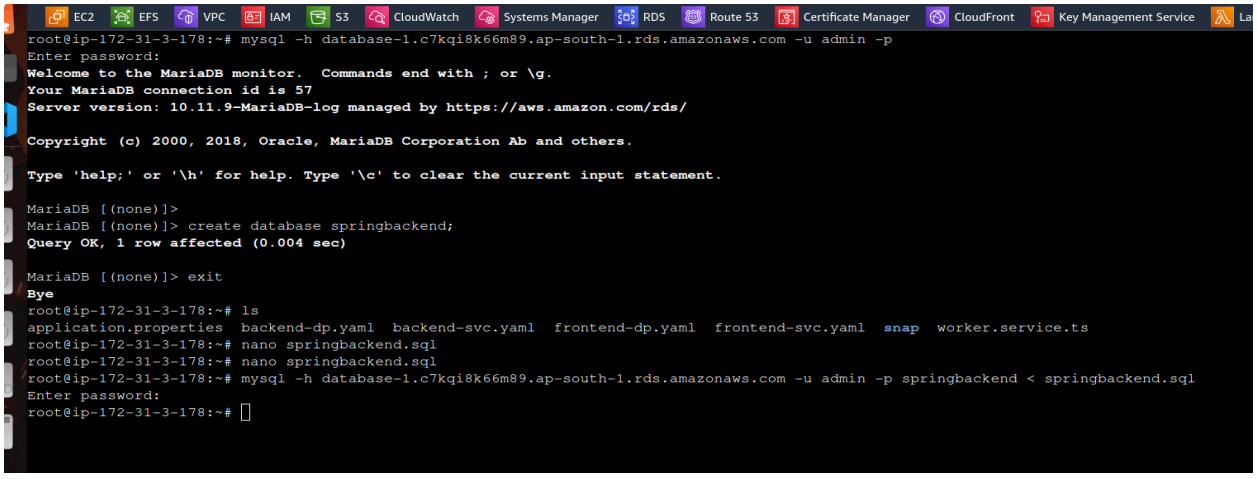
Step 3: Now connect to the RDS database.

mysql -h rds-endpoint -u admin -p

1. **After that create database springbackend in it .**

2. **After creating database exit and copy the springbackend.sql file to the database .**

mysql -h rds-endpoint -u admin -p springbackend < springbackend.sql



Step 4: Now create application.properties which will be required to connect backend with our rds database.

Replace the rds-endpoint and username and password as per your configuration.

```
EC2  EFS  VPC  IAM  S3  CloudWatch  Systems Manager  RDS  Route 53  Certificate Manager  CloudFront  Key Managem
root@ip-172-31-3-178:~# nano application.properties
root@ip-172-31-3-178:~# cat application.properties
spring.datasource.url=jdbc:mysql://database-1.c7kqi8k66m89.ap-south-1.rds.amazonaws.com:3306/springbackend?useSSL=false
spring.datasource.username=admin
spring.datasource.password=12345678
server.port=8085

spring.jpa.generate-ddl=true
root@ip-172-31-3-178:~#
```

Step 5: Create Deployment and service yaml files for the backend pod.

```
EC2  EFS  VPC  IAM  S3  CloudWatch
root@ip-172-31-3-178:~# nano backend-dp.yaml
root@ip-172-31-3-178:~# cat  backend-dp.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: backend-app
spec:
  replicas: 1
  selector:
    matchLabels:
      app: backend-app
  strategy:
    type: RollingUpdate
  template:
    metadata:
      labels:
        app: backend-app
    spec:
      containers:
      - name: backend-app
        image: gaurav1251/angularK8:ttbe
        ports:
        - name: backend
          containerPort: 8085
          protocol: TCP
root@ip-172-31-3-178:~#
```

```
root@ip-172-31-3-178:~# nano backend-svc.yaml
root@ip-172-31-3-178:~# cat backend-svc.yaml
apiVersion: v1
kind: Service
metadata:
  name: backend-service
spec:
  selector:
    app: backend-app
  ports:
  - name: backend
    targetPort: 8085
    port: 8085
  type: NodePort
root@ip-172-31-3-178:~#
```

We enter the container port =8085 because our backend image is exposed on 8085 port .

Also for the svc file we will be using NodePort because we want access the backend from frontend which cant be done by ClusterIP.

Step 6: Create deployment and svc file for the frontend.

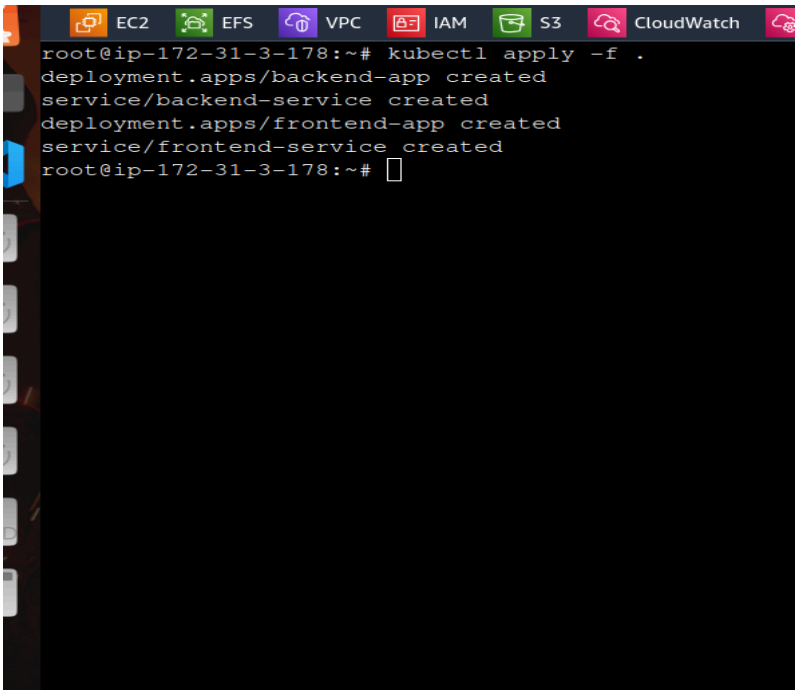
```
root@ip-172-31-3-178:~# nano frontend-dp.yaml
root@ip-172-31-3-178:~# cat frontend-dp.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: frontend-app
spec:
  replicas: 1
  selector:
    matchLabels:
      app: frontend-app
  strategy:
    type: RollingUpdate
  template:
    metadata:
      labels:
        app: frontend-app
    spec:
      containers:
      - name: frontend-app
        image: gaurav1251/angularlark8:ffe
        ports:
        - name: angular
          containerPort: 30010
          protocol: TCP
root@ip-172-31-3-178:~#
```

```
root@ip-172-31-3-178:~# nano frontend-svc.yaml
root@ip-172-31-3-178:~# cat frontend-svc.yaml
apiVersion: v1
kind: Service
metadata:
  name: frontend-service
spec:
  selector:
    app: frontend-app
  ports:
  - name: angular
    targetPort: 30010
    port: 30010
  type: NodePort
root@ip-172-31-3-178:~#
```

Here we gave 30010 as port because our frontend image is exposed to port 30010.

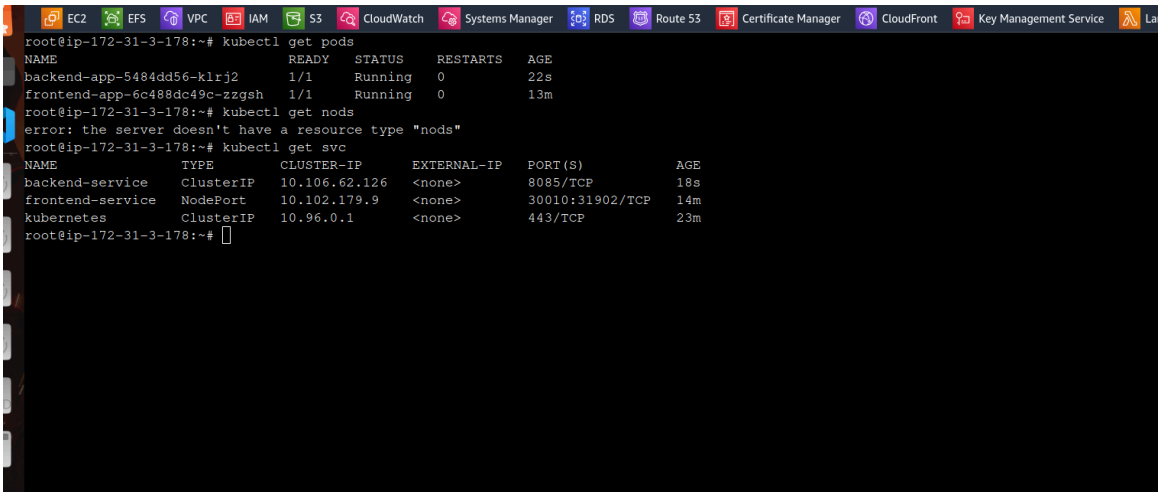
Step 7: Now apply the deployment and service files of the both backend and frontend.

Kubectl apply -f .



Check the pods and svc are running successfully.

kubectl get pods && kubectl get svc



Step 8: Now make changes in the file worker.service.ts ,add the public ip of worker node and the port which was assigned by NodePort.

```
root@ip-172-31-3-178:~# kubectl get pods
NAME                              READY   STATUS    RESTARTS        AGE
backend-app-5484dd56-klrj2        1/1     Running   3 (3m24s ago)   4m54s
frontend-app-6c488dc49c-zzgsh     1/1     Running   0               18m
root@ip-172-31-3-178:~# kubectl logs backend-app-5484dd56-klrj2
root@ip-172-31-3-178:~# kubectl get svc
NAME                TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)           AGE
backend-service     NodePort    10.96.113.34   <none>        8085:31721/TCP    25s
frontend-service    NodePort    10.102.179.9   <none>        30010:31902/TCP   20m
kubernetes          ClusterIP   10.96.0.1      <none>        443/TCP           29m
root@ip-172-31-3-178:~# nano worker.service.ts
root@ip-172-31-3-178:~# nano worker.service.ts
root@ip-172-31-3-178:~# cat worker.service.ts
import { HttpClient } from '@angular/common/http';
import { Injectable } from '@angular/core';
import { Observable } from 'rxjs';
import { map } from 'rxjs/operators';
import { Worker } from '../models/worker';

@Injectable({
  providedIn: 'root'
})
export class WorkerService {

  private getUrl: string = "http://43.204.235.147:31721/api/v1/workers";
```

Step 9: Now as the both application.properties and worker.service.ts files are configured as per the essential values copy this files to there respected paths in the pods.

For backend pod

→ kubectl cp /path/application.properties backend-pod_name:/path/

```
root@ip-172-31-3-178:~# kubectl cp application.properties backend-app-5484dd56-klrj2:/app/src/main/resources/
```

For Frontend pod

→ kubectl cp /path/worker.service.ts frontend-pod_name:/path/

```
root@ip-172-31-3-178:~# kubectl cp application.properties backend-app-5484dd56-klrj2:/app/src/main/resources/
```

Step 10: Now again check the pods are running successfully or not .

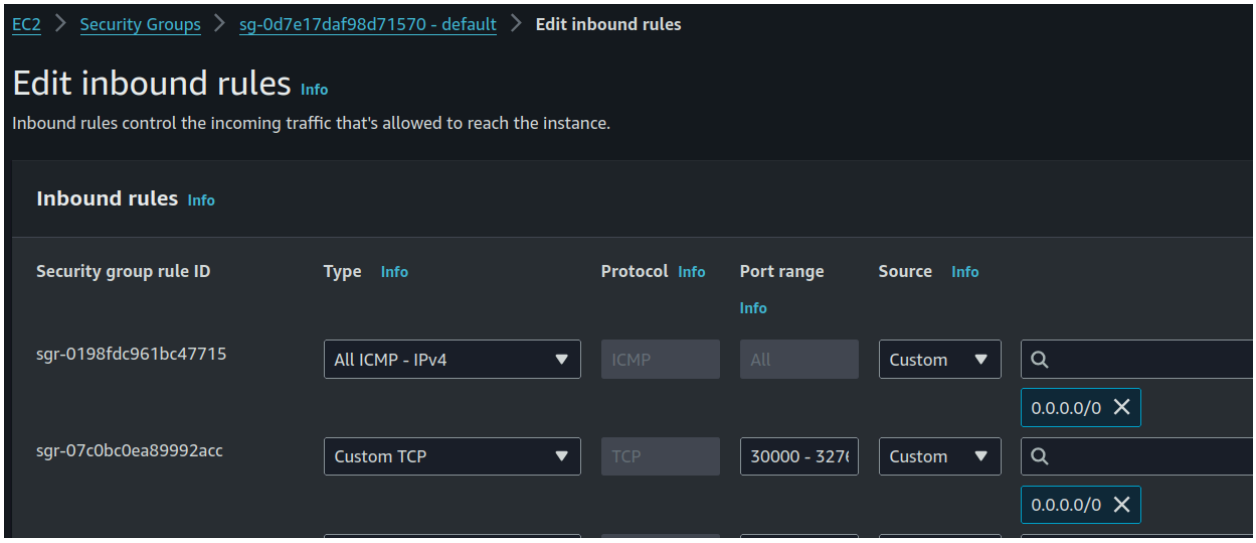
Kubectl get pods

After this check frontend service port number by →

kubectl get svc

```
root@ip-172-31-3-178:~# kubectl get pods
NAME                                READY   STATUS    RESTARTS        AGE
backend-app-5484dd56-klrj2          1/1     Running   3 (8m47s ago)   10m
frontend-app-6c488dc49c-zzgsh       1/1     Running   0               23m
root@ip-172-31-3-178:~# kubectl get svc
NAME               TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)           AGE
backend-service    NodePort    10.96.113.34   <none>        8085:31721/TCP    3m55s
frontend-service   NodePort    10.102.179.9   <none>        30010:31902/TCP   23m
kubernetes         ClusterIP   10.96.0.1      <none>        443/TCP           33m
root@ip-172-31-3-178:~#
```

After this add the port numbers 30000-32767 in the security Group of the worker node, which is the port range is used by Kubernetes for services of type `NodePort`. These ports allow you to expose services on a node's IP address at a static port.



Output : Paste the public ip of worker node and the port assigned by the NodePort to Frontend service in the web browser.

http://public_ip_of_worker-node:port/