Homework 10- DevOps
Blerona Mulladauti 221541

Requirements;

○ Deploy EMQTT cluster of three nodes

○ Have the configuration in a ConfigMap

○ Have the /opt/emqx/data folder persisted

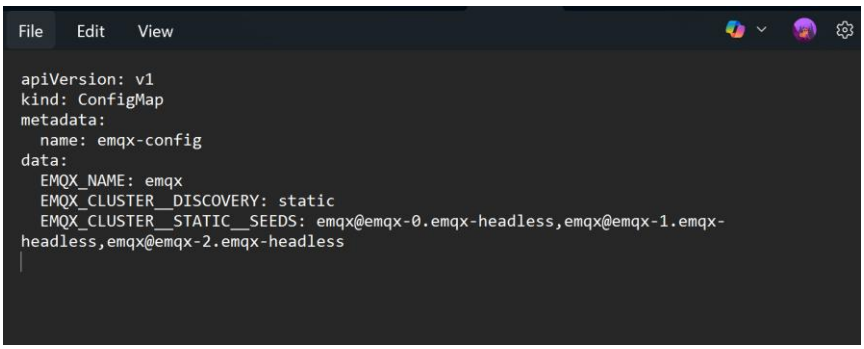
○ Example: ■ https://www.emqx.io/docs/en/v5.0/deploy/install-docker.html# use-docker-compose-to-build-an-emqx-cluster

○ Verify the running nodes with “emqx_ctl cluster status” on the nodes

*use a **StatefulSet** (not a Deployment), because: each pod needs a **stable hostname** and **stable storage**.*

EMQX nodes refer to each other by name (like emqx@emqx-0.emqx-headless).

Created the configmap.yaml



With the prefix name for all nodes: emqx

Predefined node addresses: static

Each EMQX node must persist data in /opt/emqx/data

I already have a storage class by default

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl get sc
NAME                 PROVISIONER          RECLAIMPOLICY   VOLUMEBINDINGMODE   ALLOWVOLUMEEXPANSION   AGE
hostpath (default)   docker.io/hostpath   Delete          Immediate           false                  14d
```

Now defining the statefulset.yaml which will do :

- Mount a separate PVC to each pod for /opt/emqx/data
- Use the emqx-config ConfigMap
- Enable clustering
- Deploy 3 pods for EMQX

```yaml
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: emqx
spec:
  serviceName: emqx-headless
  replicas: 3
  selector:
    matchLabels:
      app: emqx
  template:
    metadata:
      labels:
        app: emqx
    spec:
      containers:
      - name: emqx
        image: emqx/emqx:5.0.25
        ports:
        - containerPort: 1883 # MQTT port
        - containerPort: 8083 # WebSocket
        - containerPort: 18083 # Dashboard
        - containerPort: 4370 # Cluster port
        envFrom:
        - configMapRef:
            name: emqx-config
        volumeMounts:
        - name: emqx-data
          mountPath: /opt/emqx/data
```

```yaml
volumeClaimTemplates:
- metadata:
    name: emqx-data
  spec:
    accessModes: ["ReadWriteOnce"]
    storageClassName: hostpath
    resources:
      requests:
        storage: 500Mi
```

using a StatefulSet instead of a Deployment because: Each pod in the EMQX cluster needs a unique, stable hostname (like emqx-0, emqx-1, etc.), each one needs its own persistent storage and EMQX nodes form a cluster based on hostnames

```
C:\Users\blero\Not OneDrive\devOps\homework10>notepad emqx-service.yaml

C:\Users\blero\Not OneDrive\devOps\homework10>kubectl apply -f emqx-service.yaml
service/emqx-headless created
```

```
apiVersion: v1
kind: Service
metadata:
  name: emqx-headless
spec:
  clusterIP: None  # makes it headless
  selector:
    app: emqx
  ports:
    - port: 1883
      name: mqtt
    - port: 8083
      name: websocket
    - port: 18083
      name: dashboard
    - port: 4370
      name: cluster
```

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl get pods
NAME     READY   STATUS    RESTARTS   AGE
emqx-0   1/1     Running   0          9m6s
emqx-1   1/1     Running   0          8m17s
emqx-2   1/1     Running   0          8m15s
```

Now checking pod emqx-1 to enter it and run a cluster check

But I cant configure cause pods haven't connected yet and

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl logs emqx-0
WARNING: Default (insecure) Erlang cookie is in use.
WARNING: Configure node.cookie in /opt/emqx/etc/emqx.conf or override from environment variable EMQX_NODE__COOKIE
WARNING: NOTE: Use the same cookie for all nodes in the cluster.
EMQX_RPC__PORT_DISCOVERY [rpc.port_discovery]: manual
EMQX_CLUSTER__STATIC__SEEDS [cluster.static.seeds]: emqx@emqx-0.emqx-headless,emqx@emqx-1.emqx-headless,emqx@emqx-2.emqx
-headless
EMQX_CLUSTER__DISCOVERY_STRATEGY [cluster.discovery_strategy]: static
EMQX_NODE__NAME [node.name]: emqx@10.1.0.37
Listener ssl:default on 0.0.0.0:8883 started.
Listener tcp:default on 0.0.0.0:1883 started.
Listener ws:default on 0.0.0.0:8083 started.
Listener wss:default on 0.0.0.0:8084 started.
Listener http:dashboard on :18083 started.
EMQX 5.0.25 is running now!
2025-05-25T12:02:05.447918+00:00 [error] ** Cannot get connection id for node 'emqx@10.1.0.37'
2025-05-25T12:02:12.453572+00:00 [warning] Ekka(AutoCluster): discovered nodes outside cluster: ['emqx@emqx-0.emqx-headl
ess','emqx@emqx-1.emqx-headless','emqx@emqx-2.emqx-headless']
2025-05-25T12:02:20.459177+00:00 [error] ** Cannot get connection id for node 'emqx@10.1.0.37'
2025-05-25T12:02:27.467600+00:00 [warning] Ekka(AutoCluster): discovered nodes outside cluster: ['emqx@emqx-0.emqx-headl
ess','emqx@emqx-1.emqx-headless','emqx@emqx-2.emqx-headless']
2025-05-25T12:02:34.495370+00:00 [error] ** Cannot get connection id for node 'emqx@10.1.0.37'
2025-05-25T12:02:41.500050+00:00 [warning] Ekka(AutoCluster): discovered nodes outside cluster: ['emqx@emqx-0.emqx-headl
```

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl exec -it emqx-1 -- sh
$ kubectl logs emqx-0 | grep DISCOVERY
sh: 1: kubectl: not found
$ exit
command terminated with exit code 1
```

It says the Erlang cookie is in use, all nodes have different cookies so the nodes cant authenticate each other, they are discoverable but cant authenticate. Ot make the same set Erlang cookie across pods I was suggested to create a secret for the cookie

kubectl create secret generic emqx-cookie –from literal=EMQX_NODE__COOKIE=supersecretcookie

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl create secret generic emqx-cookie --from-literal=EMQX_NODE__COOKIE
=supersecretcookie
secret/emqx-cookie created
```

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl get secret emqx-cookie -o yaml
apiVersion: v1
data:
  EMQX_NODE__COOKIE: c3VwZXJzZWNyZXRjb29raWU=
kind: Secret
metadata:
  creationTimestamp: "2025-05-25T12:09:30Z"
  name: emqx-cookie
  namespace: default
  resourceVersion: "37083"
  uid: 3da63224-da48-4a2f-875e-d90e0e579f1e
```

Applied the cookie to stateful set

```
    app: emqx
 spec:
   containers:
   - name: emqx
     image: emqx/emqx:5.0.25
     ports:
     - containerPort: 1883 # MQTT port
     - containerPort: 8083 # WebSocket
     - containerPort: 18083 # Dashboard
     - containerPort: 4370 # Cluster port
     envFrom:
     - configMapRef:
         name: emqx-config
     -secretRef:
         name: emqx-cookie
     volumeMounts:
     - name: emqx-data
       mountPath: /opt/emqx/data
olumeClaimTemplates:
```

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl apply -f statefulset.yaml
statefulset.apps/emqx configured
```

Restarted the pods

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl delete pod emqx-0 emqx-1 emqx-2
pod "emqx-0" deleted
pod "emqx-1" deleted
pod "emqx-2" deleted

C:\Users\blero\Not OneDrive\devOps\homework10>kubectl get pods
NAME     READY   STATUS    RESTARTS   AGE
emqx-0   1/1     Running   0          13s
emqx-1   1/1     Running   0          12s
emqx-2   1/1     Running   0          11s
```

Still cant find the other clusters

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl exec -it emqx-0 -- sh
$ emqx_ctl cluster status
Cluster status: #{running_nodes => ['emqx@10.1.0.43'],stopped_nodes => []}
$
```

I couldn’t make it work automatically some trouble with the DNS so I joined them manually, previously this didn’t work either but now it did :

```
C:\Users\blero\Not OneDrive\devOps\homework10>kubectl exec -it emqx-0 -- sh
$ emqx_ctl cluster status
Cluster status: #{running_nodes => ['emqx@10.1.0.43','emqx@10.1.0.45'],
                  stopped_nodes => []}
$
```