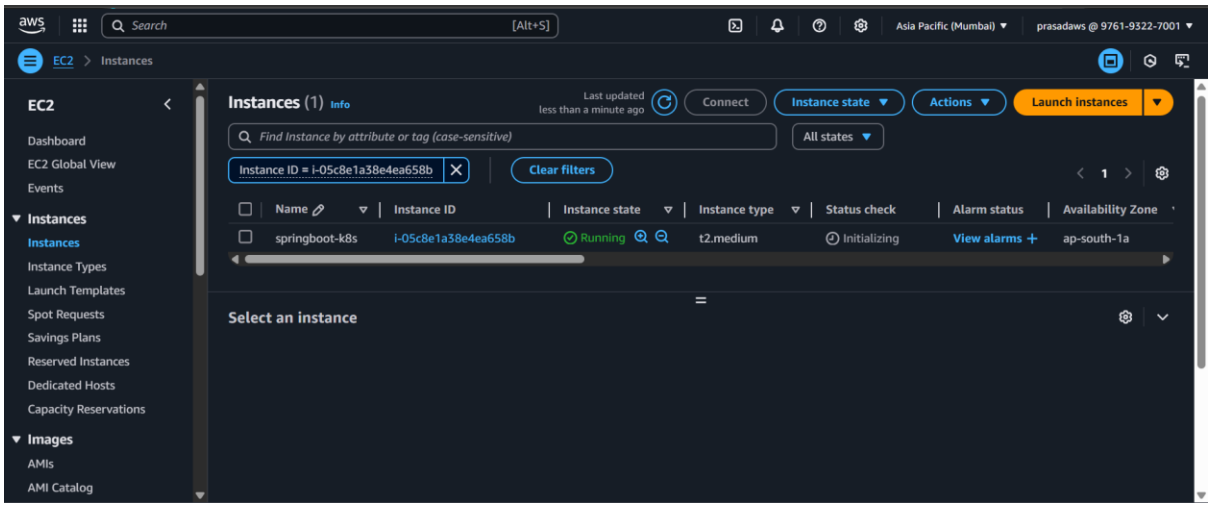
Deploying Spring Boot application on Kubernetes

Create EC2 instance:



Install Docker:

sudo apt update -y

sudo apt install -y docker.io

sudo systemctl enable docker

sudo systemctl start docker

docker --version

```
ubuntu@ip-172-31-44-46:~$ docker --version
Docker version 26.1.3, build 26.1.3-0ubuntu1~24.04.1
ubuntu@ip-172-31-44-46:~$
```

Install Minikube:

```
ubuntu@ip-172-31-44-46:~$ curl -LO https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  119M  100  119M    0     0  11.4M      0  0:00:10  0:00:10 --:--:-- 15.7M
ubuntu@ip-172-31-44-46:~$
```

Verify Minikube installation:

```
ubuntu@ip-172-31-44-46:~$ minikube version
minikube version: v1.35.0
commit: dd5d320e41b5451cdf3c01891bc4e13d189586ed-dirty
ubuntu@ip-172-31-44-46:~$
```

Install Kubectl:

```
ubuntu@ip-172-31-44-46:~$ curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl"
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100   138  100   138    0     0    434      0 --:--:-- --:--:-- --:--:--   435
100 54.6M  100 54.6M    0     0  15.6M      0  0:00:03  0:00:03 --:--:-- 17.4M
ubuntu@ip-172-31-44-46:~$
```

Verify kubectl installation:

```
ubuntu@ip-172-31-44-46:~$ kubectl version --client
Client Version: v1.32.3
Kustomize Version: v5.5.0
ubuntu@ip-172-31-44-46:~$
```

Install Git:

```
ubuntu@ip-172-31-44-46:~$ sudo apt install -y git
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
git is already the newest version (1:2.43.0-1ubuntu7.2).
git set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 143 not upgraded.
ubuntu@ip-172-31-44-46:~$
```

Clone the Repository:

```
ubuntu@ip-172-31-44-46:/opt$ sudo git clone https://github.com/Prasadrasal2002/Spring-Boot-application.git
Cloning into 'Spring-Boot-application'...
remote: Enumerating objects: 102, done.
remote: Counting objects: 100% (102/102), done.
remote: Compressing objects: 100% (71/71), done.
remote: Total 102 (delta 16), reused 73 (delta 4), pack-reused 0 (from 0)
Receiving objects: 100% (102/102), 33.05 MiB | 7.71 MiB/s, done.
Resolving deltas: 100% (16/16), done.
ubuntu@ip-172-31-44-46:/opt$
```

```
ubuntu@ip-172-31-44-46:/opt$ ls
Spring-Boot-application  containerd
ubuntu@ip-172-31-44-46:/opt$ cd Spring-Boot-application/
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

Set Up Database in Kubernetes:

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f db-pvc.yml
persistentvolumeclaim/mysql-pv-claim created
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl get pods
```

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f db-config.yml
configmap/mysql-config created
```

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f db-secret.yml
secret/mysql-secret created
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f db-statefulset.yml
statefulset.apps/mysql created
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl get pod
NAME      READY   STATUS    RESTARTS   AGE
mysql-0   1/1     Running   0          20s
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

Check the database inside the container:

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl exec -it mysql-0  -- /bin/bash
bash-4.2# mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.44 MySQL Community Server (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| prasad             |
| sys                |
+--------------------+
5 rows in set (0.00 sec)

mysql>
```

Check the Table Schema:

DESC orders_tbl;

```
mysql> DESC orders_tbl;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| id    | int(11)      | NO   | PRI | NULL    |       |
| name  | varchar(255) | YES  |     | NULL    |       |
| price | double       | NO   |     | NULL    |       |
| qty   | int(11)      | NO   |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

- **Remove the Existing Primary Key:**
- **Command:** ALTER TABLE orders_tbl DROP PRIMARY KEY;

```
mysql> ALTER TABLE orders_tbl DROP PRIMARY KEY;
Query OK, 0 rows affected (0.01 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

- **Alter the Table to Add AUTO_INCREMENT:**
- **Command:** ALTER TABLE orders_tbl MODIFY COLUMN id INT AUTO_INCREMENT PRIMARY KEY;

```
mysql> ALTER TABLE orders_tbl MODIFY COLUMN id INT NOT NULL AUTO_INCREMENT PRIMARY KEY;
Query OK, 0 rows affected (0.01 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

- **Then try inserting a record again:**
- **Command:** INSERT INTO orders_tbl (name, price, qty) VALUES ('Test Order', 100, 2);

```
mysql> DESC orders_tbl;
+-------+--------------+------+-----+---------+----------------+
| Field | Type         | Null | Key | Default | Extra          |
+-------+--------------+------+-----+---------+----------------+
| id    | int(11)      | NO   | PRI | NULL    | auto_increment |
| name  | varchar(255) | YES  |     | NULL    |                |
| price | double       | NO   |     | NULL    |                |
| qty   | int(11)      | NO   |     | NULL    |                |
+-------+--------------+------+-----+---------+----------------+
4 rows in set (0.00 sec)

mysql> INSERT INTO orders_tbl (name, price, qty) VALUES ('Test Order', 100, 2);
Query OK, 1 row affected (0.00 sec)

mysql> SELECT * FROM orders_tbl;
+----+------------+-------+-----+
| id | name       | price | qty |
+----+------------+-------+-----+
|  1 | Test Order |   100 |   2 |
+----+------------+-------+-----+
1 row in set (0.00 sec)
```

Build Docker Image:

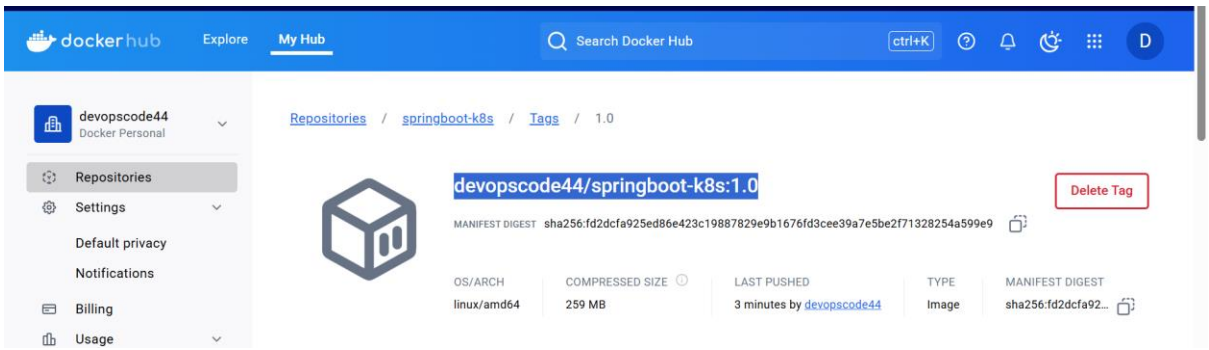
```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo docker build -t devopscode44/springboot-k8s:1.0 .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
            Install the buildx component to build images with BuildKit:
            https://docs.docker.com/go/buildx/

Sending build context to Docker daemon  73.36MB
Step 1/4 : FROM openjdk:8
8: Pulling from library/openjdk
001c52e26ad5: Pull complete
d9d4b9b6e964: Pull complete
2068746827ec: Pull complete
9daef329d350: Pull complete
d85151f15b66: Pull complete
52a8c426d30b: Pull complete
8754a66e0050: Pull complete
Digest: sha256:86e863cc57215cfb181bd319736d0baf625fe0f150577f9eb58bd937f5452cb8
Status: Downloaded newer image for openjdk:8
 ---> b273004037cc
Step 2/4 : EXPOSE 8080
 ---> Running in b70b7d2cbd8e
 ---> Removed intermediate container b70b7d2cbd8e
 ---> c8338b3a5509
Step 3/4 : ADD target/springboot-crud-k8s.jar springboot-crud-k8s.jar
 ---> eac0407e164e
Step 4/4 : ENTRYPOINT ["java","-jar","/springboot-crud-k8s.jar"]
 ---> Running in 49e16c631597
 ---> Removed intermediate container 49e16c631597
 ---> 2ea4e9749b10
Successfully built 2ea4e9749b10
Successfully tagged devopscode44/springboot-k8s:1.0
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo docker images
REPOSITORY                TAG       IMAGE ID       CREATED          SIZE
devopscode44/springboot-k8s   1.0       2ea4e9749b10   20 seconds ago   565MB
gcr.io/k8s-minikube/kicbase   v0.0.46   e72c4cbe9b29   2 months ago     1.31GB
openjdk                   8         b273004037cc   2 years ago      526MB
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

Push the image to Docker Hub:

```
Login Succeeded
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo docker push devopscode44/springboot-k8s:1.0
The push refers to repository [docker.io/devopscode44/springboot-k8s]
0d201b2d8fbc: Pushed
6b5aaff44254: Mounted from library/openjdk
53a0b163e995: Mounted from library/openjdk
b626401ef603: Mounted from library/openjdk
9b55156abf26: Mounted from library/openjdk
293d5db30c0f: Mounted from library/openjdk
03127cdb479b: Mounted from library/openjdk
9c742cd6c7a5: Mounted from library/openjdk
1.0: digest: sha256:fd2dcfa925ed86e423c19887829e9b1676fd3cee39a7e5be2f71328254a599e9 size: 2007
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

Docker Hub:



Deploy the Application in Kubernetes:

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f app-deployment.yml
deployment.apps/springboot-crud configured
```

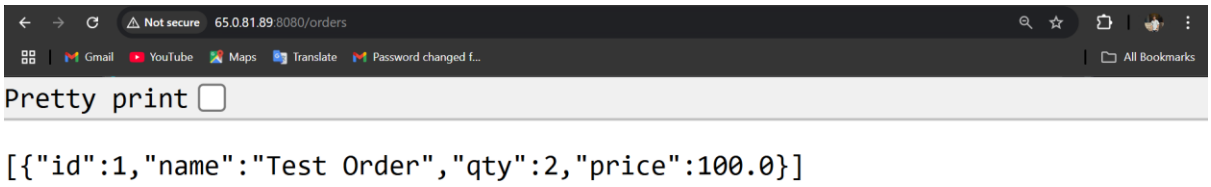
```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl get pod
NAME                              READY   STATUS    RESTARTS   AGE
mysql-0                           1/1     Running   0          21m
springboot-crud-684b9c9b4f-g2srl  1/1     Running   0          36s
springboot-crud-684b9c9b4f-lgfhd  1/1     Running   0          34s
springboot-crud-684b9c9b4f-sw9kd  1/1     Running   0          55s
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f db-service.yml
service/mysql created
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl apply -f app-service.yml
service/springboot-service created
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ sudo kubectl get svc
NAME             TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
kubernetes       ClusterIP   10.96.0.1      <none>        443/TCP          37m
mysql            ClusterIP   None           <none>        3306/TCP         30s
springboot-service   NodePort    10.98.150.78   <none>        8080:30008/TCP   10s
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$
```

Port Forwarding:

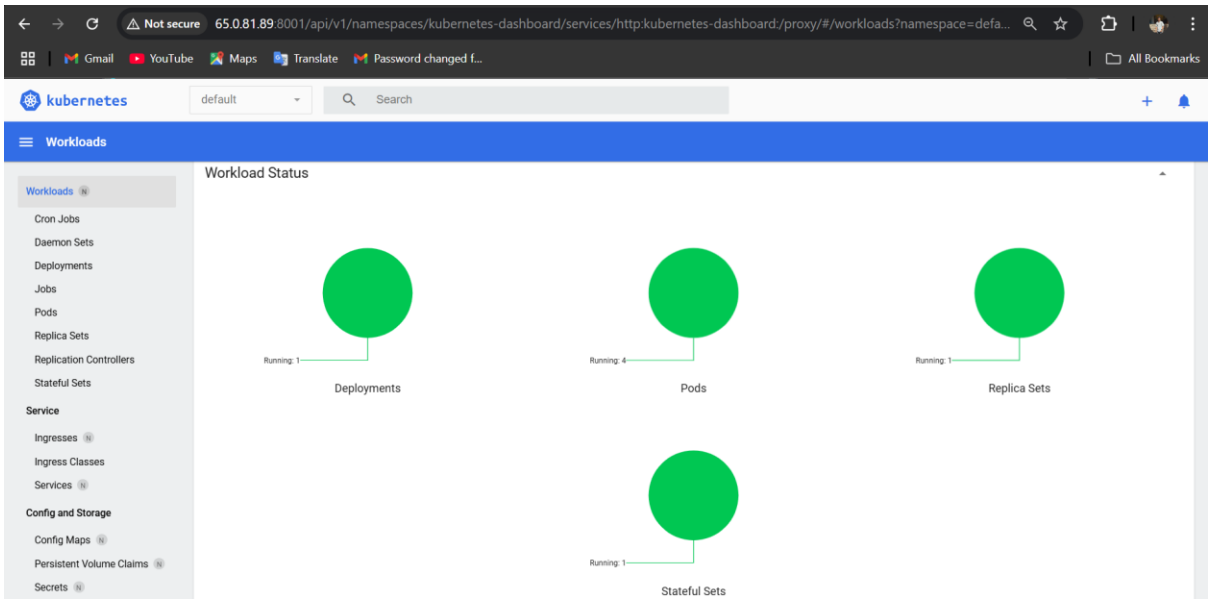
```
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ kubectl port-forward --address 0.0.0.0 svc/springboot-service 8080:8080 &
[1] 104186
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ Forwarding from 0.0.0.0:8080 -> 8080
Handling connection for 8080
Handling connection for 8080
Handling connection for 8080
Handling connection for 8080
Handling connection for 8080
Handling connection for 8080
ubuntu@ip-172-31-44-46:/opt/Spring-Boot-application$ kubectl proxy --address='0.0.0.0' --accept-hosts='^*$'
Starting to serve on [::]:8001
Handling connection for 8080
```

Spring Boot application:.

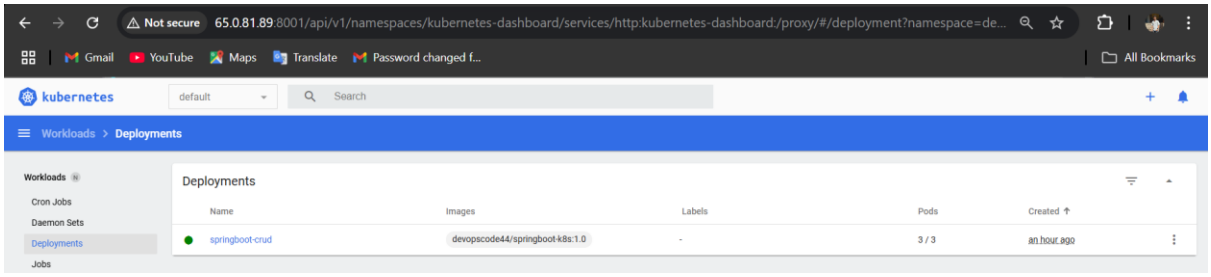


Kubernetes dashboard:

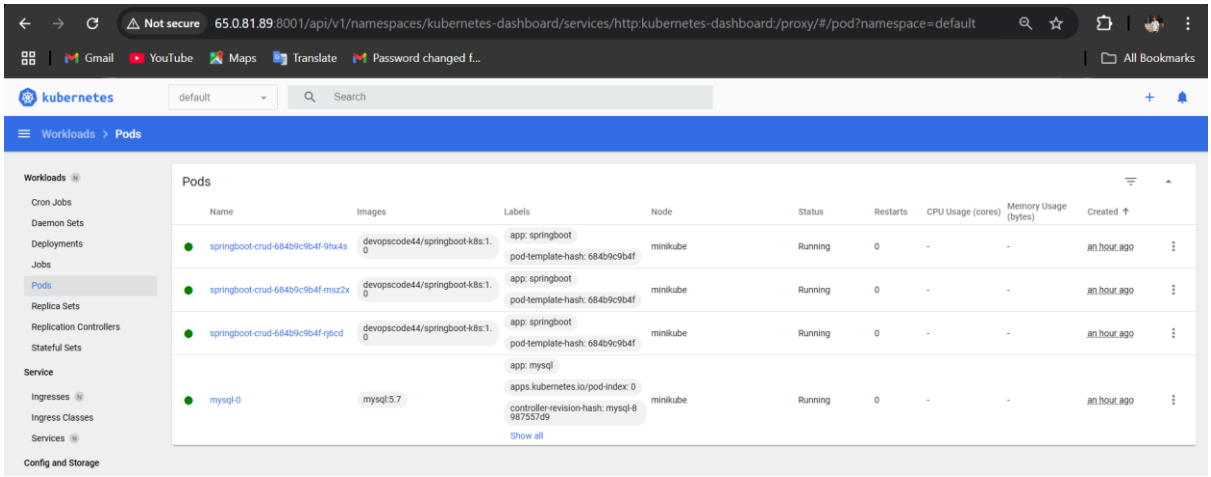
i)workload:



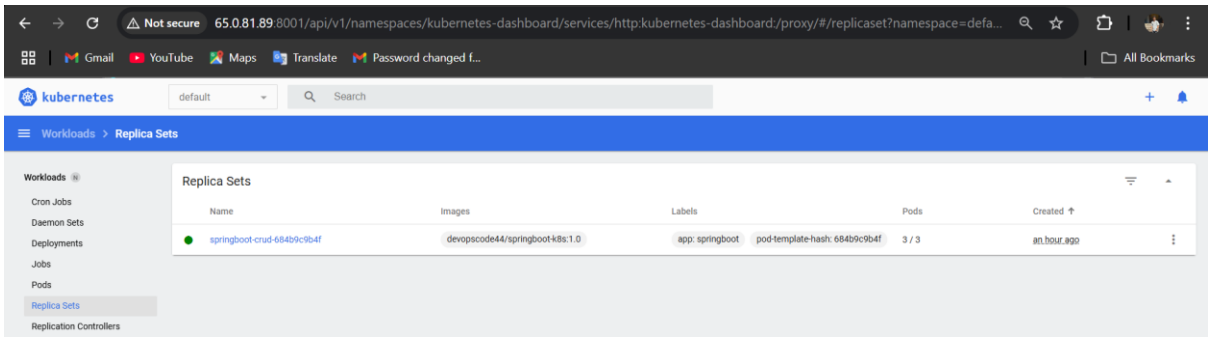
ii)Deployments:



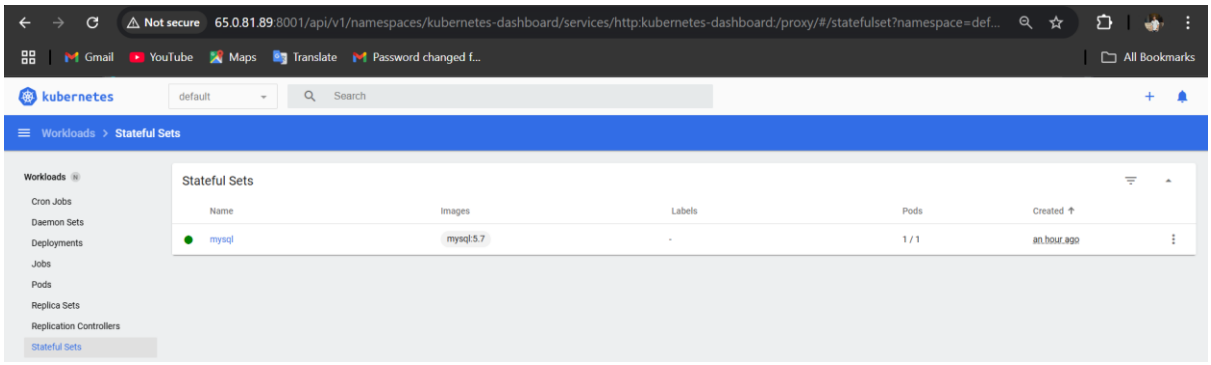
iii)Pods:



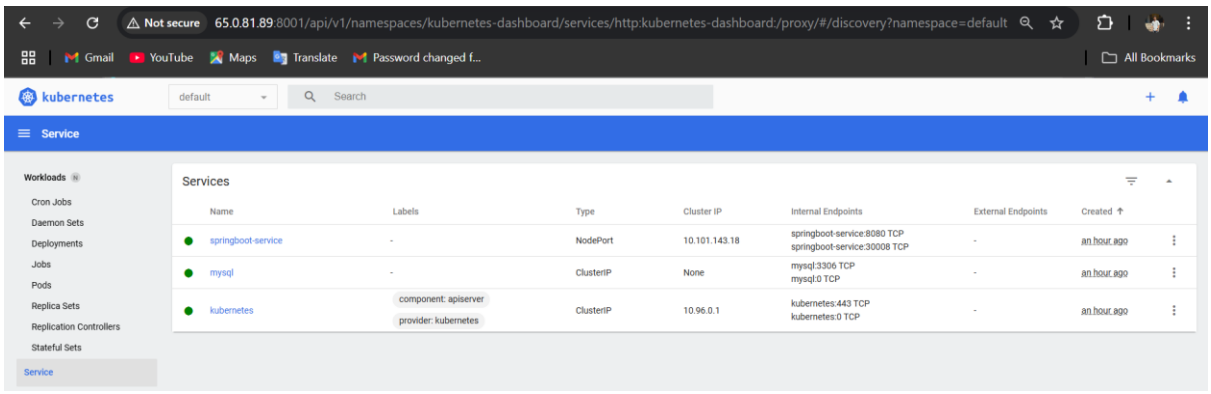
iv)Replica sets:



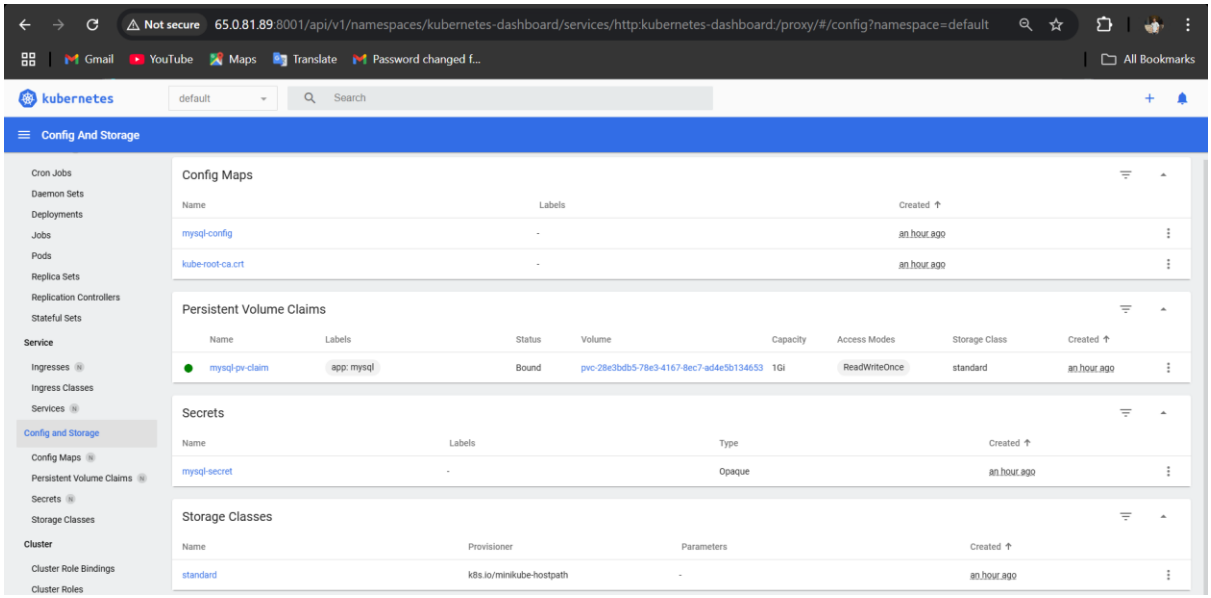
v)Stateful sets:



vi)Services:



vii)Config Maps, PVC, Secrets:


Not secure 65.0.81.89:8001/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/config?namespace=default
Gmail YouTube Maps Translate Password changed f... All Bookmarks
kubernetes
default
Search
Config And Storage
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Config Maps
Name Labels Created
mysql-config - an hour ago
kube-root-ca.crt - an hour ago
Persistent Volume Claims
Name Labels Status Volume Capacity Access Modes Storage Class Created
mysql-pv-claim app: mysql Bound pvc-28e3bdb5-78e3-4167-8ec7-ad4e5b134653 1Gi ReadWriteOnce standard an hour ago
Secrets
Name Labels Type Created
mysql-secret - Opaque an hour ago
Storage Classes
Name Provisioner Parameters Created
standard k8s.io/minikube-hostpath - an hour ago