Faculty of Engineering & Applied Science

SOFE4790U – Distributed Systems

Lab 1 – CRN 44425

Due Date: 09/18/2022

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1. MySQL Deployment

i. Deploying MySQL application on the

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl create deployment mysql-deployment --image mysql/mysql-server --port=3306
deployment.apps/mysql-deployment created
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get deployment
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
mongodb-standalone  1/1     1            1           47h
mysql-deployment    1/1     1            1           21s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongodb-standalone-5c6cb86f45-m69nl 1/1     Running   0          47h
mysql-deployment-7467c475f8-9kf6k   1/1     Running   0          28s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$
```

ii. Accessing MySQL using the temporary password through the pod

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongodb-standalone-5c6cb86f45-m69nl 1/1     Running   0          2d
mysql-deployment-7467c475f8-9kf6k   1/1     Running   0          8m7s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl logs mysql-deployment-7467c475f8-9kf6k 2>&1 |grep GENERATED
[Entrypoint] GENERATED ROOT PASSWORD: z&_e0vw,NMI9633gVI^HC61IA_/f%?q9
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl exec -it mysql-deployment-7467c475f8-9kf6k -- mysql -uroot -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 8.0.30

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

mysql>
```

iii. Changing the root password and creating a new user (sofe4790u) while allowing the user full privileges

```
mysql> ALTER USER 'root'@'localhost' IDENTIFIED BY 'password' ;
Query OK, 0 rows affected (0.01 sec)

mysql> CREATE USER 'user'@'%' IDENTIFIED BY 'sofe4790u';
Query OK, 0 rows affected (0.02 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'user'@'%' WITH GRANT OPTION;
Query OK, 0 rows affected (0.01 sec)
```

iv. Creating a load balancer service to access the pods through an external IP address

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$  kubectl expose deployment mysql-deployment --type=LoadBalancer --name=mysql-service
service/mysql-service exposed
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$
```

v. Accessing MySQL through an external IP Address

```
bhutta_abdul@cloudshell:~$ kubectl get services
NAME              TYPE           CLUSTER-IP    EXTERNAL-IP      PORT(S)          AGE
kubernetes        ClusterIP      10.84.0.1     <none>           443/TCP          9d
mongodb-service   LoadBalancer   10.84.8.48    35.226.185.35    3306:30647/TCP   20h
mysql-service     LoadBalancer   10.84.0.54    34.171.222.236   3306:30136/TCP   7d
bhutta_abdul@cloudshell:~$ mysql -uuser -psofe4790u -h34.171.222.236
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 1616
Server version: 8.0.30 MySQL Community Server - GPL

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

mysql>
```

vi. Deploying MySQL using YAML

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl apply -f mysql.yaml
service/mysql-service created
deployment.apps/mysql-deployment created
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get services
NAME                TYPE           CLUSTER-IP     EXTERNAL-IP      PORT(S)          AGE
kubernetes          ClusterIP      10.84.0.1      <none>           443/TCP          2d22h
mongodb-standalone  LoadBalancer   10.84.13.125   35.226.185.35    3306:31458/TCP   2d
mysql-service       LoadBalancer   10.84.0.54     <pending>        3306:30136/TCP   9s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get deployments
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
mongodb-standalone  1/1     1            1           2d
mysql-deployment    1/1     1            1           24s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get pods
NAME                                 READY   STATUS    RESTARTS   AGE
mongodb-standalone-5c6cb86f45-m69nl  1/1     Running   0          2d
mysql-deployment-5496fdc956-8d4mc    1/1     Running   0          55s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get services
NAME                TYPE           CLUSTER-IP     EXTERNAL-IP      PORT(S)          AGE
kubernetes          ClusterIP      10.84.0.1      <none>           443/TCP          2d22h
mongodb-standalone  LoadBalancer   10.84.13.125   35.226.185.35    3306:31458/TCP   2d
mysql-service       LoadBalancer   10.84.0.54     34.171.222.236   3306:30136/TCP   59s
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$
```

vii. Logging into MySQL using new external IP

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ mysql -uuser -psofe4790u -h34.171.222.236
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.30 MySQL Community Server - GPL

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owners.

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

viii. Running SQL Statements

```
mysql> use myDB;
Database changed
mysql> create table person( id int, age int, name varchar(50));
Query OK, 0 rows affected (0.08 sec)

mysql> insert into person values(1,30,'tom');
Query OK, 1 row affected (0.05 sec)

mysql> insert into person values(2,23,'adam');
Query OK, 1 row affected (0.05 sec)

mysql> insert into person values(3,79,'Joe');
Query OK, 1 row affected (0.05 sec)

mysql> select * from person where age>=30;
+------+------+------+
| id   | age  | name |
+------+------+------+
|    1 |   30 | tom  |
|    3 |   79 | Joe  |
+------+------+------+
2 rows in set (0.04 sec)

mysql>
```

2. MongoDB Deployment

MongoDB YAML File

```yaml
apiVersion: v1
kind: Service
metadata:
  name: mongodb-service
spec:
  type: LoadBalancer
  ports:
    - port: 3306
  selector:
    app: database
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mongodb-deployment
spec:
  replicas: 1
  selector:
    matchLabels:
      app: database
  template:
    metadata:
      labels:
        app: database
    spec:
      containers:
        - image: mongo:4.0.8
          name: database
          env:
            - name: MONGO_INITDB_ROOT_USERNAME
              value: abdulbhutta
            - name: MONGO_INITDB_ROOT_PASSWORD
              value: password
          ports:
            - containerPort: 3306
              name: database
```

Designing the YAML File

The YAML file was designed similarly to the MySQL file while making minor changes. The full YAML file is provided above to view the changes that were made. The service and deployment names were changed to mongodb-service and mongodb deployment. Once the services and deployments are running, the MongoDB terminal is accessed in administrator mode to create new records. The replica data from MySQL is added to the MongoDB database and a query is executed to display the person's age that is greater or equal to 30.

i. Deploy the YAML File

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl apply -f mongoDB.yaml
service/mongodb-service created
deployment.apps/mongodb-deployment created
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get services
NAME              TYPE           CLUSTER-IP    EXTERNAL-IP      PORT(S)          AGE
kubernetes        ClusterIP      10.84.0.1     <none>           443/TCP          9d
mongodb-service   LoadBalancer   10.84.8.48    35.226.185.35    3306:30647/TCP   81s
mysql-service     LoadBalancer   10.84.0.54    34.171.222.236   3306:30136/TCP   6d4h
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get deployments
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
mongodb-deployment  1/1     1            1           86s
mysql-deployment    1/1     1            1           6d4h
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$
```

ii. Execute the MongoDB in the pod

```
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
mongodb-deployment-5c6cb86f45-zkrsv   1/1     Running   0          2m41s
mysql-deployment-5496fdc956-8d4mc     1/1     Running   0          6d4h
bhutta_abdul@cloudshell:~ (rising-ocean-362417)$ kubectl exec -it mongodb-deployment-5c6cb86f45-zkrsv -- sh
# mongo
MongoDB shell version v4.0.8
connecting to: mongodb://127.0.0.1:27017/?gssapiServiceName=mongodb
Implicit session: session { "id" : UUID("02327236-a2f5-4117-8c68-a9323b700d1c") }
MongoDB server version: 4.0.8
Welcome to the MongoDB shell.
For interactive help, type "help".
For more comprehensive documentation, see
        http://docs.mongodb.org/
Questions? Try the support group
        http://groups.google.com/group/mongodb-user
>
```

iii. Switch to admin

```
> use admin
switched to db admin
> show dbs
> db.auth('abdulbhutta', 'password')
1
> show dbs
admin   0.000GB
config  0.000GB
local   0.000GB
>
```

iv. Create a new table and insert the first record

```
> db.person.insertOne ({id: 1, age: 30, name: "Tom"})
{
        "acknowledged" : true,
        "insertedId" : ObjectId("632cc72692f8ec0c1e5e8a2f")
}
> db.person.insertOne ({id: 2, age: 23, name: "Adam"})
{
        "acknowledged" : true,
        "insertedId" : ObjectId("632cc73992f8ec0c1e5e8a30")
}
> db.person.insertOne ({id: 3, age: 79, name: "Joe"})
{
        "acknowledged" : true,
        "insertedId" : ObjectId("632cc74792f8ec0c1e5e8a31")
}
>
```

v. Run the query to find all the person with age greater than or equal to 30

```
> db.person.find({"age" : {$gte: 30} })
{ "_id" : ObjectId("632cc72692f8ec0c1e5e8a2f"), "id" : 1, "age" : 30, "name" : "Tom" }
{ "_id" : ObjectId("632cc74792f8ec0c1e5e8a31"), "id" : 3, "age" : 79, "name" : "Joe" }
>
```