Deploy a Multi-Tier Web Application On Kubernetes


```
master@master-vm:~/multi-tier-application/flask$ docker build -t bhargavakulla/flaskapp .
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  8.192kB
Step 1/6 : FROM python:3.8
3.8: Pulling from library/python
cdd62bf39133: Pull complete
a47cff7f31e9: Pull complete
a173f2aee8e9: Pull complete
01272fe8adba: Pull complete
cddc73e4e6c7: Pull complete
cc48f13b5f0f: Pull complete
5a98c896c047: Pull complete
Digest: sha256:d411270700143fa2683cc8264d9fa5d3279fd3b6afff62ae81ea2f9d070e390c
Status: Downloaded newer image for python:3.8
 ---> 3ea6eaad4f17
Step 2/6 : WORKDIR /app
 ---> Running in 19b7ac10b279
 ---> Removed intermediate container 19b7ac10b279
 ---> 33d73ef63b70
Step 3/6 : COPY app.py .
 ---> a19a95850ba4
Step 4/6 : COPY requirements.txt .
 ---> 69a7af3140fd
Step 5/6 : RUN pip install --no-cache-dir -r requirements.txt
 ---> Running in b63f6f3a951b
Collecting flask
  Downloading flask-3.0.3-py3-none-any.whl (101 kB)
                                     101.7/101.7 kB 3.3 MB/s eta 0:00:00
Collecting mysql-connector-python
  Downloading mysql_connector_python-9.0.0-cp38-cp38-manylinux_2_17_x86_64.whl (19.3 MB)
                                     19.3/19.3 MB 42.7 MB/s eta 0:00:00
Collecting itsdangerous>=2.1.2
  Downloading itsdangerous-2.2.0-py3-none-any.whl (16 kB)
```



```
Successfully built 4a9fc5a6b6c8
Successfully tagged bhargavakulla/flaskapp:latest
master@master-vm:~/multi-tier-application/flask$ docker push bhargavakulla/flaskapp
Using default tag: latest
The push refers to repository [docker.io/bhargavakulla/flaskapp]
8805b32e6f27: Pushed
0aa4e7a26de3: Pushed
73a97d2d465a: Pushed
01e2b817dee1: Pushed
32ee710ca3c7: Mounted from library/python
1767e4d52b5a: Mounted from library/python
45b98afd69b3: Mounted from library/python
2bce433c3a29: Mounted from library/python
f91dc7a486d9: Mounted from library/python
3e14a6961052: Mounted from library/python
d50132f2fe78: Mounted from library/python
latest: digest: sha256:bd2b5c70e24336f56b5b877d2aba0dcd7732cb3dfe6c8650354a64784a2ebf52 size: 2628
master@master-vm:~/multi-tier-application/flask$ kubectl apply -f flask-deployment.yaml
deployment.apps/flask-app created
master@master-vm:~/multi-tier-application/flask$ kubectl apply -f flask-service.yaml
service/flask-service created
master@master-vm:~/multi-tier-application/flask$ cd ..
master@master-vm:~/multi-tier-application$ cd mysql/
master@master-vm:~/multi-tier-application/mysql$ kubectl apply -f mysql-deployment.yaml
deployment.apps/mysql created
service/mysql created
master@master-vm:~/multi-tier-application/mysql$ kubectl apply -f mysql-pv.yaml
persistentvolume/mysql-pv created
persistentvolumeclaim/mysql-pvc created
master@master-vm:~/multi-tier-application/mysql$ kubectl apply -f mysql-secret.yaml
secret/mysql-secret created
master@master-vm:~/multi-tier-application/mysql$ cd ..
master@master-vm:~/multi-tier-application$ cd nginx/
master@master-vm:~/multi-tier-application/nginx$ kubectl apply -f nginx-configmap.yaml
configmap/nginx-config created
master@master-vm:~/multi-tier-application/nginx$ kubectl apply -f nginx-deployment.yaml
```



```
master@master-vm:~/multi-tier-application/mysql$ kubectl apply -f mysql-pv.yaml
persistentvolume/mysql-pv created
persistentvolumeclaim/mysql-pvc created
master@master-vm:~/multi-tier-application/mysql$ kubectl apply -f mysql-secret.yaml
secret/mysql-secret created
master@master-vm:~/multi-tier-application/mysql$ cd ..
master@master-vm:~/multi-tier-application$ cd nginx/
master@master-vm:~/multi-tier-application/nginx$ kubectl apply -f nginx-configmap.yaml
configmap/nginx-config created
master@master-vm:~/multi-tier-application/nginx$ kubectl apply -f nginx-deployment.yaml
deployment.apps/nginx created
master@master-vm:~/multi-tier-application/nginx$ kubectl apply -f nginx-service.yaml
service/nginx-service created
```

```
master@master-vm:~/multi-tier-application/nginx$ kubectl get all -o wide
NAME                            READY   STATUS    RESTARTS   AGE     IP              NODE         NOMINATED NODE   READINESS GATES
pod/flask-app-694d959f47-bvk8f  1/1     Running   0          7m12s   172.16.114.92   worker2-vm   <none>           <none>
pod/flask-app-694d959f47-fs2c6  1/1     Running   0          7m12s   172.16.114.91   worker2-vm   <none>           <none>
pod/flask-app-694d959f47-rlccq  1/1     Running   0          7m12s   172.16.94.227   worker1-vm   <none>           <none>
pod/flask-app-694d959f47-rwdt5  1/1     Running   0          7m12s   172.16.94.226   worker1-vm   <none>           <none>
pod/mysql-66d468f74c-6ggzz      1/1     Running   0          6m54s   172.16.114.93   worker2-vm   <none>           <none>
pod/nginx-78b5b78b99-796f9      1/1     Running   0          5m4s    172.16.114.95   worker2-vm   <none>           <none>


NAME                    TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)       AGE     SELECTOR
service/flask-service   ClusterIP   10.107.176.49   <none>        5000/TCP      7m6s    app=flask
service/kubernetes      ClusterIP   10.96.0.1       <none>        443/TCP       7m58s   <none>
service/mysql           ClusterIP   10.110.104.236  <none>        3306/TCP      6m54s   app=mysql
service/nginx-service   NodePort    10.104.43.56    <none>        80:30007/TCP  6m21s   app=nginx


NAME                        READY   UP-TO-DATE   AVAILABLE   AGE     CONTAINERS   IMAGES                      SELECTOR
deployment.apps/flask-app   4/4     4            4           7m13s   flask        bhargavakulla/flaskapp      app=flask
deployment.apps/mysql       1/1     1            1           6m54s   mysql        mysql:5.7                   app=mysql
deployment.apps/nginx       1/1     1            1           5m4s    nginx        nginx                       app=nginx


NAME                                              DESIRED   CURRENT   READY   AGE     CONTAINERS   IMAGES                   SELECTOR
replicaset.apps/flask-app-694d959f47              4         4         4       7m13s   flask        bhargavakulla/flaskapp   app=flask,pod-templ
ate-hash=694d959f47
replicaset.apps/mysql-66d468f74c                  1         1         1       6m54s   mysql        mysql:5.7                app=mysql,pod-templ
ate-hash=66d468f74c
replicaset.apps/nginx-78b5b78b99                  1         1         1       5m4s    nginx        nginx                    app=nginx,pod-templ
ate-hash=78b5b78b99
```
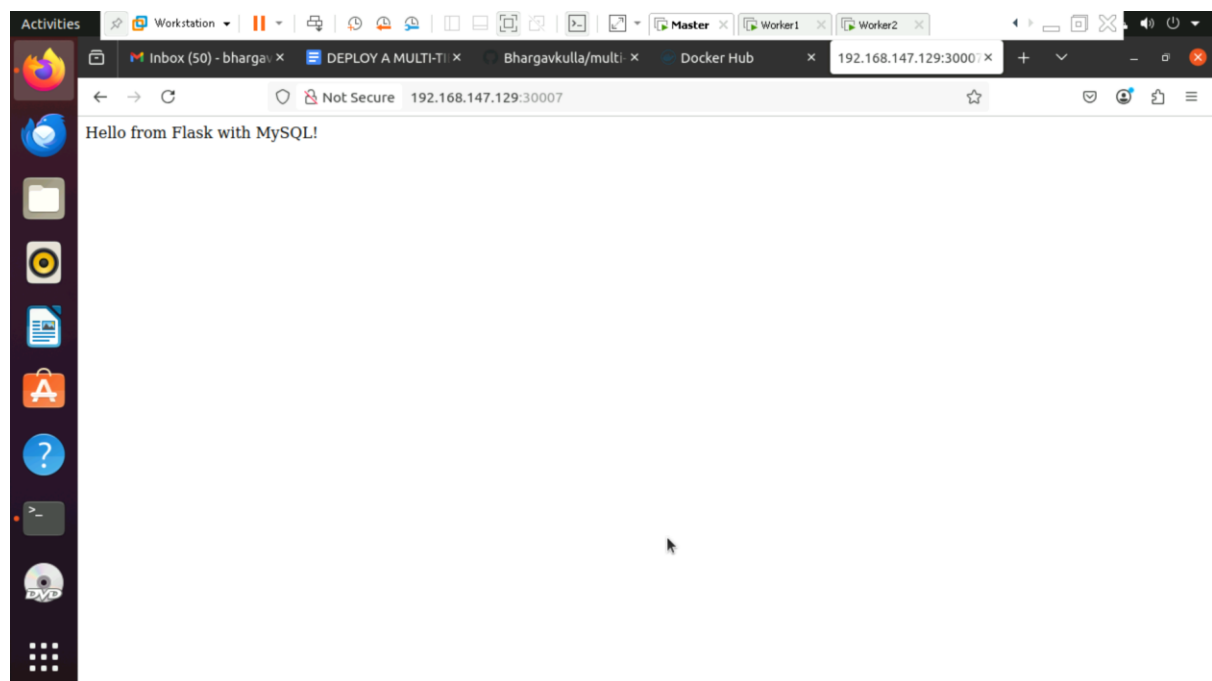
Hello from Flask with MySQL!

```
                              master@master-vm: ~/multi-tier-application/mysql

flask  mysql  nginx  README.md
master@master-vm:~/multi-tier-application$ cd mysql/
master@master-vm:~/multi-tier-application/mysql$ kubectl get pods
NAME                        READY   STATUS    RESTARTS   AGE
flask-app-694d959f47-bvk8f  1/1     Running   0          23m
flask-app-694d959f47-fs2c6  1/1     Running   0          23m
flask-app-694d959f47-rlccq  1/1     Running   0          23m
flask-app-694d959f47-rwdt5  1/1     Running   0          23m
mysql-66d468f74c-6ggzz      1/1     Running   0          22m
nginx-78b5b78b99-7nwgk      1/1     Running   0          3m14s
master@master-vm:~/multi-tier-application/mysql$ kubectl exec -it mysql-66d468f74c-6ggzz -- mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.7.44 MySQL Community Server (GPL)

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owners.

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

mysql> CREATE DATABASE mydb;
ERROR 1007 (HY000): Can't create database 'mydb'; database exists
mysql> CREATE DATABASE mydata;
Query OK, 1 row affected (0.00 sec)

mysql> USE mydata;
Database changed
mysql> SHOW TABLES;
Empty set (0.00 sec)

mysql> CREATE TABLE users (
    ->     id INT AUTO INCREMENT PRIMARY KEY,
```

```
                              master@master-vm: ~/multi-tier-application/mysql

mysql> USE mydata;
Database changed
mysql> SHOW TABLES;
Empty set (0.00 sec)

mysql> CREATE TABLE users (
    ->     id INT AUTO_INCREMENT PRIMARY KEY,
    ->     name VARCHAR(100),
    ->     email VARCHAR(100)
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql> INSERT INTO users (name, email) VALUES ('Bhargav', 'bhargav@gmail.com');
Query OK, 1 row affected (0.03 sec)

mysql> INSERT INTO users (name, email) VALUES ('Prabhakar', 'prabhakar@gmail.com');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO users (name, email) VALUES ('Barath', 'barath@gmail.com');
Query OK, 1 row affected (0.00 sec)

mysql> INSERT INTO users (name, email) VALUES ('Parakram', 'parakram@gmail.com');
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM users;
+----+-----------+---------------------+
| id | name      | email               |
+----+-----------+---------------------+
|  1 | Bhargav   | bhargav@gmail.com   |
|  2 | Prabhakar | prabhakar@gmail.com |
|  3 | Barath    | barath@gmail.com    |
|  4 | Parakram  | parakram@gmail.com  |
+----+-----------+---------------------+
4 rows in set (0.00 sec)
```

```
        ->    name VARCHAR(100),
        ->    email VARCHAR(100)
        -> );
Query OK, 0 rows affected (0.02 sec)

mysql> INSERT INTO users (name, email) VALUES ('Bhargav', 'bhargav@gmail.com');
Query OK, 1 row affected (0.03 sec)

mysql> INSERT INTO users (name, email) VALUES ('Prabhakar', 'prabhakar@gmail.com');
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO users (name, email) VALUES ('Barath', 'barath@gmail.com');
Query OK, 1 row affected (0.00 sec)

mysql> INSERT INTO users (name, email) VALUES ('Parakram', 'parakram@gmail.com');
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM users;
+----+-----------+---------------------+
| id | name      | email               |
+----+-----------+---------------------+
|  1 | Bhargav   | bhargav@gmail.com   |
|  2 | Prabhakar | prabhakar@gmail.com |
|  3 | Barath    | barath@gmail.com    |
|  4 | Parakram  | parakram@gmail.com  |
+----+-----------+---------------------+
4 rows in set (0.00 sec)

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

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

mysql>
```



```
192.168.147.129:30007/users

JSON   Raw Data   Headers
Save  Copy  Collapse All  Expand All  Filter JSON

▼ 0:
    email:  "bhargav@gmail.com"
    id:     3
    name:   "Bhargav"
▼ 1:
    email:  "prabhakar@gmail.com"
    id:     4
    name:   "Prabhakar"
▼ 2:
    email:  "barath@gmail.com"
    id:     5
    name:   "Barath"
▼ 3:
    email:  "parakram@gmail.com"
    id:     6
    name:   "Parakram"
```