# Assignment 4
Kubernetes / Docker

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Question:

1.Pull an Image from docker hub and run it in docker playground.

2.Create a docker file for the jobportal application and deploy it in Docker desktop application.

3.Create a IBM container registry and deploy helloworld app or jobportalapp.

4.Create a Kubernetes cluster in IBM cloud and deploy helloworld image or jobportal image and also expose the same app to run in nodeport.

Solution:
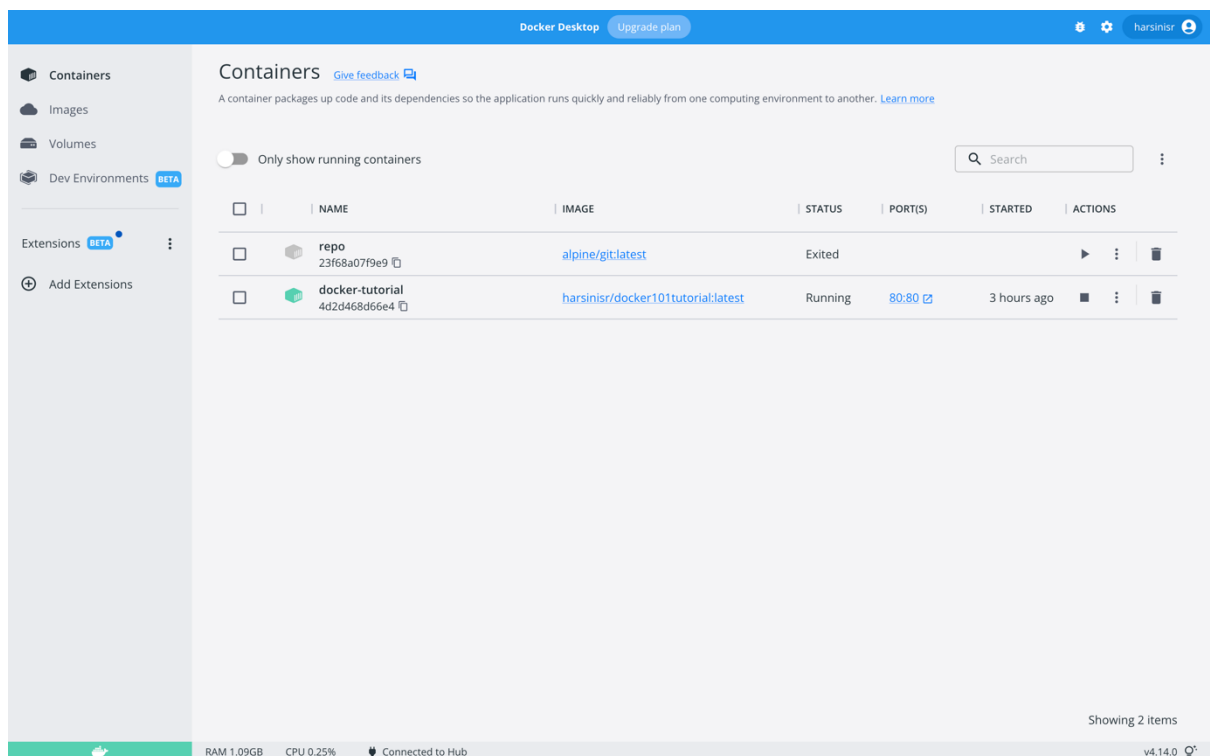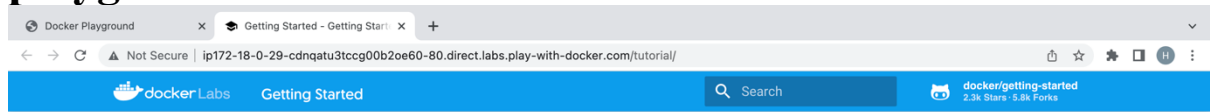
Pull an Image from docker hub and run it in docker playground.

The command you just ran

Congratulations! You have started the container for this tutorial! Let's first explain the command that you just ran. In case you forgot, here's the command:

```
docker run -d -p 80:80 docker/getting-started
```

You'll notice a few flags being used. Here's some more info on them:

- `-d` - run the container in detached mode (in the background)
- `-p 80:80` - map port 80 of the host to port 80 in the container
- `docker/getting-started` - the image to use

Pro tip

You can combine single character flags to shorten the full command. As an example, the command above could be written as:

```
docker run -dp 80:80 docker/getting-started
```

The Docker Dashboard

Before going too far, we want to highlight the Docker Dashboard, which gives you a quick view of the containers running on your machine. It gives you quick access to container logs, lets you get a shell inside the container, and lets you easily manage container lifecycle (stop, remove, etc.).

Create a docker file for the jobportal application and deploy it in Docker desktop application.


```
Last login: Sat Nov 12 16:31:17 on ttys000
[harsini@Harsinis-MacBook-Pro ~ % cd desktop
[harsini@Harsinis-MacBook-Pro desktop % cd flask_with_form_and_docker-main
[harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker build -t harsinisampleapp
"docker build" requires exactly 1 argument.
See 'docker build --help'.

Usage:  docker build [OPTIONS] PATH | URL | -

Build an image from a Dockerfile
[harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker build -t harsinisampleapp .
[+] Building 55.7s (11/11) FINISHED
 => [internal] load build definition from Dockerfile                                                                 0.1s
 => => transferring dockerfile: 267B                                                                                 0.0s
 => [internal] load .dockerignore                                                                                    0.0s
 => => transferring context: 2B                                                                                      0.0s
 => [internal] load metadata for docker.io/library/python:3.10.6                                                    4.6s
 => [auth] library/python:pull token for registry-1.docker.io                                                       0.0s
 => [internal] load build context                                                                                   0.1s
 => => transferring context: 19.58kB                                                                                0.1s
 => [1/5] FROM docker.io/library/python:3.10.6@sha256:745efdfb7e4aac9a8422bd8c62d8bc35a693e8979a240d29677cb03e6aa91052  44.1s
 => => resolve docker.io/library/python:3.10.6@sha256:745efdfb7e4aac9a8422bd8c62d8bc35a693e8979a240d29677cb03e6aa91052  0.0s
 => => sha256:3e94d13e55e7a4ef17ff21376f57fb95c7e1706931f8704aa99260968d81f6e4 5.16MB / 5.16MB                     2.2s
 => => sha256:745efdfb7e4aac9a8422bd8c62d8bc35a693e8979a240d29677cb03e6aa91052 2.35kB / 2.35kB                      0.0s
 => => sha256:1671565cc8df8c365c9b661d3fbc164e73d01f1b0430c6179588428f99a9da2e 55.01MB / 55.01MB                    9.4s
 => => sha256:fa9c7528c685216129e8e67bf362a7702e7b1daa585ab85546a41508830657d6 10.88MB / 10.88MB                    3.8s
 => => sha256:8d1f943ceaaf3b3ce05df5c0926e7958836b048b700176bf9c56d8f37ac13fca 2.22kB / 2.22kB                      0.0s
 => => sha256:d25a66380b10283603ff696d7777bba5cdb1b9126fb0be7d118b9574946bcf84 8.53kB / 8.53kB                      0.0s
 => => sha256:53ad072f9cd16fc8eb93b182b20e758e11acc0ef60babef0bf1043c08de1901a 54.58MB / 54.58MB                    13.7s
 => => sha256:d6b983117533b718374f1701ef593dd2afa6613c7908c6553be8e2a150e6448a 196.79MB / 196.79MB                  35.0s
 => => sha256:d8092d56ded5476fe7c302256eb4dc6ff495ae8fb4dd28aa18dbcb7581e24a6c 6.29MB / 6.29MB                      11.4s
 => => extracting sha256:1671565cc8df8c365c9b661d3fbc164e73d01f1b0430c6179588428f99a9da2e                           3.6s
 => => sha256:c71afc637d59adc44c5fd3c348504df82b35bbb204f0057ea22c6ac8a1d285a5 20.02MB / 20.02MB                    15.8s
 => => extracting sha256:3e94d13e55e7a4ef17ff21376f57fb95c7e1706931f8704aa99260968d81f6e4                           0.4s
 => => sha256:864a10b3c704553e08cb5fcd12fbaee1c07048f6365f0fa35e84a285413da40b 234B / 234B                          14.0s
 => => extracting sha256:fa9c7528c685216129e8e67bf362a7702e7b1daa585ab85546a41508830657d6                           0.4s
 => => sha256:4334b2fe8293d19ddc1c3559093aae88f21601a7c85a31c6da6c0dc48fb6ed3c 3.04MB / 3.04MB                      15.3s
 => => extracting sha256:53ad072f9cd16fc8eb93b182b20e758e11acc0ef60babef0bf1043c08de1901a                           3.3s
 => => extracting sha256:d6b983117533b718374f1701ef593dd2afa6613c7908c6553be8e2a150e6448a                           7.1s
 => => extracting sha256:d8092d56ded5476fe7c302256eb4dc6ff495ae8fb4dd28aa18dbcb7581e24a6c                           0.3s
 => => extracting sha256:c71afc637d59adc44c5fd3c348504df82b35bbb204f0057ea22c6ac8a1d285a5                           0.6s
 => => extracting sha256:864a10b3c704553e08cb5fcd12fbaee1c07048f6365f0fa35e84a285413da40b                           0.0s
 => => extracting sha256:4334b2fe8293d19ddc1c3559093aae88f21601a7c85a31c6da6c0dc48fb6ed3c                           0.2s
 => [2/5] WORKDIR /app                                                                                               0.5s
 => [3/5] COPY requirements.txt ./                                                                                   0.0s
 => [4/5] RUN pip install -r requirements.txt                                                                        6.1s
 => [5/5] COPY . .                                                                                                   0.0s
 => exporting to image                                                                                               0.2s
 => => exporting layers                                                                                              0.2s
 => => writing image sha256:b6aa458ec41eb1f84735c1244d1c2f57cb4a3ea88ba62139ce0c2f3c75be36aa                         0.0s
 => => naming to docker.io/library/harsinisampleapp                                                                  0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main %
```

Create a IBM container registry and deploy helloworld app or jobportalapp

```
 => [3/5] COPY requirements.txt ./                                                                    0.0s
 => [4/5] RUN pip install -r requirements.txt                                                         6.1s
 => [5/5] COPY . .                                                                                    0.2s
 => exporting to image                                                                                0.2s
 => => exporting layers                                                                               0.2s
 => => writing image sha256:b6aa458ec41eb1f84735c1244d1c2f57cb4a3ea88ba62139ce0c2f3c75be36aa          0.0s
 => => naming to docker.io/library/harsinisampleapp                                                   0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker build -t harsinisampleapp .
[+] Building 3.3s (11/11) FINISHED
 => [internal] load build definition from Dockerfile                                                  0.0s
 => => transferring dockerfile: 120B                                                                  0.0s
 => [internal] load .dockerignore                                                                     0.0s
 => => transferring context: 2B                                                                       0.0s
 => [internal] load metadata for docker.io/library/python:3.10.6                                      3.1s
 => [auth] library/python:pull token for registry-1.docker.io                                         0.0s
 => [1/5] FROM docker.io/library/python:3.10.6@sha256:745efdfb7e4aac9a8422bd8c62d8bc35a693e8979a240d29677cb03e6aa91052  0.0s
 => [internal] load build context                                                                     0.0s
 => => transferring context: 9.72kB                                                                   0.0s
 => CACHED [2/5] WORKDIR /app                                                                          0.0s
 => CACHED [3/5] COPY requirements.txt ./                                                             0.0s
 => CACHED [4/5] RUN pip install -r requirements.txt                                                  0.0s
 => [5/5] COPY . .                                                                                    0.0s
 => exporting to image                                                                                0.0s
 => => exporting layers                                                                               0.0s
 => => writing image sha256:a36bca38ed1db750c4e1ceeb884a3202b23916e3b0306f8fed9de51f7c93daf1          0.0s
 => => naming to docker.io/library/harsinisampleapp                                                   0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker run -p 5000:5000 harsinisampleapp
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on all addresses (0.0.0.0)
 * Running on http://127.0.0.1:5000
 * Running on http://172.17.0.2:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 874-697-760
172.17.0.1 - - [12/Nov/2022 16:21:15] "GET / HTTP/1.1" 200 -
172.17.0.1 - - [12/Nov/2022 16:21:16] "GET /favicon.ico HTTP/1.1" 404 -
^C
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker tag harsinisampleapp harsinisr/harsinisampleapp
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % docker push harsinisr/harsinisampleapp
Using default tag: latest
The push refers to repository [docker.io/harsinisr/harsinisampleapp]
653b2d0bfd19: Pushed
0ce4d5f66c8a: Pushed
424f11dae8da: Pushed
21fb379aef9e: Pushed
bfc1deb8136e: Mounted from library/python
1f123186824c: Mounted from library/python
3d6eb1152931: Mounted from library/python
100796cdf3b1: Mounted from library/python
54acb5a6fa0b: Mounted from library/python
8d51c618126f: Mounted from library/python
9ff6e4d46744: Mounted from library/python
a89d1d47b5a1: Mounted from library/python
655ed1b7a428: Mounted from library/python
latest: digest: sha256:395dc476a0174d7d8c59fd8b4cab61613bd402aa17419bbdb374808f2de71a0c size: 3050
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main %
```
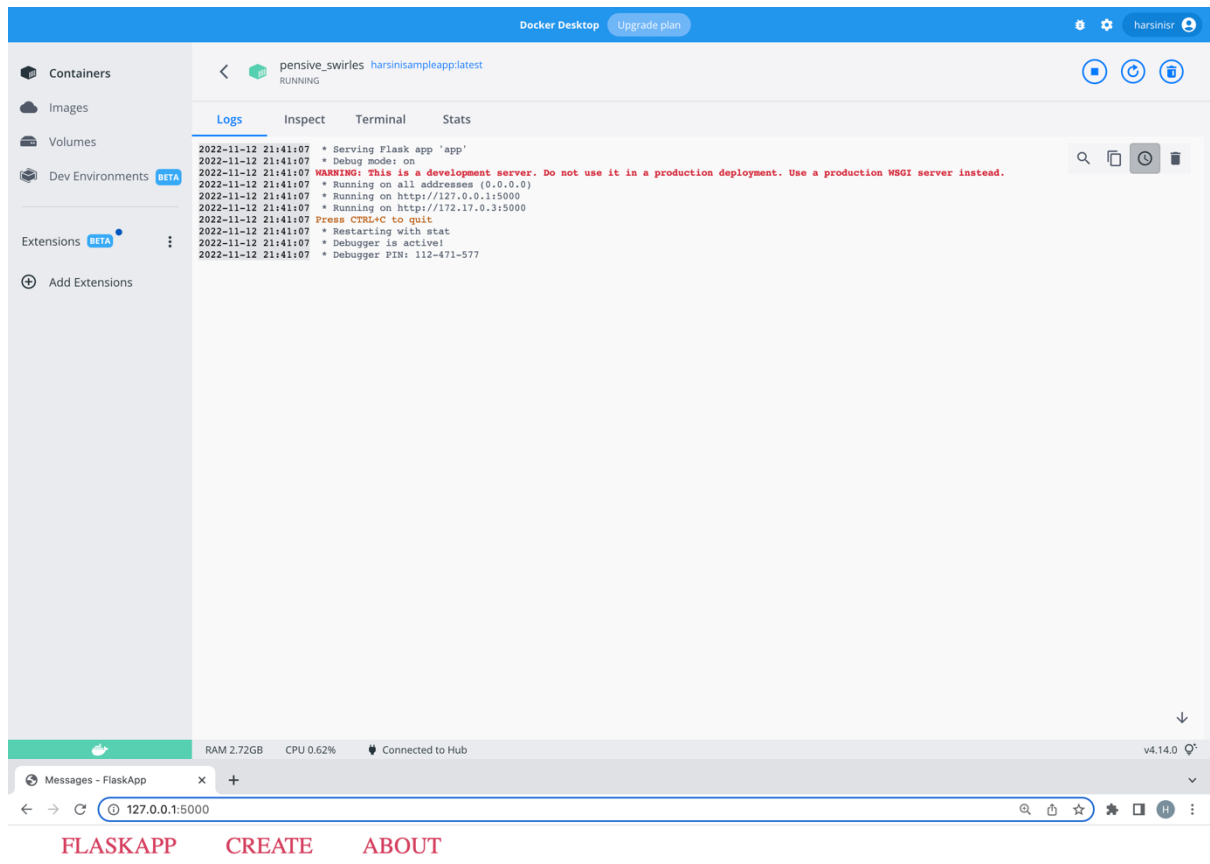
harsinisr ❯ Repositories ❯ harsinisampleapp   Using 0 of 1 private repositories. Get more

General | Tags | Builds | Collaborators | Webhooks | Settings

ℹ️ Add a short description for this repository   Update
The short description is used to index your content on Docker Hub and in search engines. It's visible to users in search results.

🌐 harsinisr / **harsinisampleapp**

Description

🖉 *This repository does not have a description*

🕐 Last pushed: 13 hours ago

Docker commands   Public View

To push a new tag to this repository,

```
docker push harsinisr/harsinisampleapp:tagname
```

Tags and scans   🛡️ VULNERABILITY SCANNING - DISABLED
                                                                       Enable
This repository contains 1 tag(s).

Tag	OS	Type	Pulled	Pushed
🟢 latest	🐧	Image	13 hours ago	13 hours ago

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Namespaces

Location

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Resource group: Filter... ∨   🔍 Search   Create +

	Name	Resource group	Repository count	Image count	Retention policy	
☐	⊞ harsinins	Default	0	0	Retain all images	⋮

Items per page: 25 ∨   1–1 of 1 item   1 ∨ 1 of 1 page ◄ ►

IBM **Cloud**

Container Registry

Quick start

Namespaces · 1
Repositories · 1
Images · 1
Trash · 0

Settings

Search resources and products...

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Namespaces

Location

Tokyo ∨

Resource group: Filter... ∨   🔍 Search   Create +

		Name	Resource group	Repository count	Image count	Retention policy	
∧	☐	⊞ harsinins	Default	1	1	Retain all images	⋮

Repository	Image count	Last updated	
🗇 jp.icr.io/harsinins/hello-world	1	415 days ago	⋮

Items per page: 25 ∨   1–1 of 1 item   1 ∨ 1 of 1 page ◄ ►

Search resources and products... Catalog Manage ∨ Harsini SR's Account

⊡ **Container Registry**

Quick start
Namespaces   1
Repositories   1
Images   1
Trash   0
Settings

Repositories

Location

| Tokyo | ∨ |

🔍 Search   ↻   ⚙   **Create +**

	Name	Image count	Namespace	Last updated	
⌄ ☐ 🗐	**hello-world** jp.icr.io/harsinins/hello-world	1	harsinins	415 days ago	⋮

Digest	Manifest type	Tags	Created	Size	Security status	
▦ f54a58bc1aac	Docker	latest	415 days ago	2 KB	🚫 Unsupported OS	⋮

Items per page: 25 ∨   1–1 of 1 item   1 ∨   1 of 1 page   ‹   ›

‹

Search resources and products... Catalog Manage ∨ Harsini SR's Account

⊡ **Container Registry**

Quick start
Namespaces   1
Repositories   1
Images   1
Trash   0
Settings

Images

Location

| Tokyo | ∨ |

View by: | Digest ∨ | 🔍 Search   ↻   ⚙   **Create +**

	Repository@digest	Tags	Manifest type	Created	Size	Security status	
☐ ▦	harsinins/hello-world@sha256:f54a58bc1aac...	latest ✏	Docker	415 days ago	2 KB	🚫 Unsupported OS	⋮

Items per page: 25 ∨   1–1 of 1 item   1 ∨   1 of 1 page   ‹   ›

‹

Create a Kubernetes cluster in IBM cloud and deploy helloworld image

```
  drain          Drain node in preparation for maintenance
  taint          Update the taints on one or more nodes

Troubleshooting and Debugging Commands:
  describe       Show details of a specific resource or group of resources
  logs           Print the logs for a container in a pod
  attach         Attach to a running container
  exec           Execute a command in a container
  port-forward   Forward one or more local ports to a pod
  proxy          Run a proxy to the Kubernetes API server
  cp             Copy files and directories to and from containers
  auth           Inspect authorization
  debug          Create debugging sessions for troubleshooting workloads and
nodes

Advanced Commands:
  diff           Diff the live version against a would-be applied version
  apply          Apply a configuration to a resource by file name or stdin
  patch          Update fields of a resource
  replace        Replace a resource by file name or stdin
  wait           Experimental: Wait for a specific condition on one or many
resources
  kustomize      Build a kustomization target from a directory or URL.

Settings Commands:
  label          Update the labels on a resource
  annotate       Update the annotations on a resource
  completion     Output shell completion code for the specified shell (bash,
zsh, fish, or powershell)

Other Commands:
  alpha          Commands for features in alpha
  api-resources  Print the supported API resources on the server
  api-versions   Print the supported API versions on the server, in the form of
"group/version"
  config         Modify kubeconfig files
  plugin         Provides utilities for interacting with plugins
  version        Print the client and server version information

Usage:
  kubectl [flags] [options]

Use "kubectl <command> --help" for more information about a given command.
Use "kubectl options" for a list of global command-line options (applies to all
commands).
harsini@Harsinis-MacBook-Pro ~ % kubectl apply -f https://raw.githubusercontent.com/kubernetes/dashboard/v2.6.1/aio/deploy/recommended.yaml
namespace/kubernetes-dashboard created
serviceaccount/kubernetes-dashboard created
service/kubernetes-dashboard created
secret/kubernetes-dashboard-certs created
secret/kubernetes-dashboard-csrf created
secret/kubernetes-dashboard-key-holder created
configmap/kubernetes-dashboard-settings created
role.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrole.rbac.authorization.k8s.io/kubernetes-dashboard created
rolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
deployment.apps/kubernetes-dashboard created
service/dashboard-metrics-scraper created
deployment.apps/dashboard-metrics-scraper created
harsini@Harsinis-MacBook-Pro ~ % kubectl proxy
Starting to serve on 127.0.0.1:8001
```

```
Other Commands:
  alpha           Commands for features in alpha
  api-resources   Print the supported API resources on the server
  api-versions    Print the supported API versions on the server, in the form of "group/version"
  config          Modify kubeconfig files
  plugin          Provides utilities for interacting with plugins
  version         Print the client and server version information

Usage:
  kubectl [flags] [options]

Use "kubectl <command> --help" for more information about a given command.
Use "kubectl options" for a list of global command-line options (applies to all commands).
harsini@Harsinis-MacBook-Pro desktop % kubectl get nodes
NAME            STATUS   ROLES           AGE   VERSION
docker-desktop  Ready    control-plane   49m   v1.25.2
harsini@Harsinis-MacBook-Pro desktop % kubectl get pods
No resources found in default namespace.
harsini@Harsinis-MacBook-Pro desktop % kubectl get ns
NAME                   STATUS   AGE
default                Active   49m
kube-node-lease        Active   49m
kube-public            Active   49m
kube-system            Active   49m
kubernetes-dashboard   Active   39m
harsini@Harsinis-MacBook-Pro desktop % kubectl -n kubernetes-dashboard describe serviceaccount admin-user
Error from server (NotFound): serviceaccounts "admin-user" not found
harsini@Harsinis-MacBook-Pro desktop % kubectl apply -f dashboard-adminuser.yaml
error: the path "dashboard-adminuser.yaml" does not exist
harsini@Harsinis-MacBook-Pro desktop % cd flask_with_form_and_docker-main
harsini@Harsinis-MacBook-Pro flask_with_form_and_docker-main % cd kubernetes
harsini@Harsinis-MacBook-Pro kubernetes % kubectl apply -f dashboard-adminuser.yaml
serviceaccount/admin-user created
secret/admin-user-token created
clusterrolebinding.rbac.authorization.k8s.io/admin-user created
harsini@Harsinis-MacBook-Pro kubernetes % kubectl -n kubernetes-dashboard describe serviceaccount admin-user
Name:                admin-user
Namespace:           kubernetes-dashboard
Labels:              <none>
Annotations:         <none>
Image pull secrets:  <none>
Mountable secrets:   <none>
Tokens:              admin-user-token
Events:              <none>
harsini@Harsinis-MacBook-Pro kubernetes % kubectl -n kubernetes-dashboard describe secret admin-user-token
Name:        admin-user-token
Namespace:   kubernetes-dashboard
Labels:      <none>
Annotations: kubernetes.io/service-account.name: admin-user
             kubernetes.io/service-account.uid: e744c9ac-adea-48b8-ad2a-e6e2ebc7d952

Type:  kubernetes.io/service-account-token

Data
====
ca.crt:     1099 bytes
namespace:  20 bytes
```

```
token:  eyJhbGciOiJSUzI1NiIsImtpZCI6IkRwTjVOMXdWYVFBQW16ZVlfVkVtLW5adDZvWFRUU2lVdzdIcWtJUGpxOXcifQ.eyJpc3MiOiJrdWJlcm5ldGVzL3NlcnZpY2VhY2NvdW50Iiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9uYW11c3BhY2UiO
iJrdWJlcm5ldGVzLWRhc2hib2FyZCIsImt1YmVybmV0ZXMuaW8vc2VydmljZWFjY291bnQvc2VjcmV0Lm5hbWUiOiJhZG1pbi11c2VyLXRva2VuIiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9zZXJ2aWNlLWFjY291bnQubmFtZSI6ImFkbWluLXVzZXIiLCJrd
WJlcm5ldGVzLmlvL3NlcnZpY2VhY2NvdW50L3NlcnZpY2UtYWNjb3VudC51aWQiOiJlNzQ0YzlhYy1hZGVhLTQ4YjgtYWQyYS11NmUyZWJjN2Q5NTIiLCJzdWIiOiJzeXN0ZW06c2VydmljZWFjY291bnQ6a3ViZXJuZXRlcy1kYXNoYm9hcmQ6YWRtaW4tdXNlciJ9.Q4SX
Z2oPcNWK8RFtNdDkreq0LJNSF5YtTdd_DqKGrInqnJsSg2_pqiuVorGq12581TAu58z1dnCLW2soPW8RuMSFFtYbEjB9BjRwAlP1BGQmM9OrM1he4-4Pcc7cGDl513FNQ1-IobI23QNvog--AT2-I1eGEe5Pio6HgDuKyca2neFogmcCSHqahQqujXQTrSU72uweR7oxYL1I
Ihn4bmZHbn7jMlUXODazC88UzGFCDUw1oiJ5TKvSb8COpxO1wspiOmv9HeyA8duCyYTdJ_I7g6k3NzaifM9BR5LNQA7_tf8rBJgykTD_wbDFKN_OJJSUlSzu7P49NDk6ffU2vA
```

```
harsini@Harsinis-MacBook-Pro kubernetes %
```

FLASKAPP   CREATE   ABOUT

Blog Page

Messages

Message One

Message One Content

Message Two

Message Two Content

dashboard-adminuser.yaml

```yaml
apiVersion: v1
kind: ServiceAccount
metadata:
  name: admin-user
  namespace: kubernetes-dashboard
---
apiVersion: v1
```

```yaml
kind: Secret
metadata:
  name: admin-user-token
  namespace: kubernetes-dashboard
  annotations:
    kubernetes.io/service-account.name: admin-user
type: kubernetes.io/service-account-token


---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: admin-user
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: cluster-admin
subjects:
- kind: ServiceAccount
  name: admin-user
  namespace: kubernetes-dashboard
```

flask_deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: flask-app

spec:
  replicas: 1
  selector:
    matchLabels:
      app: flask-app
  template:
    metadata:
      labels:
        app: flask-app

    spec:
      containers:
        - name: flask-app-container
          image: flask-app
          imagePullPolicy: Never
          ports:
            - containerPort: 5000
              protocol: TCP
```

flask_ingress.yaml

```yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: flask-app-ingress
  annotations:
    kubernetes.io/ingress.class: nginx
    nginx.ingress.kubernetes.io/ssl-redirect: "false"

spec:
  rules:
    - http:
        paths:
          - backend:
              service:
                name: flask-app-service
                port:
                  number: 5000
            path: /
            pathType: Prefix
```

flask_service.yaml

```yaml
apiVersion: v1
kind: Service
metadata:
  name: flask-app-service
spec:
  type: ClusterIP
  ports:
    - port: 5000
  selector:
    app: flask-app
```

```yaml
apiVersion: v1
kind: ServiceAccount
metadata:
  name: admin-user
  namespace: kubernetes-dashboard
---
apiVersion: v1
kind: Secret
metadata:
  name: admin-user-token
  namespace: kubernetes-dashboard
  annotations:
    kubernetes.io/service-account.name: admin-user
type: kubernetes.io/service-account-token

---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: admin-user
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: cluster-admin
subjects:
- kind: ServiceAccount
  name: admin-user
  namespace: kubernetes-dashboard
```