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Project Name	Project - Personal Expense Tracker

Assignment - 4

Kubernetes and Docker

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 jobportal app

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

Solutions

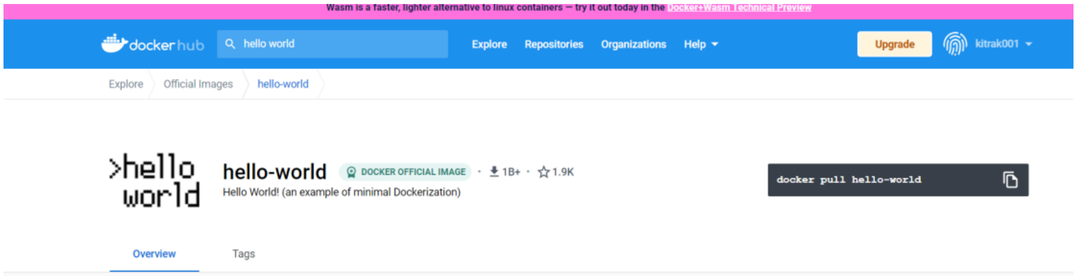
1. Pull an Image from docker hub and run it in Docker Playground

a. Pull an image *uifd/ui-for-docker* from the docker hub

b. This image is used for viewing and managing the docker engine

c. Use **`docker pull image_name`** and **`docker run -it image_name`** commands to run the above image in the Docker Playground

<u>hello-world - Official Image | Docker Hub</u>(https://hub.docker.com/_/hello-world)



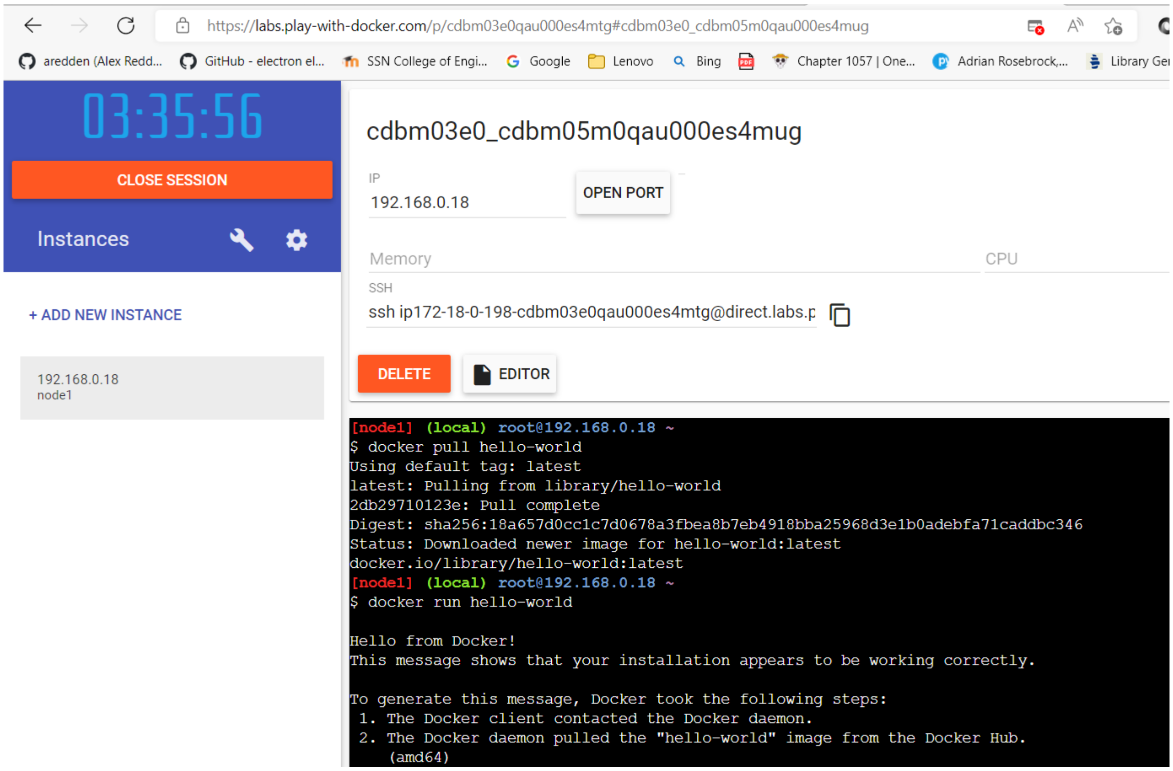
Wasm is a faster, lighter alternative to linux containers — try it out today in the Docker+Wasm Technical Preview

hello-world

Hello World! (an example of minimal Dockerization)

```
docker pull hello-world
```

Pull



cdbm03e0_cdbm05m0qau000es4mug

IP: 192.168.0.18

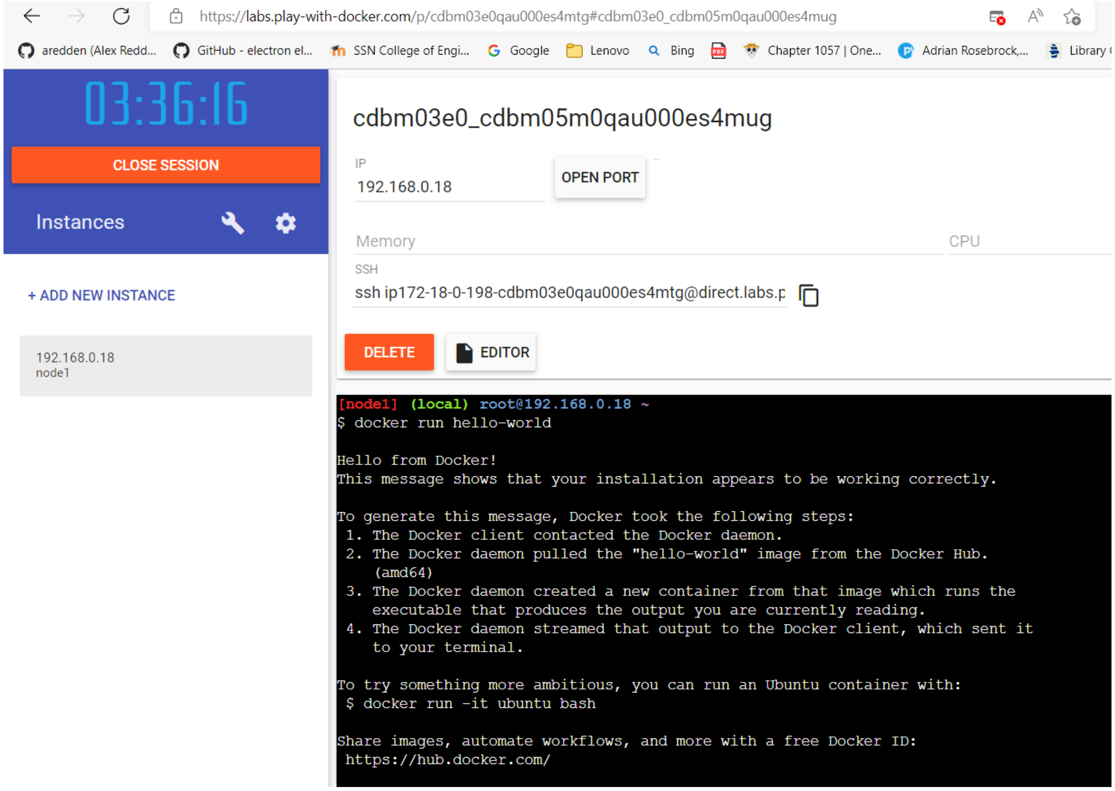
Memory

CPU

SSH: ssh ip172-18-0-198-cdbm03e0qau000es4mtg@direct.labs.p

```
[node1] (local) root@192.168.0.18 ~
$ docker pull hello-world
Using default tag: latest
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:18a657d0cc1c7d0678a3fbea8b7eb4918bba25968d3e1b0adebfa71caddbc346
Status: Downloaded newer image for hello-world:latest
docker.io/library/hello-world:latest
[node1] (local) root@192.168.0.18 ~
$ docker run hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
```

Run



cdbm03e0_cdbm05m0qau000es4mug

IP: 192.168.0.18

Memory

CPU

SSH: ssh ip172-18-0-198-cdbm03e0qau000es4mtg@direct.labs.p

```
[node1] (local) root@192.168.0.18 ~
$ docker run hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/
```

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

a. Create a docker file for build and deploy flask app.

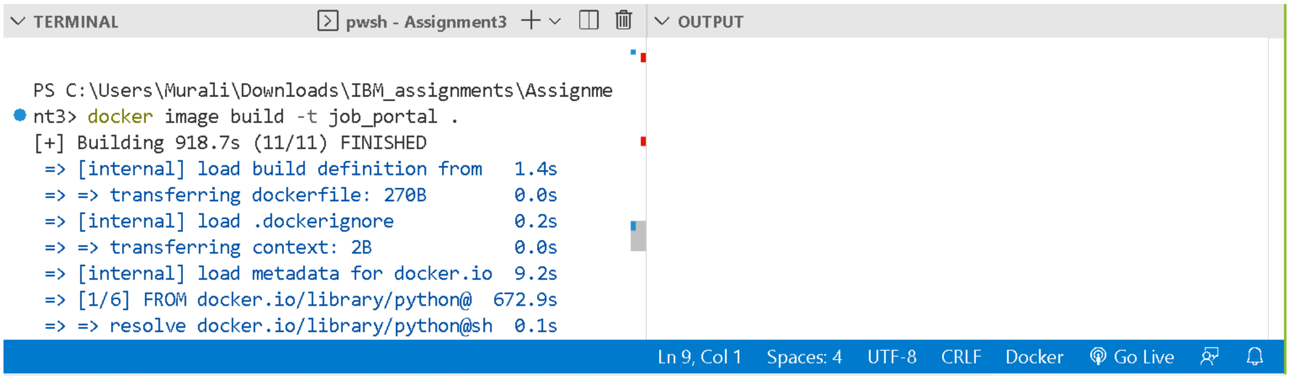
b. Use **`docker build -t image_name .`** in the current directory to start building the docker image and deploy in our local docker

c. Use **`docker run -p 5000:5000 image_name`** to run in local system

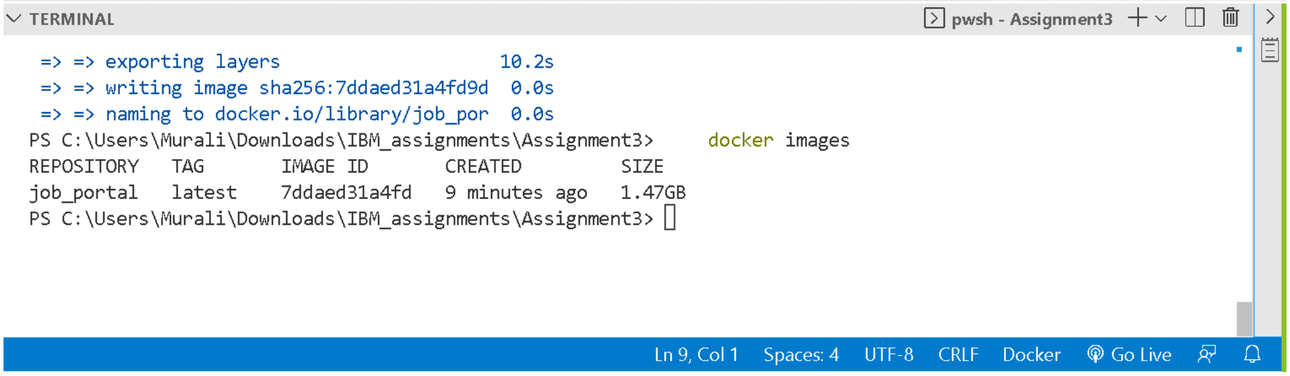
Dockerfile

```
FROM python

COPY ./requirements.txt /flaskApp/requirements.txt

WORKDIR /flaskApp

RUN pip install scipy
RUN pip install -r requirements.txt

COPY . /flaskApp


ENTRYPOINT [ "python" ]

CMD ["app.py" ]
EXPOSE 5000
```

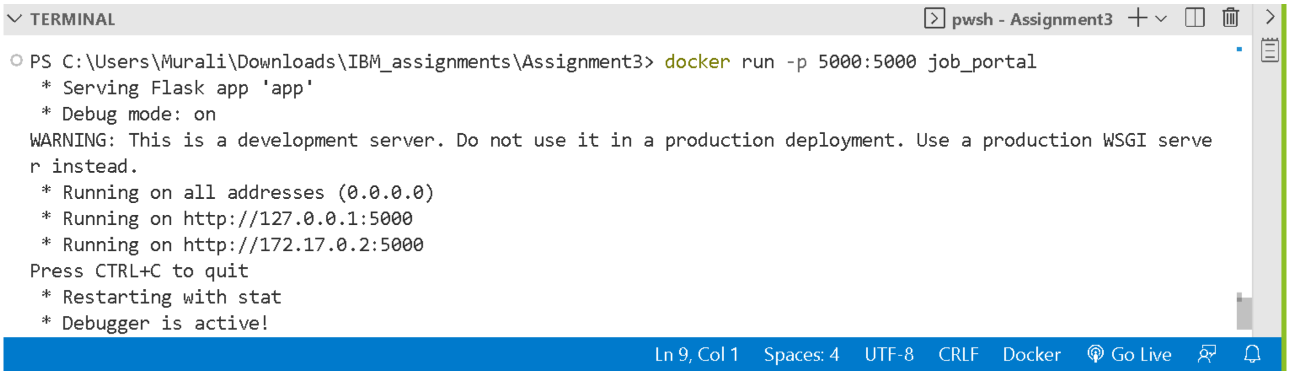
Steps:



```
PS C:\Users\Murali\Downloads\IBM_assignments\Assignme
nt3> docker image build -t job_portal .
[+] Building 918.7s (11/11) FINISHED
 => [internal] load build definition from   1.4s
 => => transferring dockerfile: 270B        0.0s
 => [internal] load .dockerignore           0.2s
 => => transferring context: 2B             0.0s
 => [internal] load metadata for docker.io  9.2s
 => [1/6] FROM docker.io/library/python@  672.9s
 => => resolve docker.io/library/python@sh  0.1s
```

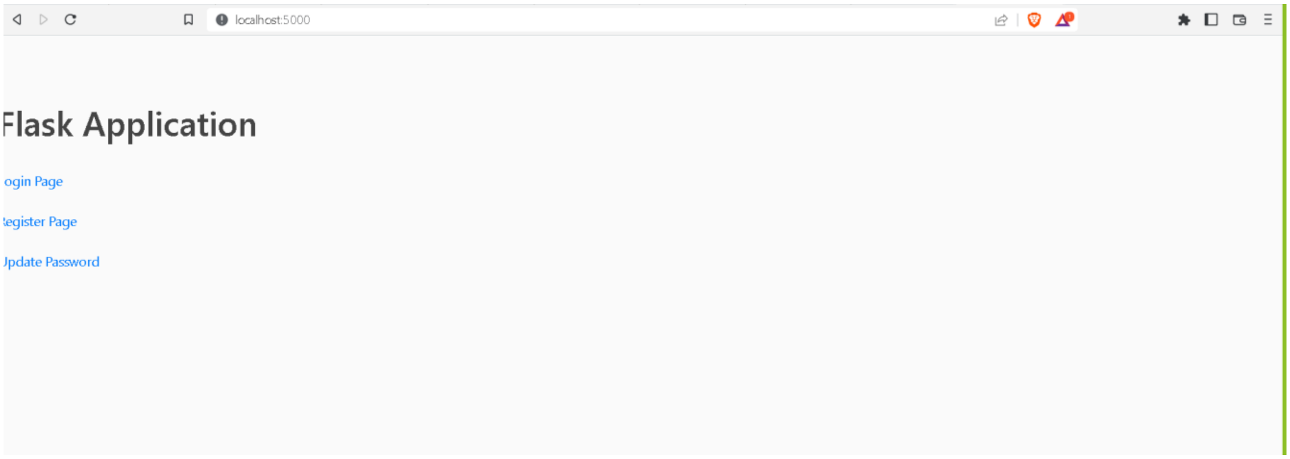


```
 => => exporting layers                    10.2s
 => => writing image sha256:7ddaed31a4fd9d  0.0s
 => => naming to docker.io/library/job_por  0.0s
PS C:\Users\Murali\Downloads\IBM_assignments\Assignment3>    docker images
REPOSITORY   TAG       IMAGE ID       CREATED         SIZE
job_portal   latest    7ddaed31a4fd   9 minutes ago   1.47GB
PS C:\Users\Murali\Downloads\IBM_assignments\Assignment3>
```



```
PS C:\Users\Murali\Downloads\IBM_assignments\Assignment3> docker run -p 5000:5000 job_portal
 * 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 serve
r 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!
```

Run locally using docker



localhost:5000

Flask Application

ogin Page

egister Page

pdate Password

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

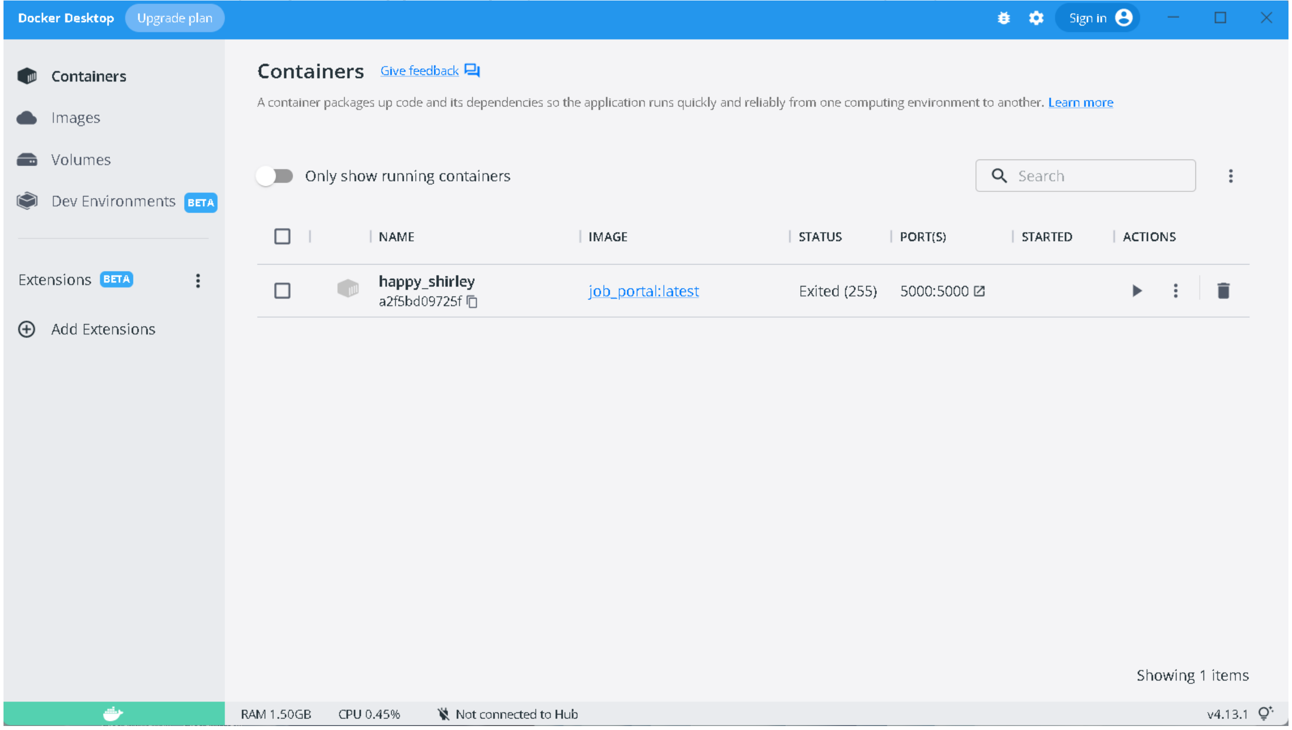
a. Log into IBM cloud

b. Create a **container registry**

c. Using IBM Cloud CLI, install the **container registry plugin** in our system

d. Push our docker image into the created container registry using **docker push**

e. So, our job portal app is deployed in the IBM container registry



Containers Give feedback

A container packages up code and its dependencies so the application runs quickly and reliably from one computing environment to another. Learn more

Only show running containers

□	NAME	IMAGE	STATUS	PORT(S)	STARTED	ACTIONS
□	happy_shirley a2f5bd09725f	job_portal:latest	Exited (255)	5000:5000		

Showing 1 items

RAM 1.50GB CPU 0.45% Not connected to Hub v4.13.1

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

a. Log into IBM cloud

b. Create a **kubernete**

c. Using IBM Cloud CLI, install the **ks plugin** in our system

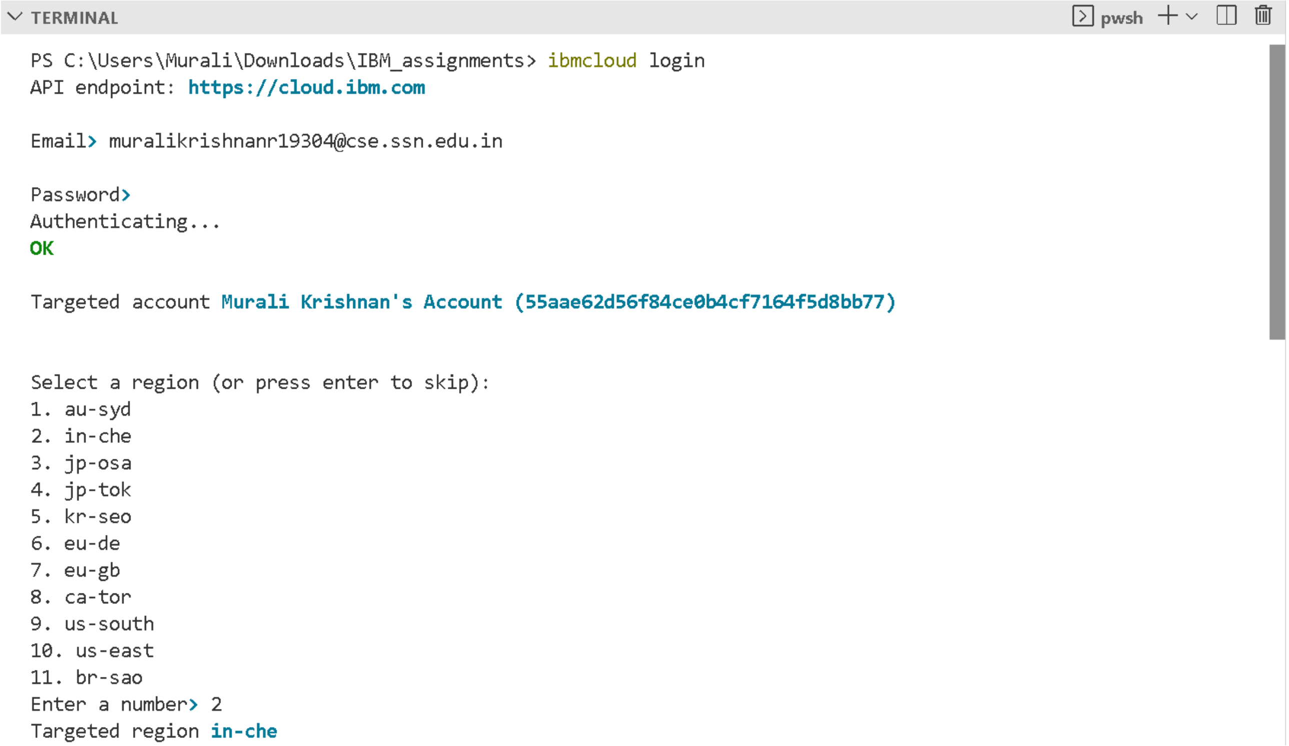
d. Create **a cluster** in the kubernetes

e. Now, go to the **kubernetes dashboard** where we need to create a service based on a yml file (given below)

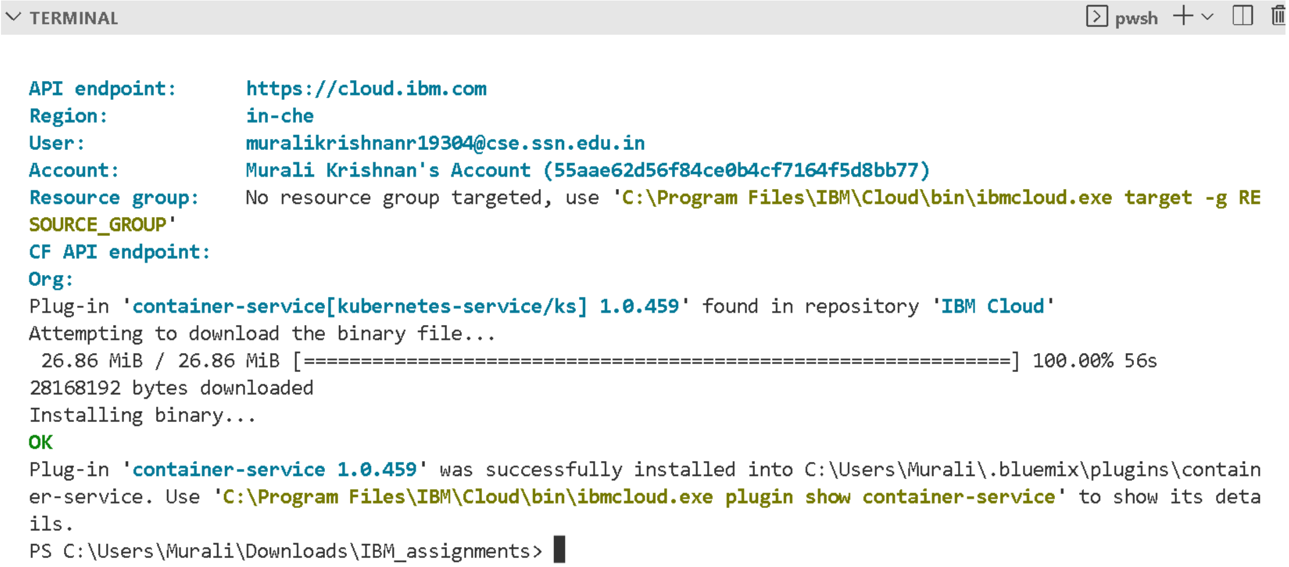
f. In that file, we have to mention *which image we are going to use* and the *app name*

g. Take the **public IP address** and **Nodeport** since we exposed the *flask app in nodeport*

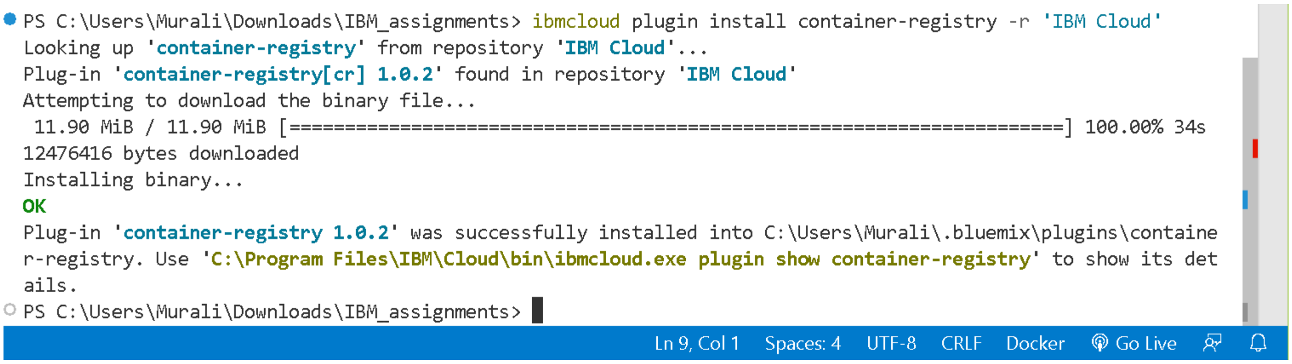
h. Finally, we got the **url address** where our flask app is hosted



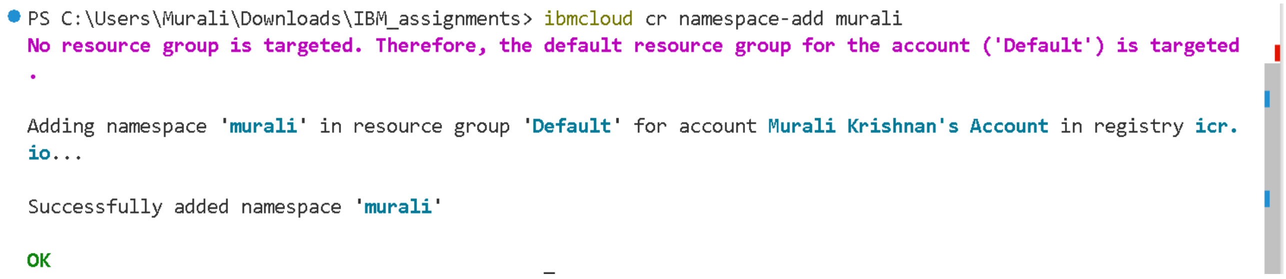
```
PS C:\Users\Murali\Downloads\IBM_assignments> ibmcloud login
API endpoint: https://cloud.ibm.com

Email> muralikrishnanr19304@cse.ssn.edu.in

Password>
Authenticating...
OK

Targeted account Murali Krishnan's Account (55aae62d56f84ce0b4cf7164f5d8bb77)


Select a region (or press enter to skip):
1. au-syd
2. in-che
3. jp-osa
4. jp-tok
5. kr-seo
6. eu-de
7. eu-gb
8. ca-tor
9. us-south
10. us-east
11. br-sao
Enter a number> 2
Targeted region in-che
```



```
API endpoint:      https://cloud.ibm.com
Region:            in-che
User:              muralikrishnanr19304@cse.ssn.edu.in
Account:           Murali Krishnan's Account (55aae62d56f84ce0b4cf7164f5d8bb77)
Resource group:    No resource group targeted, use 'C:\Program Files\IBM\Cloud\bin\ibmcloud.exe target -g RE
SOURCE_GROUP'
CF API endpoint:
Org:
Plug-in 'container-service[kubernetes-service/ks] 1.0.459' found in repository 'IBM Cloud'
Attempting to download the binary file...
 26.86 MiB / 26.86 MiB [==============================================================] 100.00% 56s
28168192 bytes downloaded
Installing binary...
OK
Plug-in 'container-service 1.0.459' was successfully installed into C:\Users\Murali\.bluemix\plugins\contain
er-service. Use 'C:\Program Files\IBM\Cloud\bin\ibmcloud.exe plugin show container-service' to show its deta
ils.
PS C:\Users\Murali\Downloads\IBM_assignments>
```



```
PS C:\Users\Murali\Downloads\IBM_assignments> ibmcloud plugin install container-registry -r 'IBM Cloud'
Looking up 'container-registry' from repository 'IBM Cloud'...
Plug-in 'container-registry[cr] 1.0.2' found in repository 'IBM Cloud'
Attempting to download the binary file...
 11.90 MiB / 11.90 MiB [======================================================================] 100.00% 34s
12476416 bytes downloaded
Installing binary...
OK
Plug-in 'container-registry 1.0.2' was successfully installed into C:\Users\Murali\.bluemix\plugins\containe
r-registry. Use 'C:\Program Files\IBM\Cloud\bin\ibmcloud.exe plugin show container-registry' to show its det
ails.
PS C:\Users\Murali\Downloads\IBM_assignments>
```



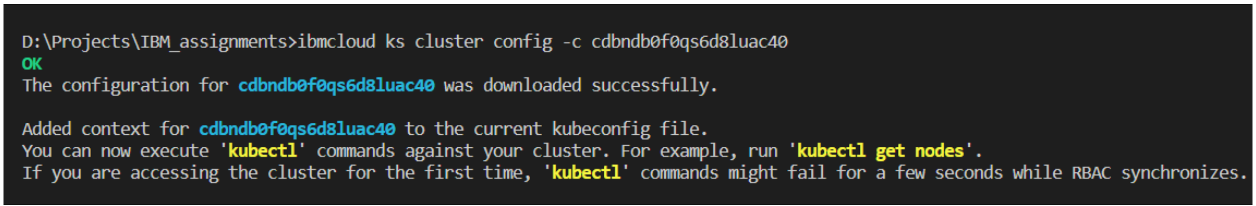
```
PS C:\Users\Murali\Downloads\IBM_assignments> ibmcloud cr namespace-add murali
No resource group is targeted. Therefore, the default resource group for the account ('Default') is targeted
.

Adding namespace 'murali' in resource group 'Default' for account Murali Krishnan's Account in registry icr.
io...

Successfully added namespace 'murali'

OK
```

job-portal-app.yml

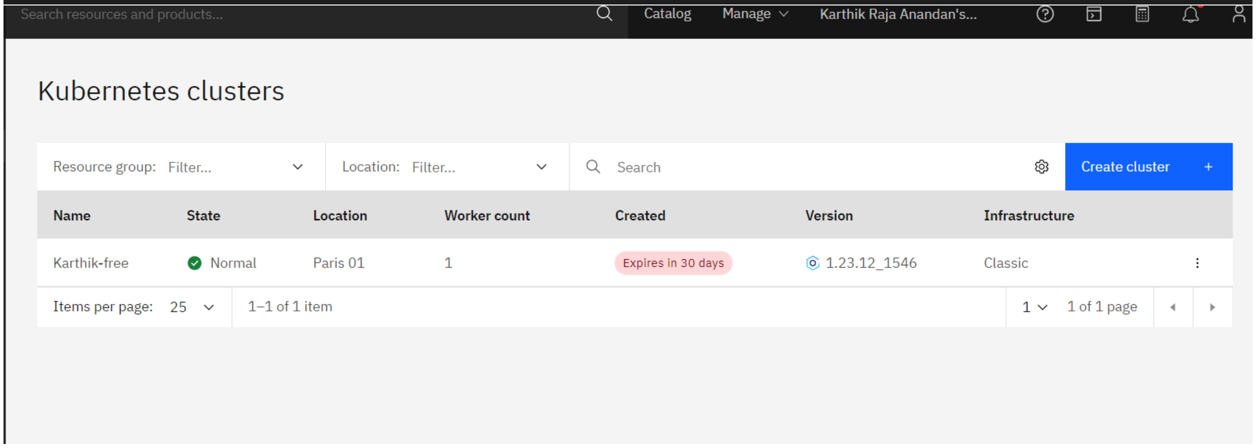
```
apiVersion: v1

kind: Service

metadata:

name: job-portal-app

spec:

selector:

app: job-portal-app

ports:

-   port: 5000

type: NodePort

---

apiVersion: apps/v1

kind: Deployment

metadata:

name: job-portal-app

labels:

app: job-portal-app

spec:

selector:

matchLabels:

app: job-portal-app

replicas: 1

template:

metadata:

labels:
```

```
app: job-portal-app

spec:

containers:

-       name: job-portal-app

image: image_name ports:

-         containerPort:
5000 env:
-         name: DISABLE_WEB_APP

value: "false"
```

Cluster creation



```
D:\Projects\IBM_assignments>ibmcloud ks cluster config -c cdbndb0f0qs6d8luac40
OK
The configuration for cdbndb0f0qs6d8luac40 was downloaded successfully.

Added context for cdbndb0f0qs6d8luac40 to the current kubeconfig file.
You can now execute 'kubectl' commands against your cluster. For example, run 'kubectl get nodes'.
If you are accessing the cluster for the first time, 'kubectl' commands might fail for a few seconds while RBAC synchronizes.
```



Search resources and products...
Catalog
Manage
Karthik Raja Anandan's...

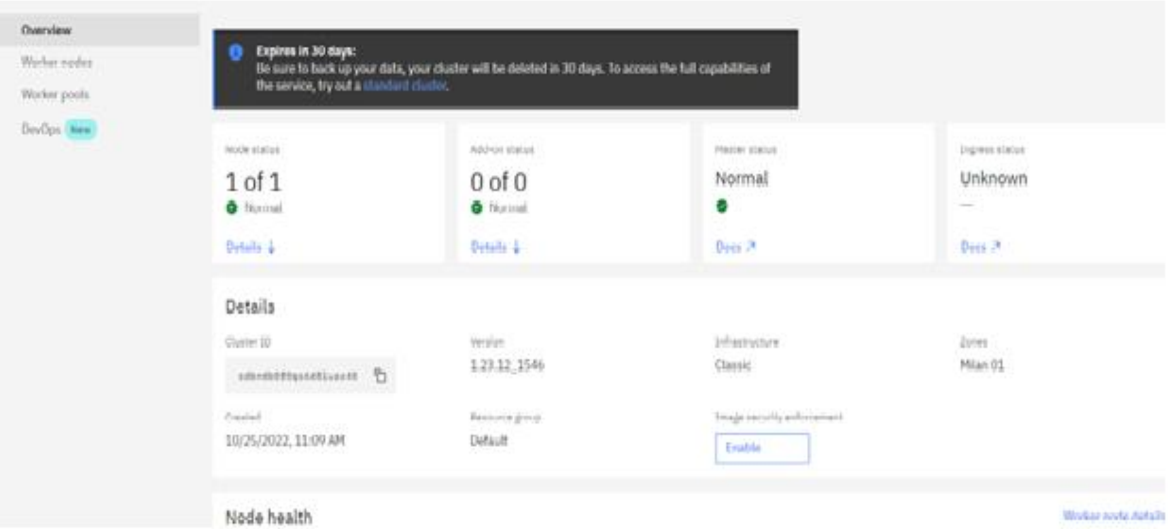
Kubernetes clusters

Resource group: Filter...
Location: Filter...
Search
Create cluster +

Name	State	Location	Worker count	Created	Version	Infrastructure
Karthik-free	✓ Normal	Paris 01	1	Expires in 30 days	1.23.12_1546	Classic

Items per page: 25 1–1 of 1 item 1 1 of 1 page

Configuring the cluster



Expires in 30 days:
Be sure to back up your data, your cluster will be deleted in 30 days. To access the full capabilities of the service, try out a standard cluster.

Node status
1 of 1
● Normal
Details ↓

Add-on status
0 of 0
● Normal
Details ↓

Master status
Normal
●
Docs ↗

Ingress status
Unknown
—
Docs ↗

Details

Cluster ID
[illegible]

Version
1.23.12_1546

Infrastructure
Classic

Zones
Milan 01

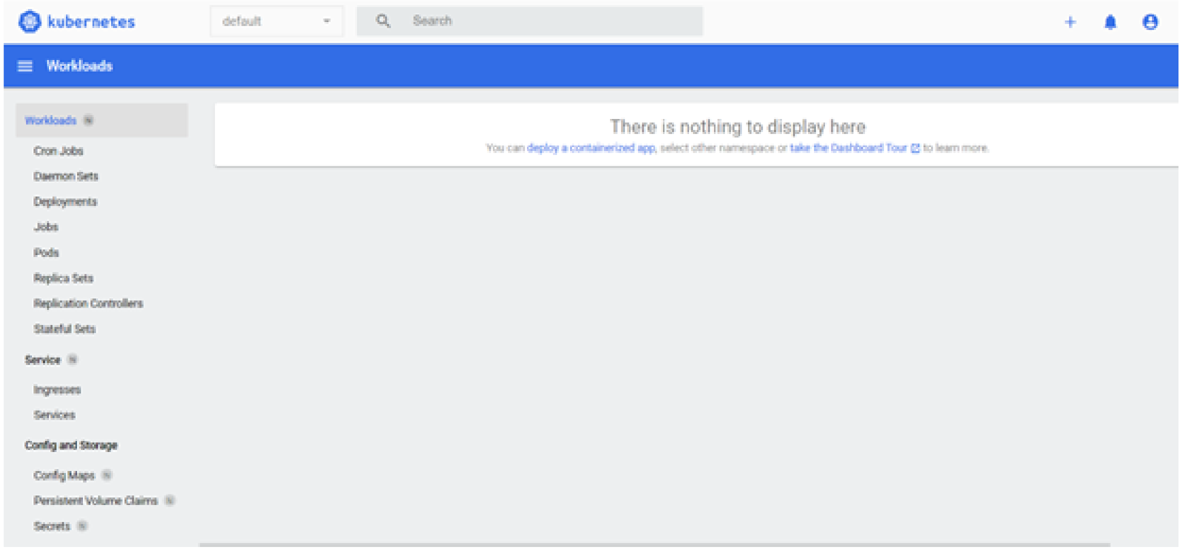
Created
10/25/2022, 11:09 AM

Resource group
Default

Image security enforcement
Enable

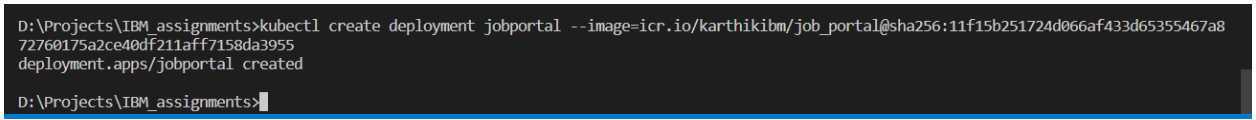
Node health

Worker node details

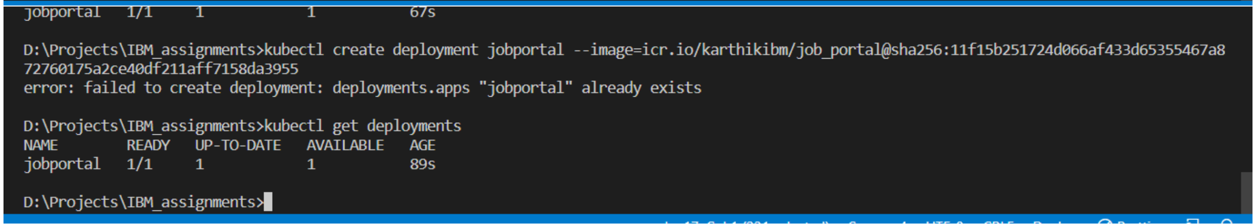


There is nothing to display here

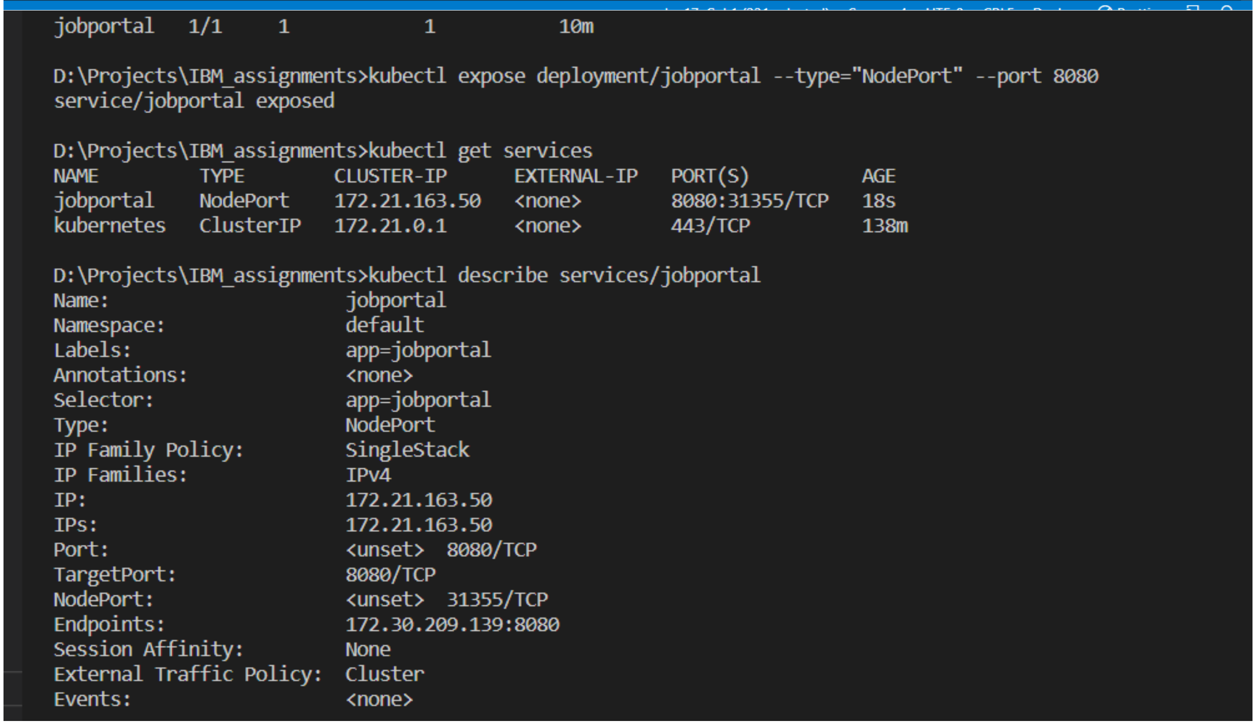
You can deploy a containerized app, select other namespace or take the Dashboard Tour to learn more.



```
D:\Projects\IBM_assignments>kubectl create deployment jobportal --image=icr.io/karthikibm/job_portal@sha256:11f15b251724d066af433d65355467a8
72760175a2ce40df211aff7158da3955
deployment.apps/jobportal created

D:\Projects\IBM_assignments>
```

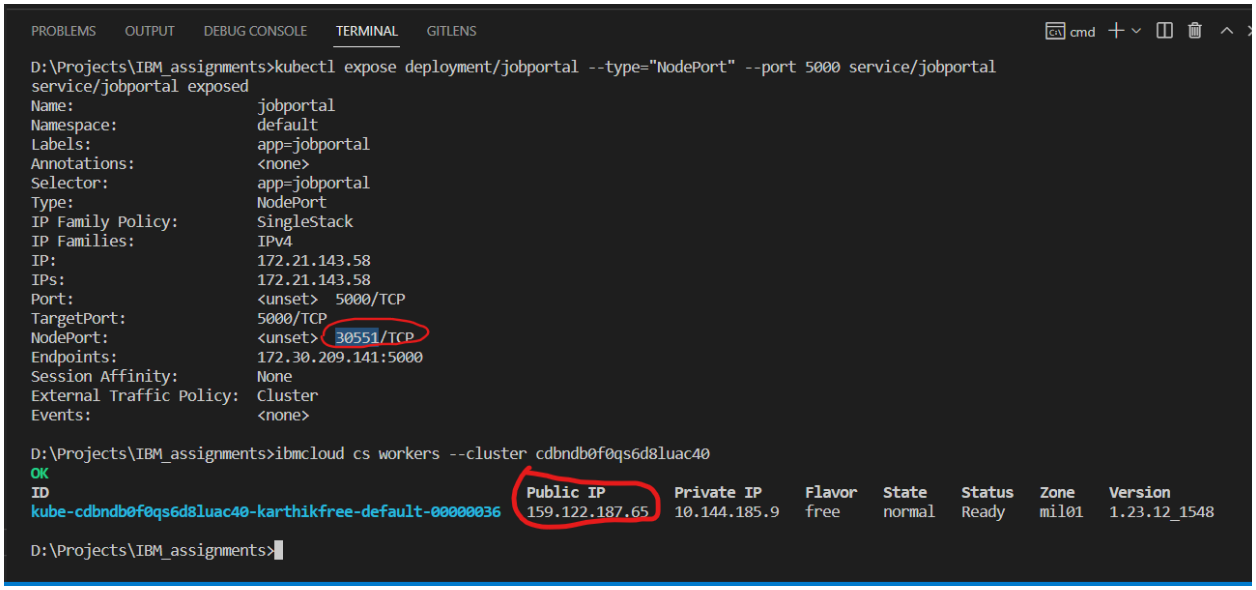


```
jobportal   1/1     1            1           67s

D:\Projects\IBM_assignments>kubectl create deployment jobportal --image=icr.io/karthikibm/job_portal@sha256:11f15b251724d066af433d65355467a8
72760175a2ce40df211aff7158da3955
error: failed to create deployment: deployments.apps "jobportal" already exists

D:\Projects\IBM_assignments>kubectl get deployments
NAME        READY   UP-TO-DATE   AVAILABLE   AGE
jobportal   1/1     1            1           89s

D:\Projects\IBM_assignments>
```



```
jobportal   1/1     1            1           10m

D:\Projects\IBM_assignments>kubectl expose deployment/jobportal --type="NodePort" --port 8080
service/jobportal exposed

D:\Projects\IBM_assignments>kubectl get services
NAME         TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
jobportal    NodePort    172.21.163.50   <none>        8080:31355/TCP   18s
kubernetes   ClusterIP   172.21.0.1      <none>        443/TCP          138m

D:\Projects\IBM_assignments>kubectl describe services/jobportal
Name:                     jobportal
Namespace:                default
Labels:                   app=jobportal
Annotations:              <none>
Selector:                 app=jobportal
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       172.21.163.50
IPs:                      172.21.163.50
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  31355/TCP
Endpoints:                172.30.209.139:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
```

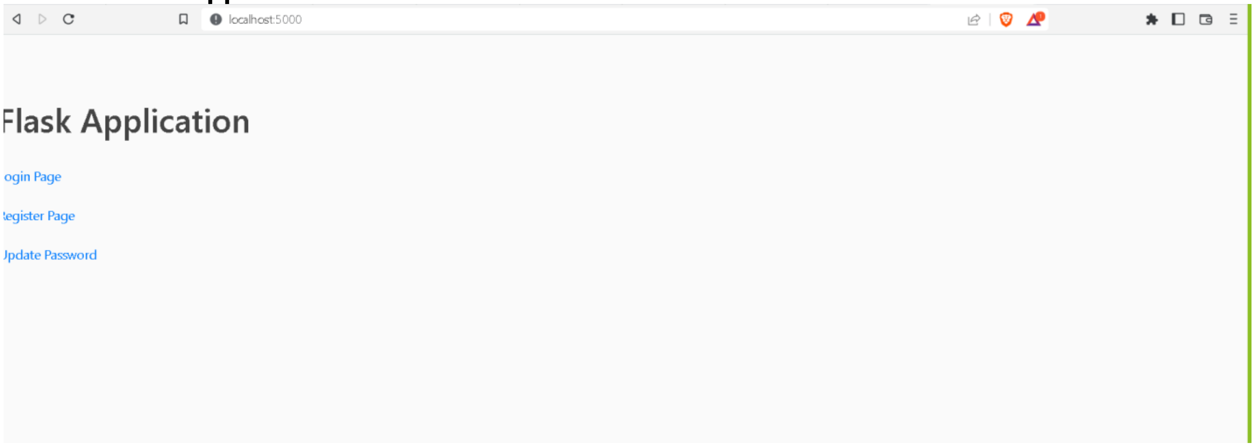
Procedure to find the exposed url



```
D:\Projects\IBM_assignments>kubectl expose deployment/jobportal --type="NodePort" --port 5000 service/jobportal
service/jobportal exposed
Name:                     jobportal
Namespace:                default
Labels:                   app=jobportal
Annotations:              <none>
Selector:                 app=jobportal
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       172.21.143.58
IPs:                      172.21.143.58
Port:                     <unset>  5000/TCP
TargetPort:               5000/TCP
NodePort:                 <unset>  30551/TCP
Endpoints:                172.30.209.141:5000
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>

D:\Projects\IBM_assignments>ibmcloud cs workers --cluster cdbndb0f0qs6d8luac40
OK
ID                                                     Public IP        Private IP     Flavor   State    Status   Zone    Version
kube-cdbndb0f0qs6d8luac40-karthikfree-default-00000036   159.122.187.65   10.144.185.9   free     normal   Ready    mil01   1.23.12_1548

D:\Projects\IBM_assignments>
```

]

Run our flask app in the IBM kubernetes



Flask Application

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Jpdate Password