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Date	22 October 2022
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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

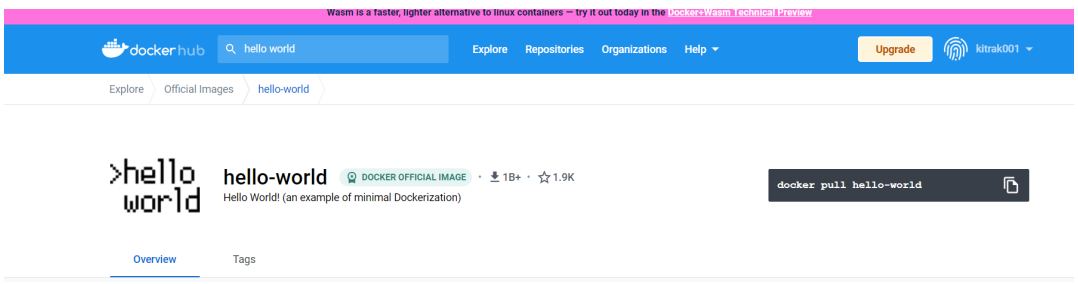
1. Pull an Image from docker hub and run it in Docker Playground

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

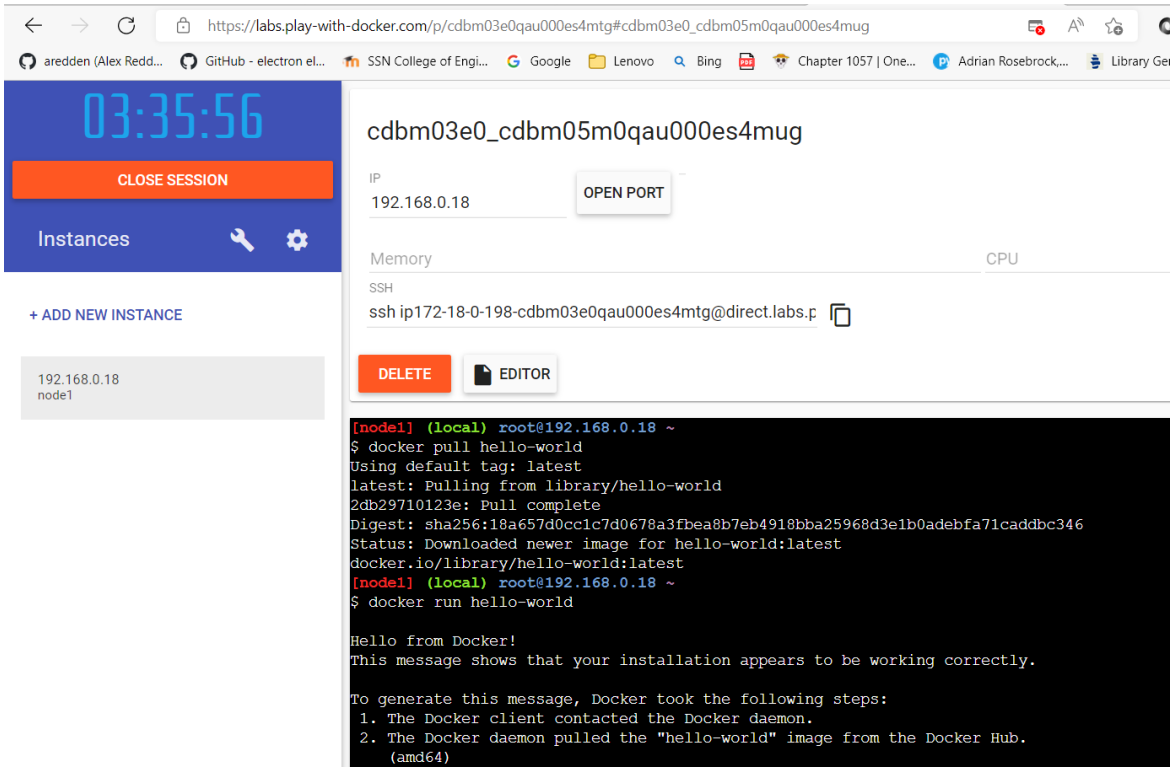
b. This image is used for viewing and managing the docker engine

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

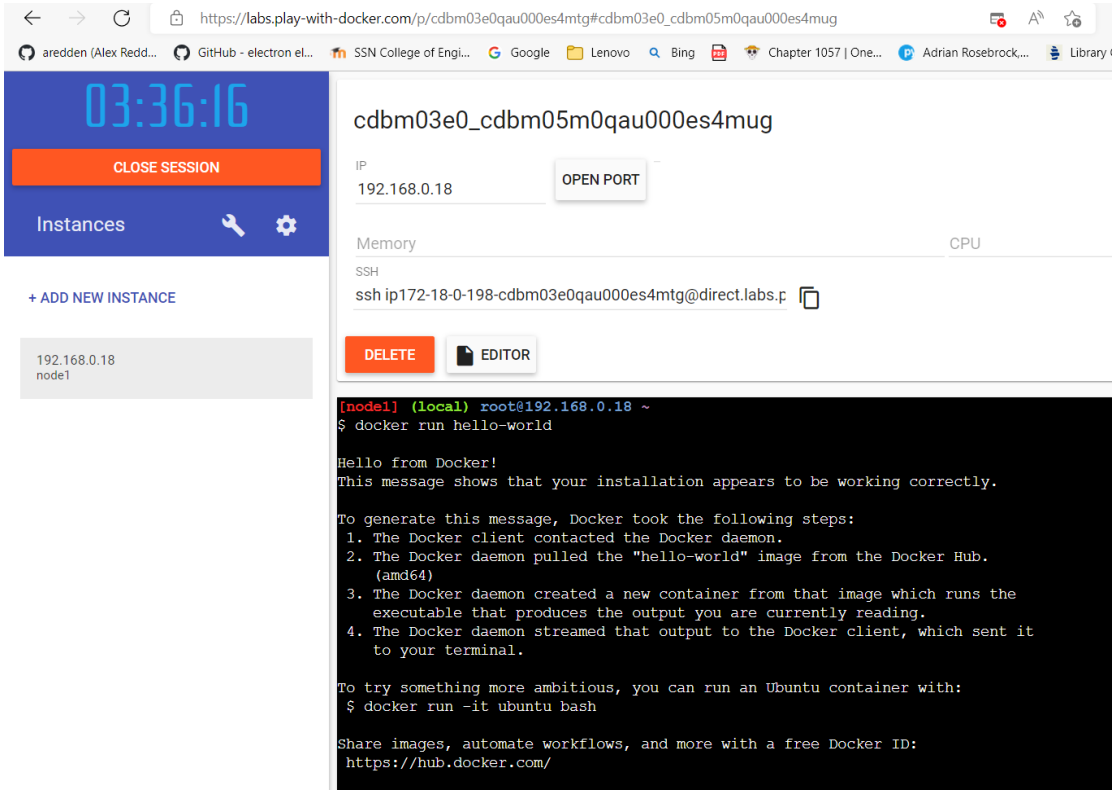
hello-world - Official Image | Docker Hub(https://hub.docker.com/_/hello-world)



Pull


https://labs.play-with-docker.com/p/cdbm03e0qau000es4mtg#cdbm03e0_cdbm05m0qau000es4mug
03:35:56
CLOSE SESSION
Instances
+ ADD NEW INSTANCE
192.168.0.18
node1
cdbm03e0_cdbm05m0qau000es4mug
IP
192.168.0.18
OPEN PORT
Memory
CPU
SSH
ssh ip172-18-0-198-cdbm03e0qau000es4mtg@direct.labs.p
DELETE
EDITOR
[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


https://labs.play-with-docker.com/p/cdbm03e0qau000es4mtg#cdbm03e0_cdbm05m0qau000es4mug
03:36:16
CLOSE SESSION
Instances
+ ADD NEW INSTANCE
192.168.0.18
node1
cdbm03e0_cdbm05m0qau000es4mug
IP
192.168.0.18
OPEN PORT
Memory
CPU
SSH
ssh ip172-18-0-198-cdbm03e0qau000es4mtg@direct.labs.p
DELETE
EDITOR
[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
```

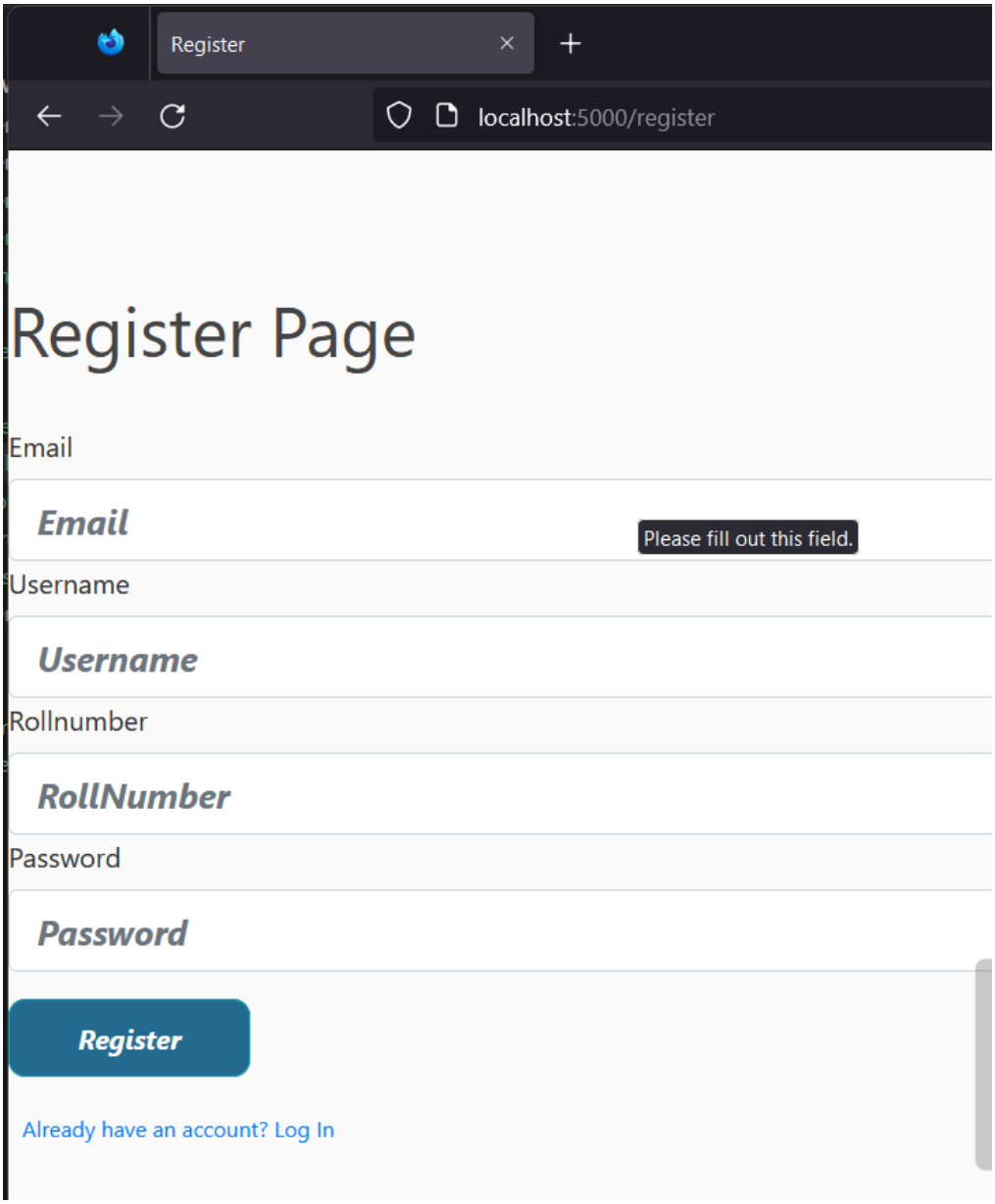
Steps:

```
(venv) D:\Projects\IBM_assignments\Assignment3>docker image build -t flask_docker .
[+] Building 62.9s (11/11) FINISHED
 => [internal] load build definition from Dockerfile
 => => transferring dockerfile: 32B
 => [internal] load .dockerignore
 => => transferring context: 2B
 => [internal] load metadata for docker.io/library/python:latest
 => CACHED [stage-1 1/6] FROM docker.io/library/python@sha256:03d1adc831e7ca7119666ce4825d91526a32c1323a2f6d69be6dcfbd3a50e111
 => [internal] load build context
 => => transferring context: 1.28kB
 => [stage-1 2/6] COPY ./requirements.txt /flaskApp/requirements.txt
 => [stage-1 3/6] WORKDIR /flaskApp
 => [stage-1 4/6] RUN pip install scipy
 => [stage-1 5/6] RUN pip install -r requirements.txt
 => [stage-1 6/6] COPY . /flaskApp
 => exporting to image
 => => exporting layers
```

```
(venv) D:\Projects\IBM_assignments\Assignment3>docker images
REPOSITORY                      TAG                 IMAGE ID       CREATED          SIZE
flask_docker                    latest              568a320e1c73   47 seconds ago   1.47GB
sandeepdoodigani/jobportalapp   latest              c8641e59c3bd   3 months ago     1.08GB
tensorflow/tensorflow           latest-gpu-jupyter  5f9e07bacf1d   5 months ago     6.07GB
sandeepdoodigani/jobportal      latest              d0dab7559fe5   6 months ago     1.08GB
hello-world                     latest              feb5d9fea6a5   13 months ago    13.3kB

(venv) D:\Projects\IBM_assignments\Assignment3>docker
```

```
(venv) D:\Projects\IBM_assignments\Assignment3>docker run -p 5000:5000 flask_docker
 * 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 http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 555-164-836
```

Run locally using docker


Register
localhost:5000/register
Register Page
Email
Email
Please fill out this field.
Username
Username
Rollnumber
RollNumber
Password
Password
Register
Already have an account? Log In

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

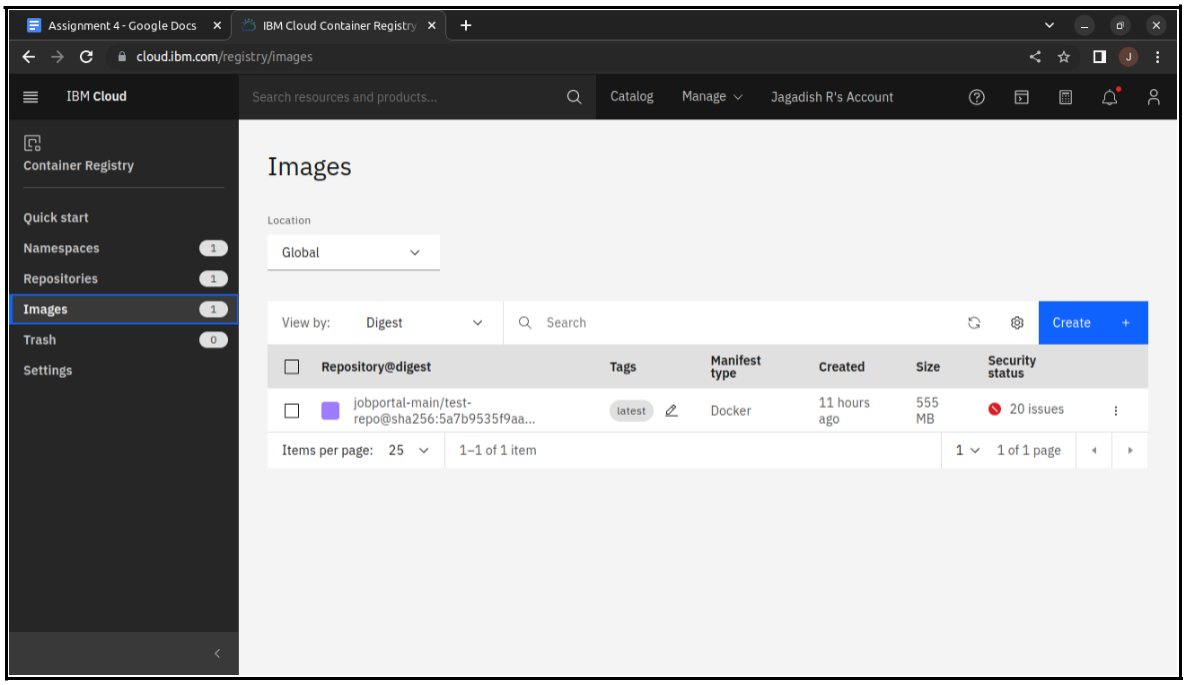
    a. Log into IBM cloud

    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



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

```
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:              karthikraja19048@cse.ssn.edu.in
Account:           Karthik Raja Anandan's Account (cf3187da5683419fbc644dedb6c35d4a)
Resource group:    No resource group targeted, use 'ibmcloud target -g RESOURCE_GROUP'
CF API endpoint:
Org:
Space:

D:\Projects\IBM_assignments>
```

```
D:\Projects\IBM_assignments>ibmcloud login
API endpoint: https://cloud.ibm.com

Email> karthikraja19048@cse.ssn.edu.in

Password>
Authenticating...
OK

Targeted account Karthik Raja Anandan's Account (cf3187da5683419fbc644dedb6c35d4a)


Select a region (or press enter to skip):
1. au-syd
2. in-che
3. jp-osa
```

```
D:\Projects\IBM_assignments>ibmcloud plugin list
Listing installed plug-ins...

Plugin Name            Version   Status   Private endpoints supported
container-registry     1.0.2             true
observe-service[ob]    1.0.82            false


D:\Projects\IBM_assignments>
```

Ln 17,

```
D:\Projects\IBM_assignments>ibmcloud ks
FAILED
'ks' is not a registered command. Check your GitLens installed plug-ins. See 'ibmcloud help'.


D:\Projects\IBM_assignments>ibmcloud plugin install ks
Looking up 'ks' from repository 'IBM Cloud'...
Plug-in 'container-service[kubernetes-service/ks] 1.0.459' found in repository 'IBM Cloud'
Attempting to download the binary file...
Plugin installation was canceled.
```

```
D:\Projects\IBM_assignments>ibmcloud cr namespace-add karthikibm
No resource group is targeted. Therefore, the default resource group for the account ('Default') is targeted.

Adding namespace 'karthikibm' in resource group 'Default' for account Karthik Raja Anandan's Account in registry icr.io...

Successfully added namespace 'karthikibm'

OK
```

```
D:\Projects\IBM_assignments>ibmcloud cr namespace-list -v
Listing namespaces for account 'Karthik Raja Anandan's Account' in registry 'icr.io'...

Namespace    Resource Group    Created
karthikibm   Default           46 seconds ago

OK
```

```
D:\Projects\IBM_assignments>docker tag flask_docker:latest job_portal:latest

D:\Projects\IBM_assignments>
```

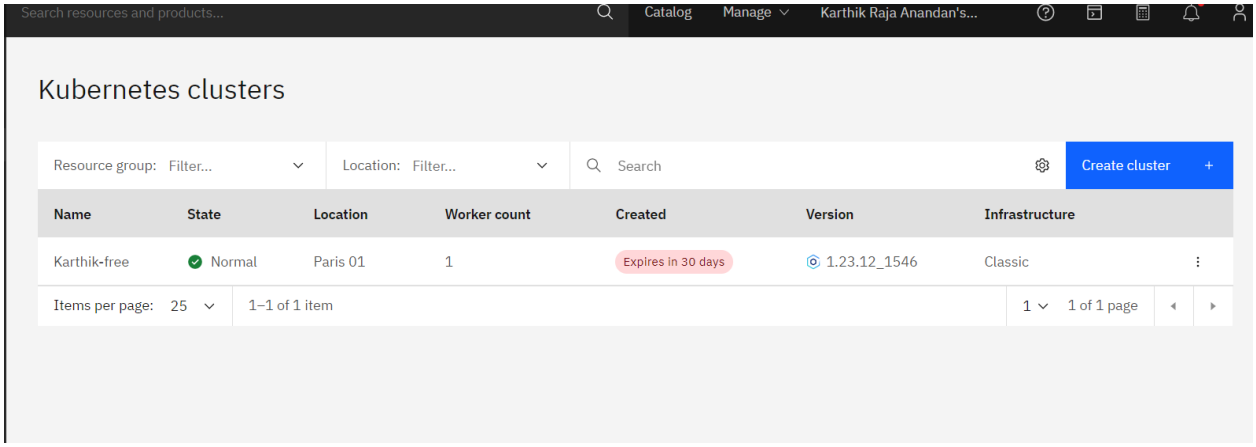
```
D:\Projects\IBM_assignments>docker tag job_portal  icr.io/karthikibm/job_portal:latest

D:\Projects\IBM_assignments>docker push icr.io/karthikibm/job_portal:latest
The push refers to repository [icr.io/karthikibm/job_portal]
fa8bc0492236: Pushed
31f3c05b48a6: Pushed
94c3a9ca4264: Pushed
5f70bf18a086: Pushed
5e21a51c70c5: Pushed
3894db7b92b6: Pushed
df34520418a8: Pushed
e10dffc9c9bd: Pushed
0c7daf9a72c8: Pushed
75ba02937496: Pushing [=========================================>       ]  456.8MB/528.9MB
288cf3a46e32: Pushed
186da837555d: Pushed
955c9335e041: Pushed
8e079fee2186: Pushed
```

```
D:\Projects\IBM_assignments>docker push icr.io/karthikibm/job_portal:latest
The push refers to repository [icr.io/karthikibm/job_portal]
fa8bc0492236: Pushed
31f3c05b48a6: Pushed
94c3a9ca4264: Pushed
5f70bf18a086: Pushed
5e21a51c70c5: Pushed
3894db7b92b6: Pushed
df34520418a8: Pushed
e10dffc9c9bd: Pushed
0c7daf9a72c8: Pushed
75ba02937496: Pushed
288cf3a46e32: Pushed
186da837555d: Pushed
955c9335e041: Pushed
8e079fee2186: Pushed
latest: digest: sha256:11f15b251724d066af433d65355467a872760175a2ce40df211aff7158da3955 size: 3265
```

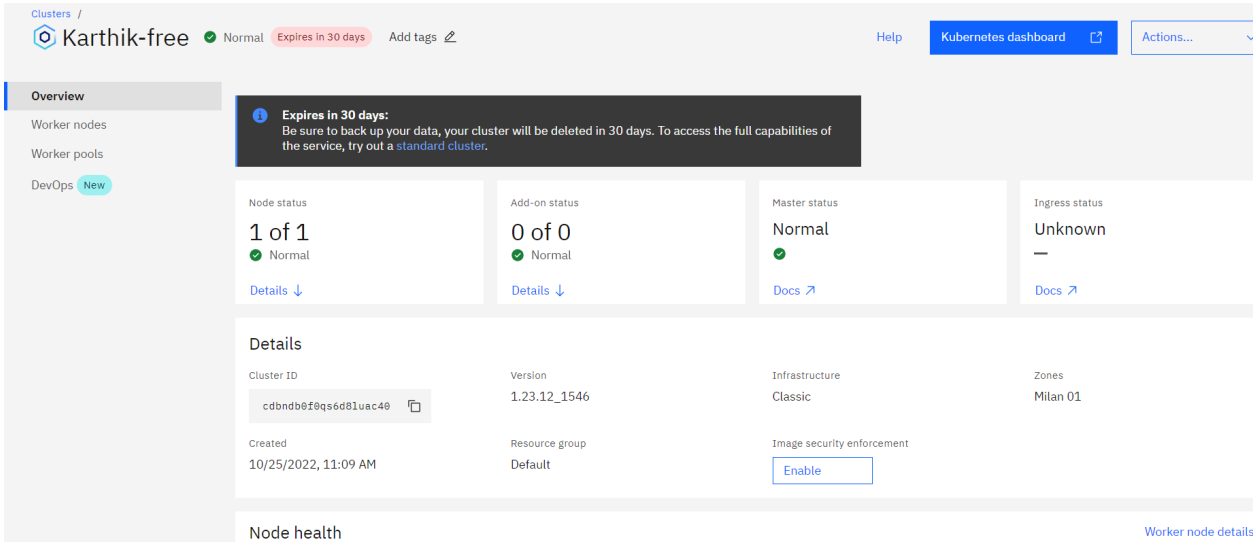
```
D:\Projects\IBM_assignments>ibmcloud cr image-list
Listing images...

Repository                    Tag      Digest         Namespace    Created          Size     Security status
icr.io/karthikibm/job_portal  latest   11f15b251724   karthikibm   56 minutes ago   584 MB   -

OK

D:\Projects\IBM_assignments>ibmcloud cr quota
Getting quotas and usage for the current month, for account 'Karthik Raja Anandan's Account'...

Quota          Limit    Used
Pull traffic   5.0 GB   0 B
Storage        512 MB   557 MB

Your account has exceeded its storage quota.
Review your storage quota in the preceding table, and use the 'ibmcloud cr plan' command to review your current pricing plan.
You can either delete some images, or modify your quota and plan settings.
If you want to modify your quota, run the 'ibmcloud cr quota-set' command. If you want to upgrade your plan, run the 'ibmcloud cr pla
de' command.

OK
```

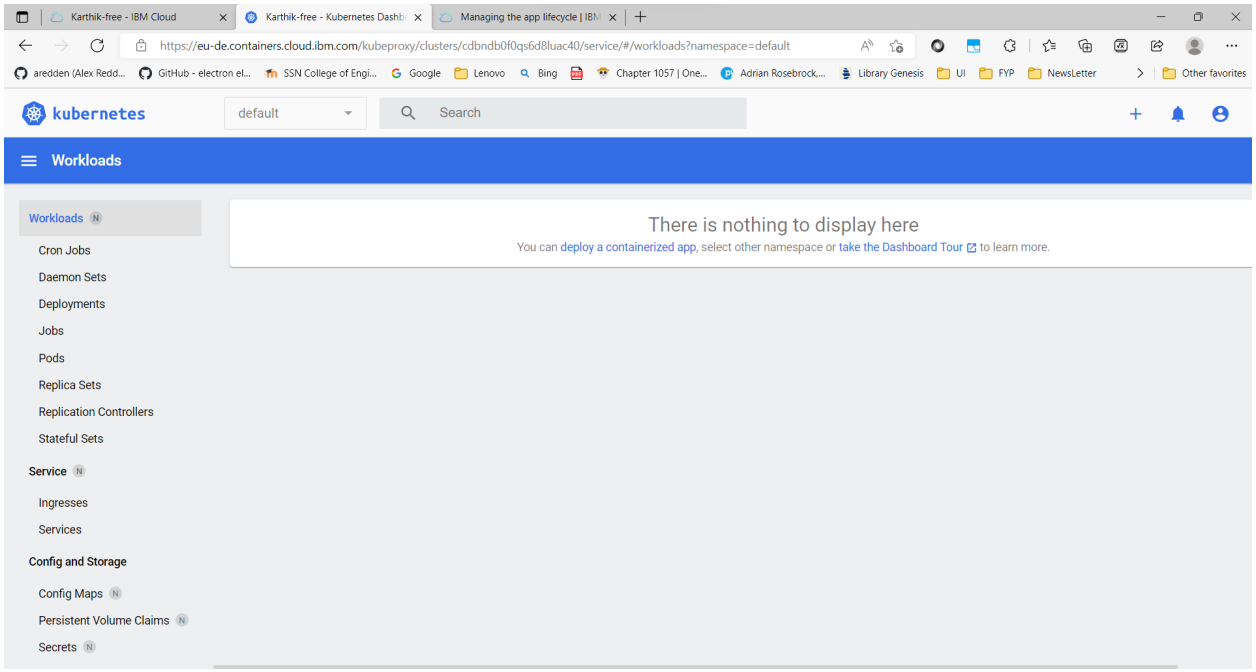
Cluster creation

```
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.
```



Configuring the cluster


Clusters /
Karthik-free
Normal
Expires in 30 days
Add tags
Help
Kubernetes dashboard
Actions...
Overview
Worker nodes
Worker pools
DevOps
New
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
cdbndb0f0qs6d8luac40
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




```
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

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  GITLENS                                   cmd

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