GitHub Link:
https://github.com/HaydenDuong/SIT323_Cloud_Native_Application_Development/tree/main/6.1P

1/ Setup the Kubernetes Cluster

- Navigate to Docker Desktop application.

- Find the Setting option on the top-right of the navigation bar of the application, it will display the following (Image 1).

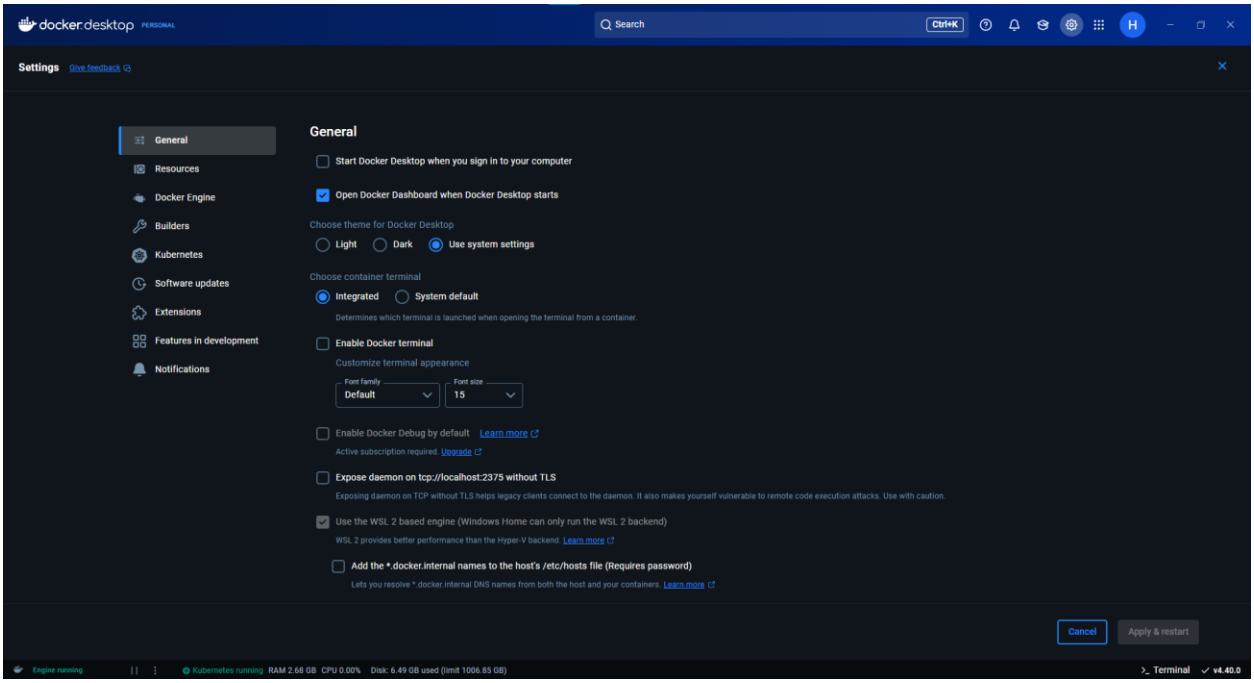


Image 1

- Select “Kubernetes” option from the left-side list (Image 2).

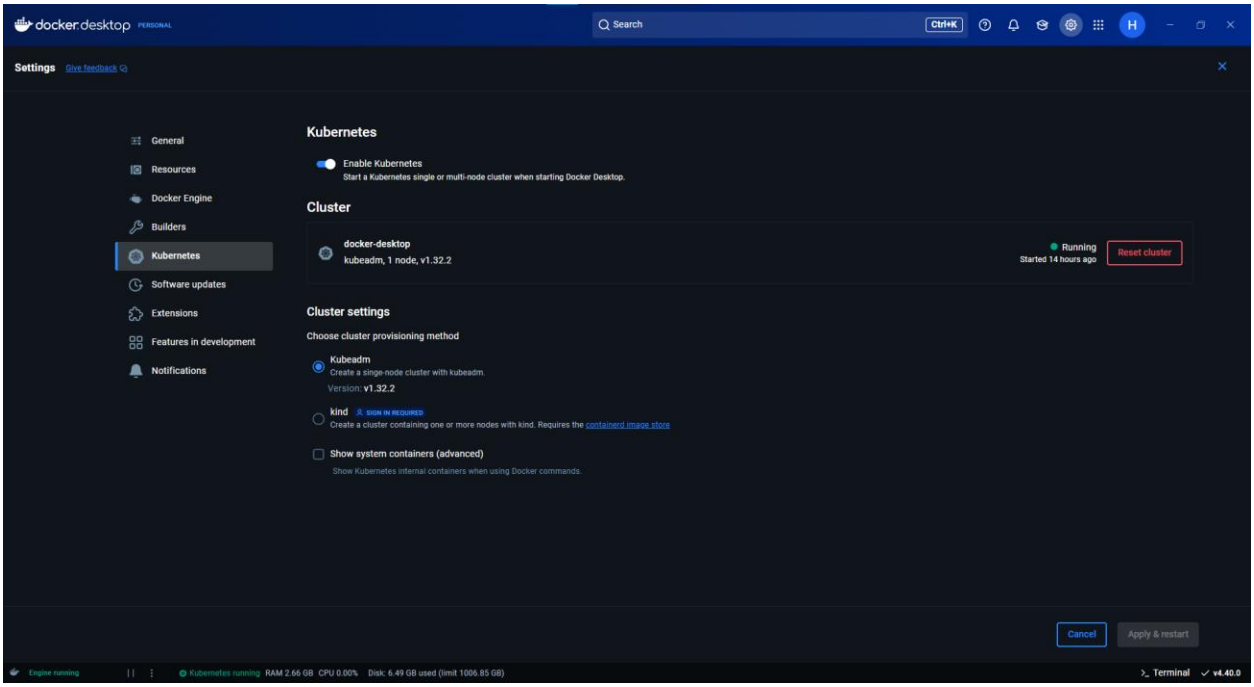
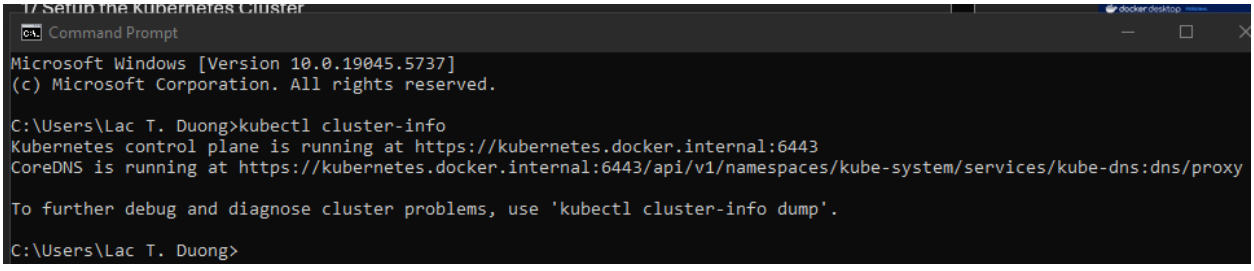


Image 2

- Enabling Kubernetes by:
  - Select “Enable Kubernetes”.
  - In “Cluster settings”, select “Kubeadm”.
  - Click “Apply & restart”.
  - Wait for short period of time for Docker to download the necessary files to construct “Kubeadm” – done when near the bottom-left corner shown “Kubernetes running”.

- Check the cluster information by type in command “kubectl clutser-info” into Command Prompt. (Image 3)



2/ Create the Docker Image

- In task 5.1P, I had created an Docker Image based on task 4.2C, named "calculator:v1" (Image 4):

```
Lac T. Duong@Legion-7 MINGW64 ~/Desktop/SIT323_737 - Cloud Native Development/SIT323_Cloud_Native_Application_Development/6.1P (main)
$ docker images
REPOSITORY                                                                                TAG                                                                IMAGE ID       CREATED         SIZE
australia-southeast2-docker.pkg.dev/sit323-25t1-duong-102550c/calculator-repo/calculator  v1                                                                 4d19093419e0   12 days ago     1.35GB
hayden2310/calculator                                                                     v1                                                                 4d19093419e0   12 days ago     1.35GB
calculator                                                                                v1                                                                 4d19093419e0   12 days ago     1.35GB
docker/desktop-kubernetes                                                                 kubernetes-v1.32.2-cni-v1.6.0-critools-v1.31.1-cri-dockerd-v0.3.16-1-debian  eeef9515fbfb   7 weeks ago     412MB
registry.k8s.io/kube-apiserver                                                            v1.32.2                                                            85b7a174738b   2 months ago    97MB
registry.k8s.io/kube-scheduler                                                            v1.32.2                                                            d8e673e7c998   2 months ago    69.6MB
registry.k8s.io/kube-proxy                                                                v1.32.2                                                            f1332858868e   2 months ago    94MB
registry.k8s.io/kube-controller-manager                                                   v1.32.2                                                            b6a454c5a800   2 months ago    89.7MB
registry.k8s.io/etcd                                                                      3.5.16-0                                                           a9e7e6b294ba   7 months ago    150MB
registry.k8s.io/coredns/coredns                                                           v1.11.3                                                            c69fa2e9cbf5   8 months ago    61.8MB
registry.k8s.io/pause                                                                     3.10                                                               873ed7510279   10 months ago   736kB
docker/labs-k8s-toolkit-extension                                                         0.0.46                                                             b4b9195545cc   16 months ago   132MB
docker/desktop-vpnkit-controller                                                          dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                           556098075b3d   23 months ago   36.2MB
docker/desktop-storage-provisioner                                                        v2.0                                                               99f89471f470   3 years ago     41.9MB
```

Image 4

- Create another image of the same application will add another 1.35GB – which is not a good choice, thus, I "recycled" the old Docker Image from task 5.1P.

3/ Create the Kubernetes Deployment

- There are 2 ways to do this:
  - Through command "kubectl create deployment <name-of-deployment> --image=<name-of-Docker-Image>".
  - Through writing a YAML file – which is allow user to have more control over the deployment.

- For this task, I chose to write YAML file and its structure is as follows (Image 5):

```
io.k8s.api.apps.v1.Deployment (v1@deployment.json)
apiVersion: apps/v1
kind: Deployment
metadata:
  name: calculator-deployment
spec:
  replicas: 1
  selector:
    matchLabels:
      app: calculator-pod
  template:
    metadata:
      labels:
        app: calculator-pod
    spec:
      containers:
      - name: calculator-container

        # Use the image from Docker Hub
        image: hayden2310/calculator:v1
        imagePullPolicy: Always # Always pull the image from the Docker Hub registry

        # Use the image from local registry
        # image: calculator:v1
        # imagePullPolicy: Never = Do not pull the image from the Docker Hub registry

        ports:
        - containerPort: 3040

```

Image 5

- Input command: “kubectl apply -f <name-of-YAML-file>” (Image 6)

```
Lac T. Duong@Legion-7 MINGW64 ~/Desktop/SIT323_737 - Cloud Native Development/SIT323_Cloud_Native_Application_Development/6.1P (main)
$ kubectl apply -f calculator-deployment.yaml
deployment.apps/calculator-deployment created
```

Image 6

- Check the status of this newly generated deployment through “kubectl get deployments” (Image 7):

```
Lac T. Duong@Legion-7 MINGW64 ~/Desktop/SIT323_737 - Cloud Native Development/SIT323_Cloud_Native_Application_Development/6.1P (main)
$ kubectl get deployments
NAME                   READY   UP-TO-DATE   AVAILABLE   AGE
calculator-deployment   1/1     1            1           21s
```

Image 7

4/ Create the Kubernetes Service

- Similar to K8s Deployment, a Service can be created by one of these two ways:
    - "kubectl expose <name-of-the-running-deployment> --type=<Option> --port 80 –target-port <port-that-the-application-running>" – this method will let kubernetes randomly choose a port (30000 – 32767) to allow external applications to accessing to the calculator app inside the container (not flexible)
    - Write a YAML file (allow easily configuration later on)

- The structure of the YAML is as follows (Image 8):

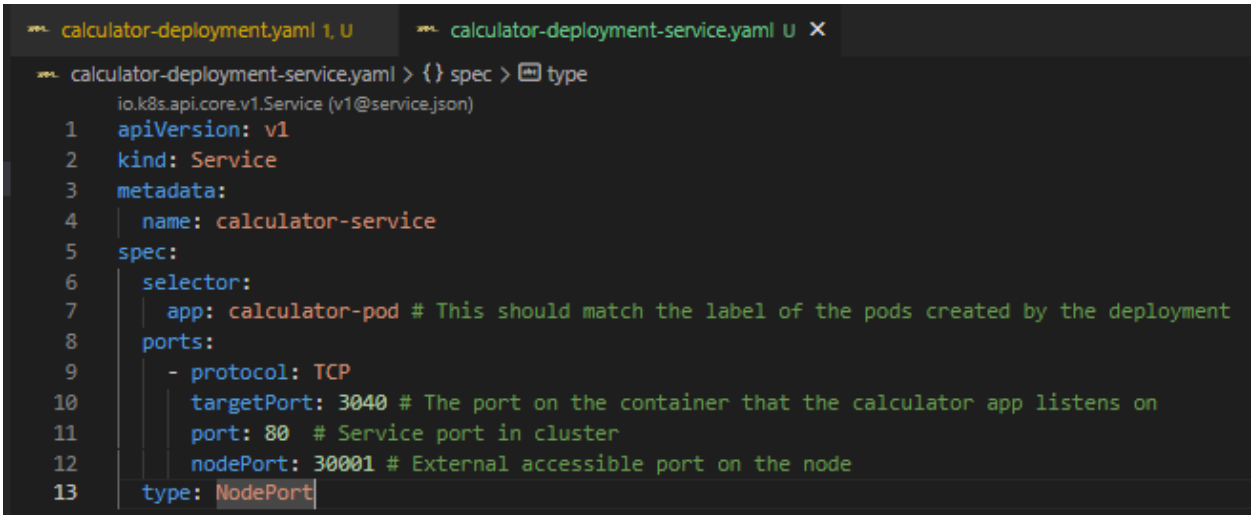


Image 8

- Apply this YAML file with "kubectl apply -f <name-of-YAML-file>"
- Check the generated service with "kubectl get services" (Image 9)

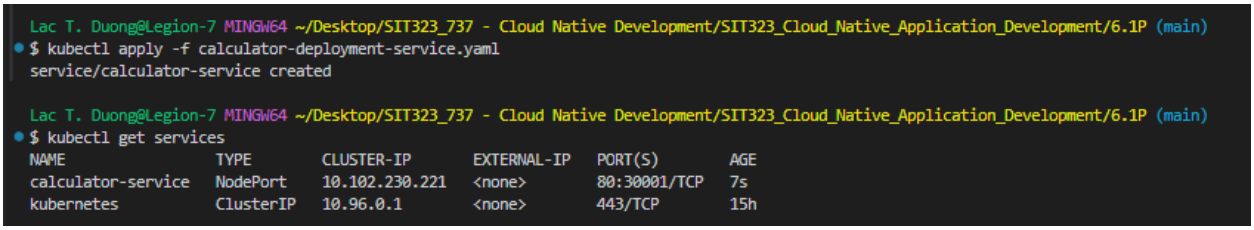


Image 9