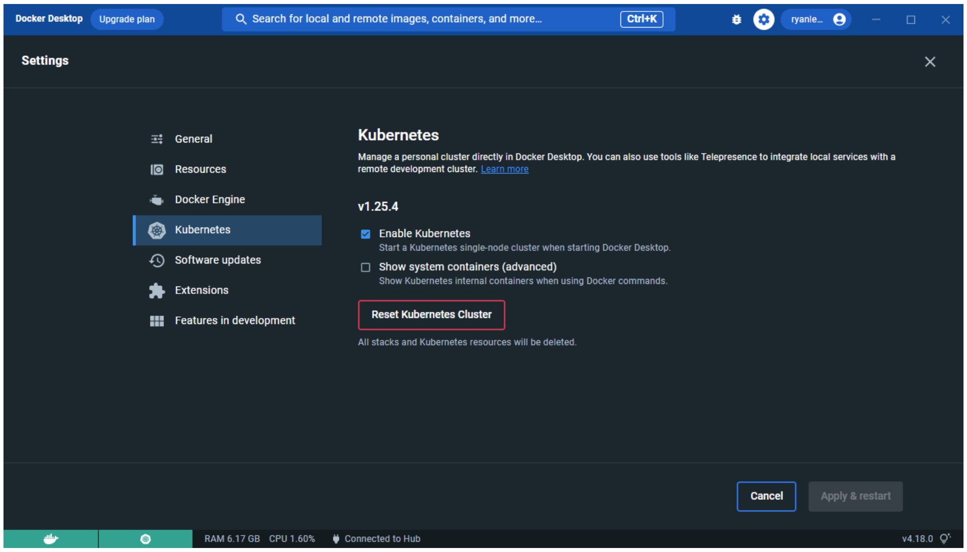
7.1P: Creating a Kubernetes Cluster for a containerised application

Set up the Kubernetes Cluster

I set up my PC with Hyper-V features, and enabled Kubernetes, creating a single-node cluster within Docker Desktop.



Kubernetes

Manage a personal cluster directly in Docker Desktop. You can also use tools like Telepresence to integrate local services with a remote development cluster. Learn more

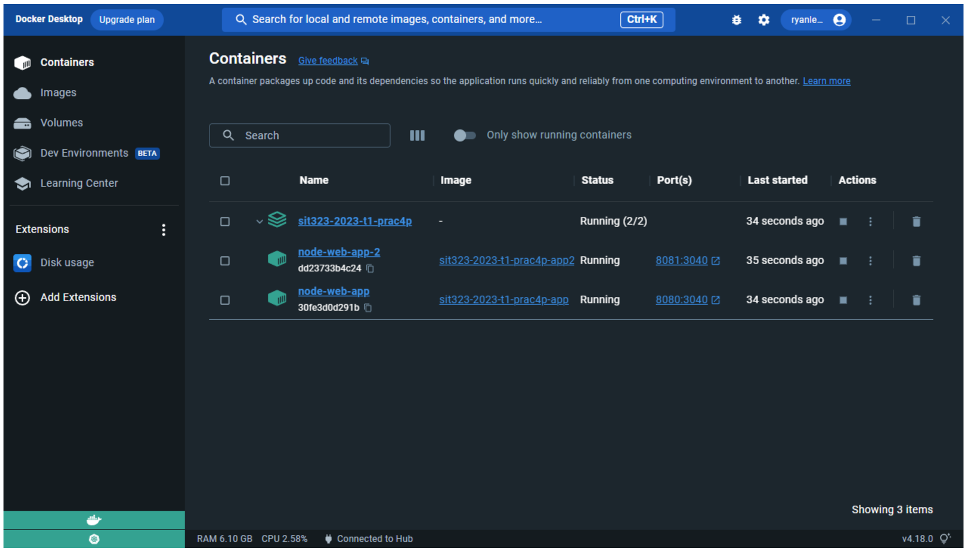
v1.25.4

☑ Enable Kubernetes
Start a Kubernetes single-node cluster when starting Docker Desktop.

□ Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.

Reset Kubernetes Cluster

All stacks and Kubernetes resources will be deleted.



Containers

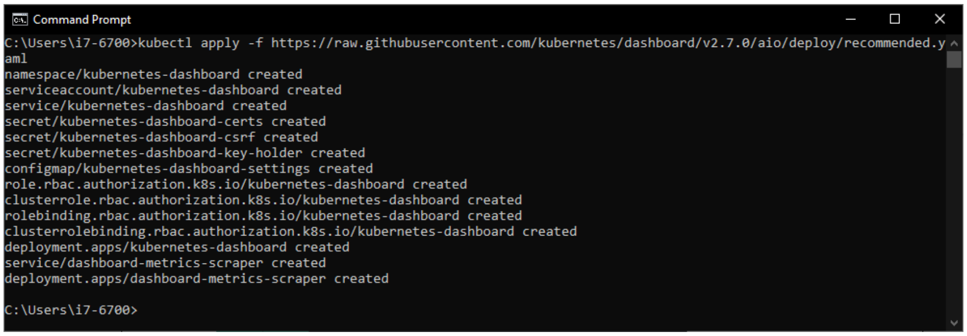
A container packages up code and its dependencies so the application runs quickly and reliably from one computing environment to another. Learn more

Name	Image	Status	Port(s)	Last started
sit323-2023-t1-prac4p	-	Running (2/2)		34 seconds ago
node-web-app-2 dd23733b4c24	sit323-2023-t1-prac4p-app2	Running	8081:3040	35 seconds ago
node-web-app 30fe3d0d291b	sit323-2023-t1-prac4p-app	Running	8080:3040	34 seconds ago

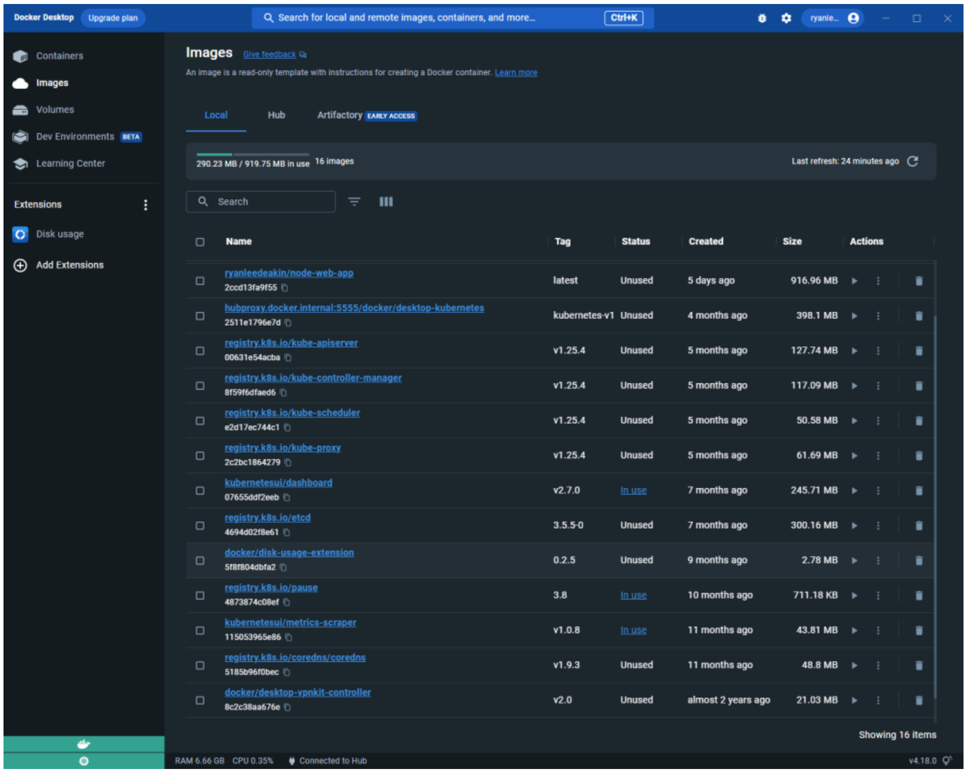
I then deployed the UI Dashboard via the Kubernetes CLI tool. I ran:

```
kubectl apply -f
https://raw.githubusercontent.com/kubernetes/dashboard/v2.7.0/aio/deploy/recommen
ded.yaml
```

This created several images and started four (4) docker containers.



```
C:\Users\i7-6700>kubectl apply -f https://raw.githubusercontent.com/kubernetes/dashboard/v2.7.0/aio/deploy/recommended.y
aml
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

C:\Users\i7-6700>
```



Images

An image is a read-only template with instructions for creating a Docker container. Learn more

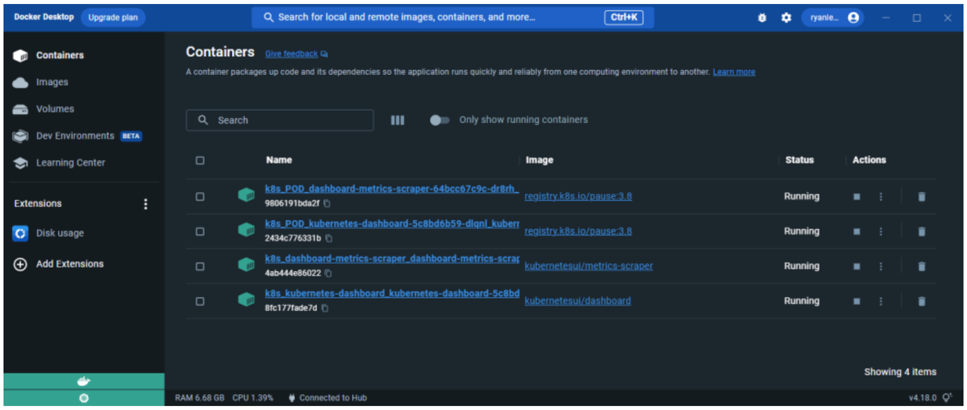
290.23 MB / 919.75 MB in use 16 images

Last refresh: 24 minutes ago

Name	Tag	Status	Created	Size
ryanleedeakin/node-web-app 2ccd13fa9f55	latest	Unused	5 days ago	916.96 MB
hubproxy.docker.internal:5555/docker/desktop-kubernetes 2511e1796e7d	kubernetes-v1	Unused	4 months ago	398.1 MB
registry.k8s.io/kube-apiserver 00631e54acba	v1.25.4	Unused	5 months ago	127.74 MB
registry.k8s.io/kube-controller-manager 8f59f6dfaed6	v1.25.4	Unused	5 months ago	117.09 MB
registry.k8s.io/kube-scheduler e2d17ec744c1	v1.25.4	Unused	5 months ago	50.58 MB
registry.k8s.io/kube-proxy 2c2bc1864279	v1.25.4	Unused	5 months ago	61.69 MB
kubernetesui/dashboard 07655ddf2eeb	v2.7.0	In use	7 months ago	245.71 MB
registry.k8s.io/etcd 4694d02f8e61	3.5.5-0	Unused	7 months ago	300.16 MB
docker/disk-usage-extension 5f8f804dbfa2	0.2.5	Unused	9 months ago	2.78 MB
registry.k8s.io/pause 4873874c08ef	3.8	In use	10 months ago	711.18 KB
kubernetesui/metrics-scraper 115053965e86	v1.0.8	In use	11 months ago	43.81 MB
registry.k8s.io/coredns/coredns 5185b96f0bec	v1.9.3	Unused	11 months ago	48.8 MB
docker/desktop-vpnkit-controller 8c2c38aa676e	v2.0	Unused	almost 2 years ago	21.03 MB

Showing 16 items

RAM 6.66 GB CPU 0.35% Connected to Hub v4.18.0



Containers

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

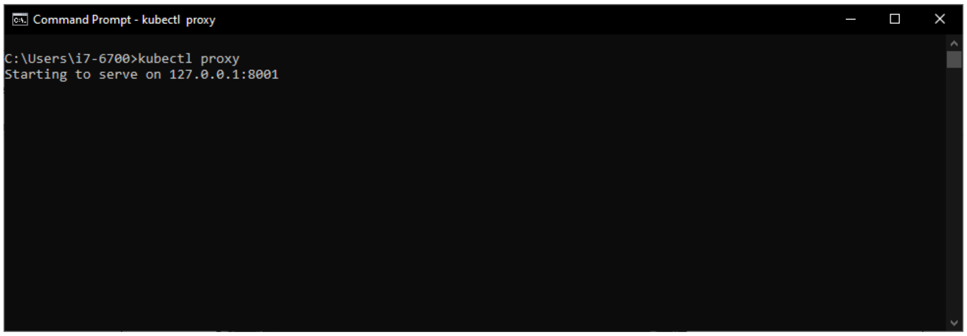
Name	Image	Status
k8s_POD_dashboard-metrics-scraper-64bcc67c9c-dr8rh_ 9806191bda2f	registry.k8s.io/pause:3.8	Running
k8s_POD_kubernetes-dashboard-5c8bd6b59-dlqnl_kuberr 2434c776331b	registry.k8s.io/pause:3.8	Running
k8s_dashboard-metrics-scraper_dashboard-metrics-scrap 4ab444e86022	kubernetesui/metrics-scraper	Running
k8s_kubernetes-dashboard_kubernetes-dashboard-5c8bd 8fc177fade7d	kubernetesui/dashboard	Running

Showing 4 items

RAM 6.68 GB CPU 1.39% Connected to Hub v4.18.0

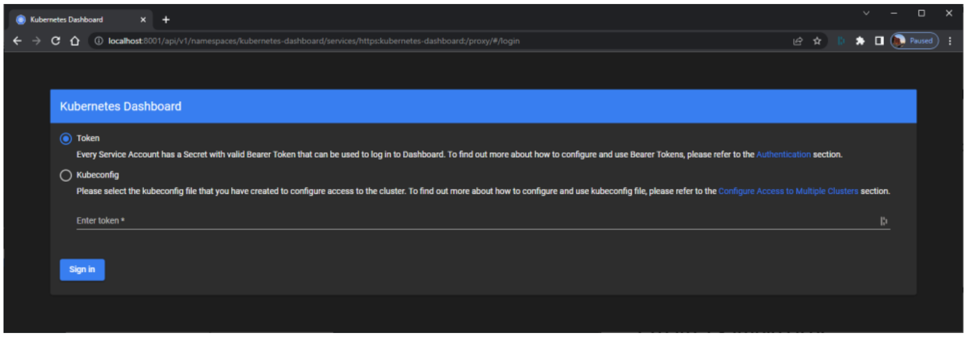
I then enabled access to the Kubernetes Dashboard UI by running the following in the CLI:

```
kubectl proxy
```



```
C:\Users\i7-6700>kubectl proxy
Starting to serve on 127.0.0.1:8001
```

I attempted to access the Dashboard, but the system asked for a token or Kubeconfig file.


Kubernetes Dashboard
localhost:8001/api/v1/namespaces/kubernetes-dashboard/services/https:kubernetes-dashboard:/proxy/#/login
Paused

Kubernetes Dashboard

● Token

Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard. To find out more about how to configure and use Bearer Tokens, please refer to the Authentication section.

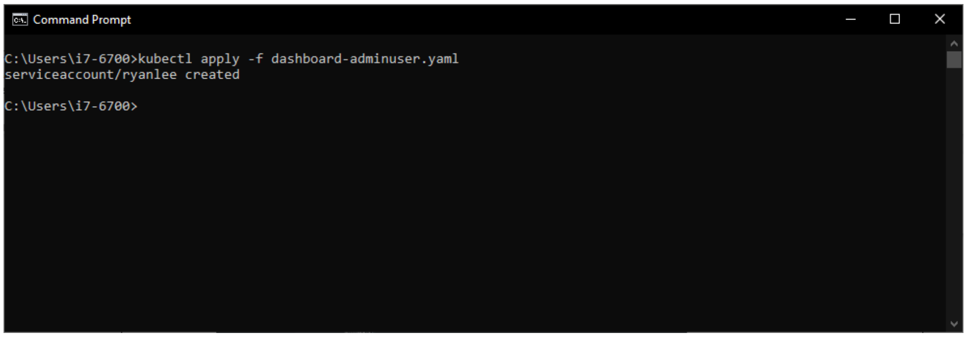
○ Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out more about how to configure and use kubeconfig file, please refer to the Configure Access to Multiple Clusters section.

I then used Kubernetes' Service Account mechanism to create an administrator user and issue an access token.

I created a yaml file with details for a user named ryanlee, and then run the following in the CLI:

```
kubectl apply -f dashboard-adminuser.yaml
```



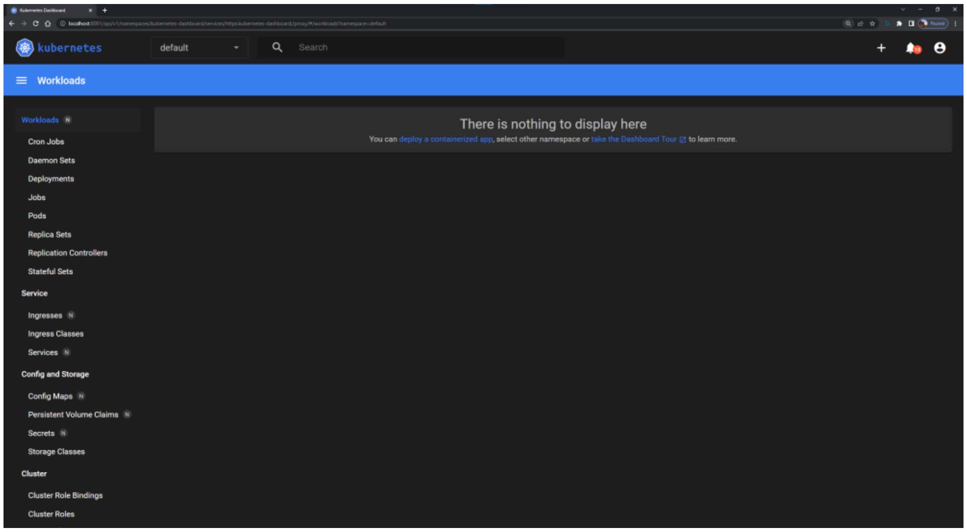
```
C:\Users\i7-6700>kubectl apply -f dashboard-adminuser.yaml
serviceaccount/ryanlee created

C:\Users\i7-6700>
```

I then created a token using command:

```
kubectl -n kubernetes-dashboard create token ryanlee
```

I then used this token to log into the Dashboard hosted at:

http://localhost:8001/api/v1/namespaces/kubernetes-dashboard/services/https:kubernetes-dashboard:/proxy/

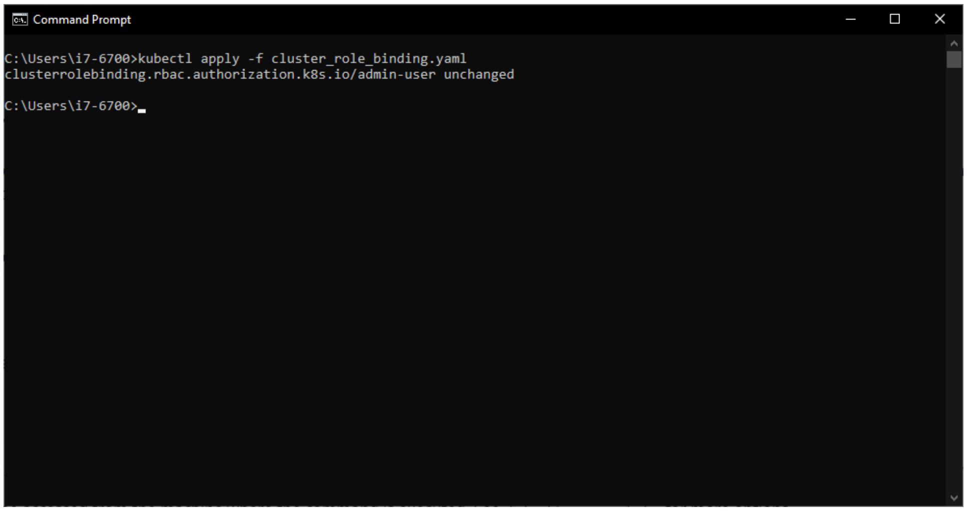


There is nothing to display here

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

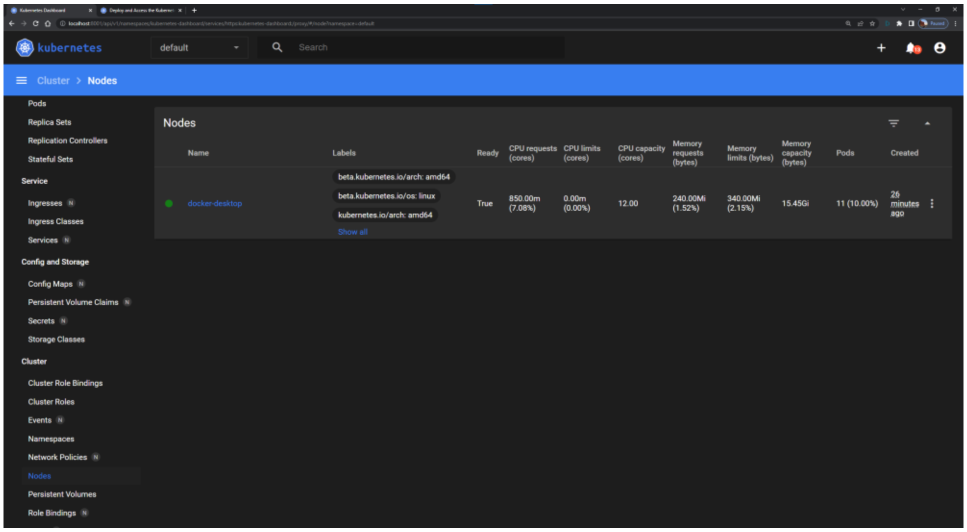
I then created the cluster admin role binding to ryanlee by creating another yaml file and executing the following in the CLI:

```
kubectl apply -f cluster_role_binding.yaml
```



```
C:\Users\i7-6700>kubectl apply -f cluster_role_binding.yaml
clusterrolebinding.rbac.authorization.k8s.io/admin-user unchanged

C:\Users\i7-6700>
```

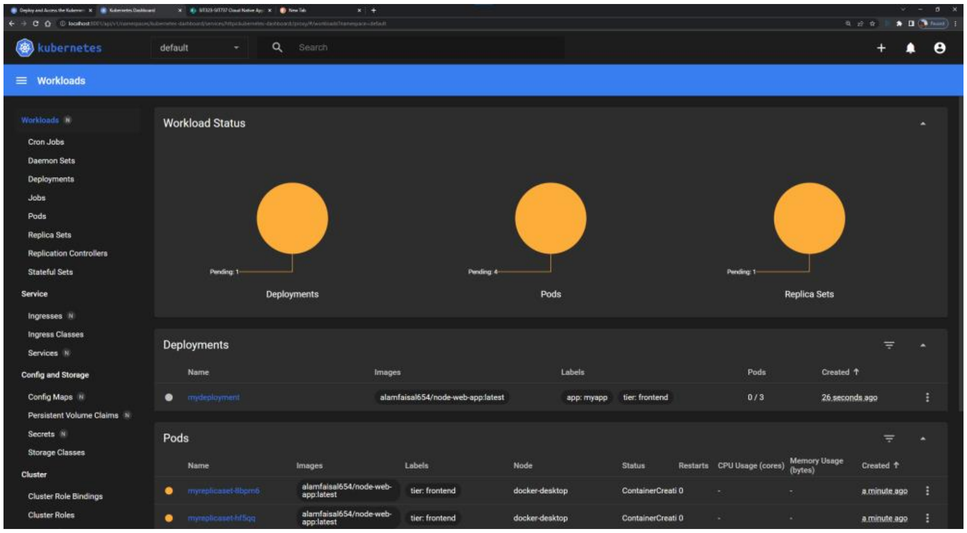
Now when I navigate through the dashboard UI, I can see the node:



Nodes

Name	Labels	Ready	CPU requests (cores)	CPU limits (cores)	CPU capacity (cores)	Memory requests (bytes)	Memory limits (bytes)	Memory capacity (bytes)	Pods	Created
docker-desktop	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux kubernetes.io/arch: amd64 Show all	True	850.00m (7.08%)	0.00m (0.00%)	12.00	240.00Mi (1.52%)	340.00Mi (2.15%)	15.45Gi	11 (10.00%)	26 minutes ago

I then downloaded the createPod, createReplicaSet and createDeployment yaml files, and applied them to the cluster. When viewing the bashboard, I could see them loaded in and pending:



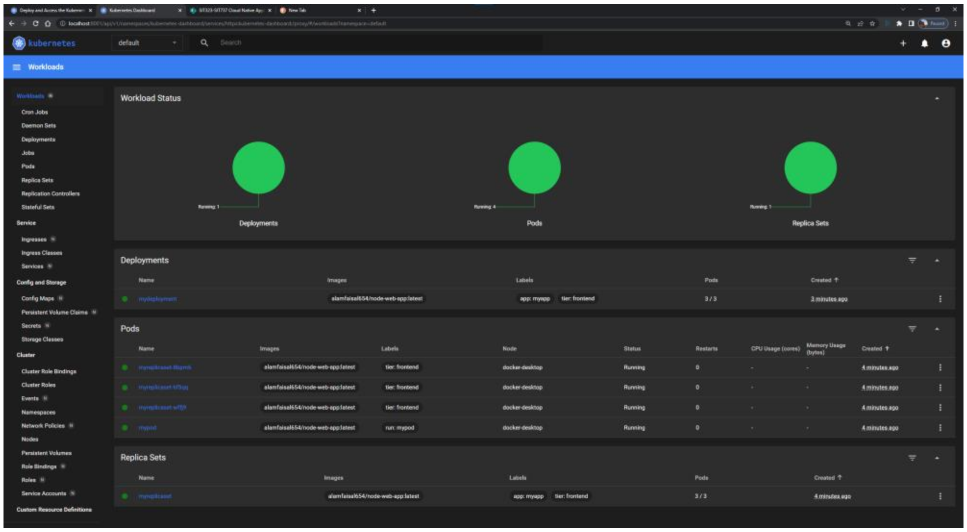
Deployments

Name	Images	Labels	Pods	Created
mydeployment	alamfaisal654/node-web-app:latest	app: myapp tier: frontend	0 / 3	26 seconds ago

Pods

Name	Images	Labels	Node	Status	Restarts	CPU Usage (cores)	Memory Usage (bytes)	Created
myreplicaset-8bpm6	alamfaisal654/node-web-app:latest	tier: frontend	docker-desktop	ContainerCreati	0	-	-	a minute ago
myreplicaset-hf5qq	alamfaisal654/node-web-app:latest	tier: frontend	docker-desktop	ContainerCreati	0	-	-	a minute ago

After a couple of minutes, they finished deploying, and that was reflected in the dashboard:



Deployments

	Name	Images	Labels	Pods	Created ↑
●	mydeployment	alamfaisal654/node-web-app:latest	app: myapp tier: frontend	3 / 3	3 minutes ago

Pods

	Name	Images	Labels	Node	Status	Restarts	CPU Usage (cores)	Memory Usage (bytes)	Created ↑
●	myreplicaset-8bpmk	alamfaisal654/node-web-app:latest	tier: frontend	docker-desktop	Running	0	-	-	4 minutes ago
●	myreplicaset-kf5qq	alamfaisal654/node-web-app:latest	tier: frontend	docker-desktop	Running	0	-	-	4 minutes ago
●	myreplicaset-wfjj9	alamfaisal654/node-web-app:latest	tier: frontend	docker-desktop	Running	0	-	-	4 minutes ago
●	mypod	alamfaisal654/node-web-app:latest	run: mypod	docker-desktop	Running	0	-	-	4 minutes ago

Replica Sets

	Name	Images	Labels	Pods	Created ↑
●	myreplicaset	alamfaisal654/node-web-app:latest	app: myapp tier: frontend	3 / 3	4 minutes ago