Personal Kubernetes Infrastructure

Initial Setup

This are initial notes from Tim on setting up a personal docker, rancher desktop and rancher server testbed environment.

I started by setting up rancher desktop on my Fedora based linux laptop. I used the appimage (despite a concerning looking warning that firefox gives about the image when downloading it.)

Here is the installation guide.

Once installed I performed the following commands to do a quick start setup of nginx running in the k8 cluster.

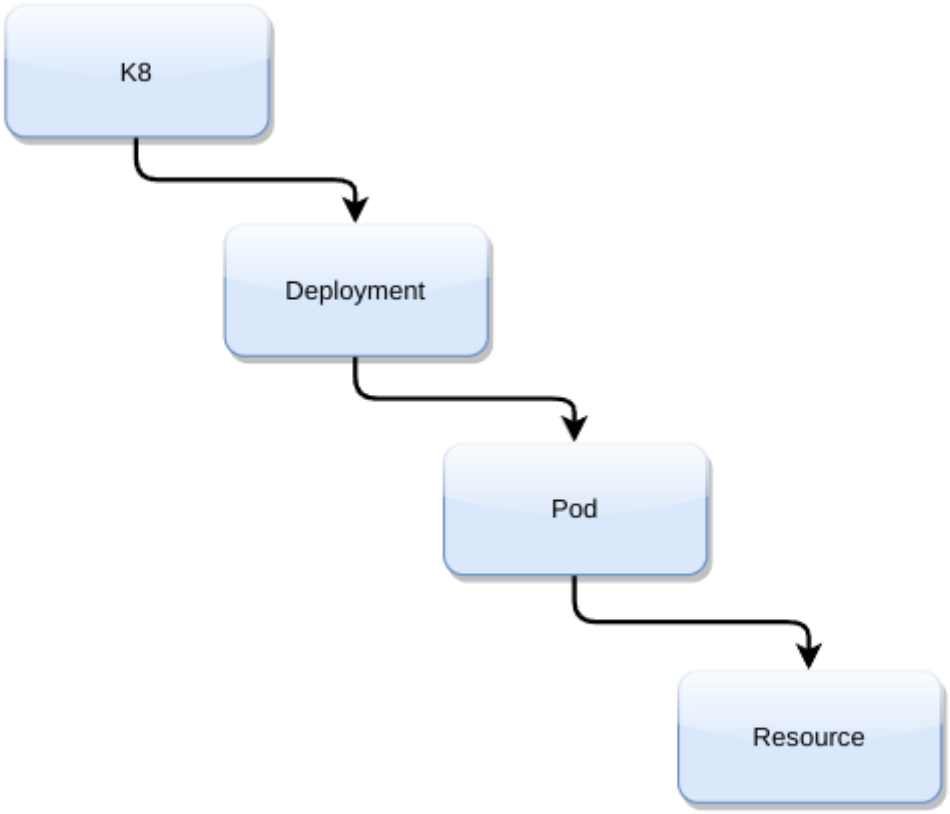
```
$kubectl get nodes
NAME                   STATUS   ROLES                  AGE   VERSION
lima-rancher-desktop   Ready    control-plane,master   80m   v1.22.7+k3s1

$kubectl create deployment nginx --image=nginx
deployment.apps/nginx created

$kubectl get pods
NAME                     READY   STATUS              RESTARTS   AGE
nginx-6799fc88d8-7k4kd   0/1     ContainerCreating   0          10s

$kubectl describe nginx-6799fc88d8-7k4kd
error: the server doesn't have a resource type "nginx-6799fc88d8-7k4kd"

$kubectl describe pod nginx-6799fc88d8-7k4kd
Name:         nginx-6799fc88d8-7k4kd
Namespace:    default
Priority:     0
Node:         lima-rancher-desktop/192.168.5.15
Start Time:   Sat, 23 Apr 2022 22:57:06 +0100
Labels:       app=nginx
              pod-template-hash=6799fc88d8
Annotations:  <none>
Status:       Running
IP:           10.42.0.9
IPs:
  IP:           10.42.0.9
Controlled By:  ReplicaSet/nginx-6799fc88d8
Containers:
  nginx:
    Container ID:   containerd://f85e833716a254f9e981ebf6c0f432edab366aacdfa74cc46b84904
    Image:          nginx
    Image ID:       docker.io/library/nginx@sha256:859ab6768a6f26a79bc42b231664111317d09
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Sat, 23 Apr 2022 22:57:23 +0100
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-hl4hc (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-hl4hc:
```

```
    Type:                    Projected (a volume that contains injected data from multip
    TokenExpirationSeconds:  3607
    ConfigMapName:           kube-root-ca.crt
    ConfigMapOptional:       <nil>
    DownwardAPI:             true
QoS Class:                   BestEffort
Node-Selectors:              <none>
Tolerations:                 node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                             node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  33s   default-scheduler  Successfully assigned default/nginx-6799fc
  Normal  Pulling    33s   kubelet            Pulling image "nginx"
  Normal  Pulled     17s   kubelet            Successfully pulled image "nginx" in 16.39
  Normal  Created    17s   kubelet            Created container nginx
  Normal  Started    16s   kubelet            Started container nginx

 timlinux   crest   ~   kubectl get pods
NAME                     READY   STATUS    RESTARTS   AGE
nginx-6799fc88d8-7k4kd   1/1     Running   0          44s

 timlinux   crest   ~   kubectl get pods -o wide
NAME                     READY   STATUS    RESTARTS   AGE   IP          NODE
nginx-6799fc88d8-7k4kd   1/1     Running   0          57s   10.42.0.9   lima-rancher-des

$kubectl exec -it nginx-6799fc88d8-7k4kd /bin/sh
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a future version. Use
# curl 10.42.0.9
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
```

```
</html>
# exit

$kubectl get pods
NAME                     READY   STATUS    RESTARTS   AGE
nginx-6799fc88d8-7k4kd   1/1     Running   0          2m45s
```

These steps are verbatim from this youtube video.

From this initial run through we can assume these basic concepts:



Deploying Rancher on Rancher Desktop

I remember that Dominic explained about namespaces in his initial walk through so let me try to create a new namespace.

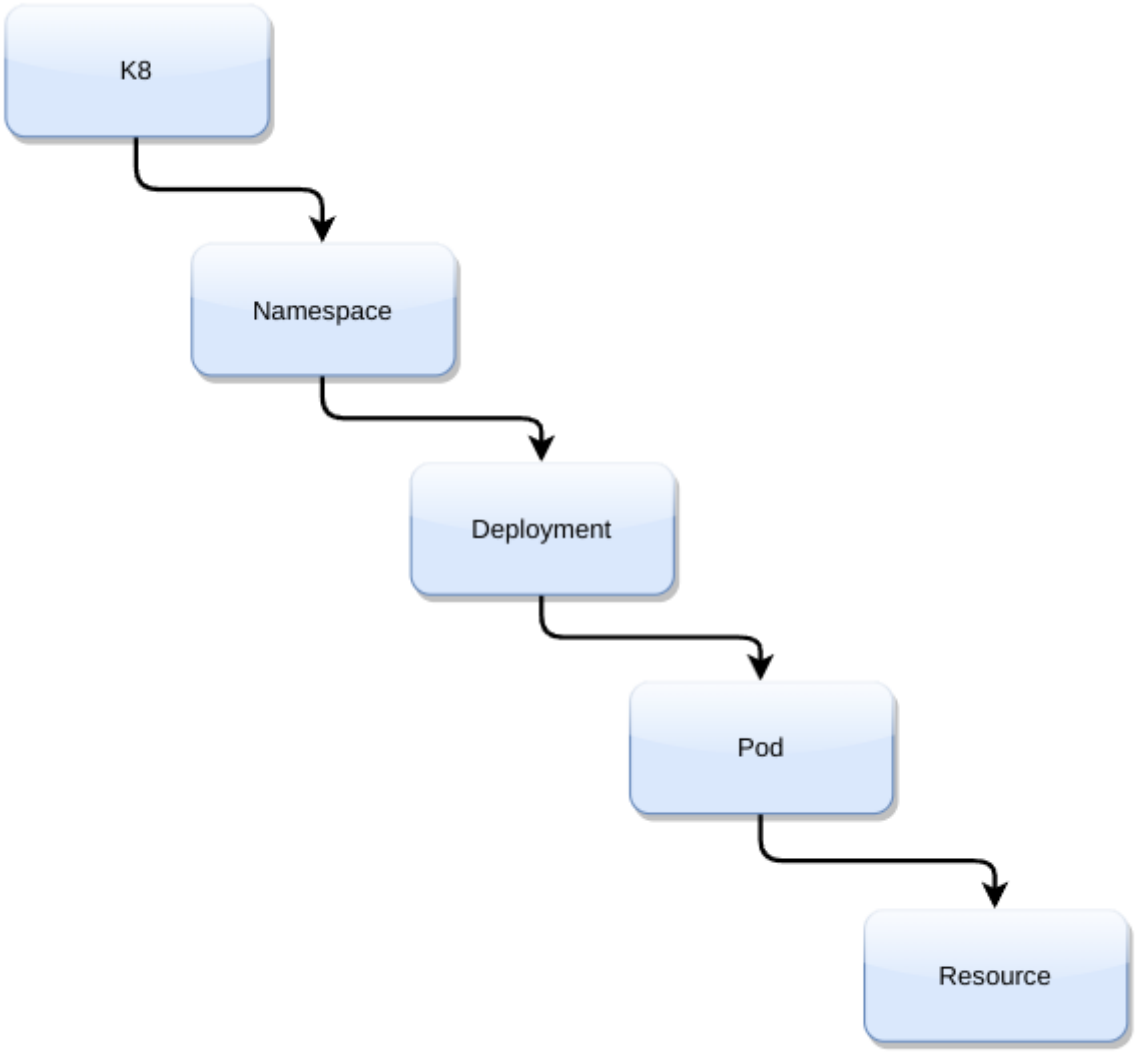
```
$kubectl create namespace tim
```

While trying to figure out how to list my namespaces, I found this nice k8 cheatsheet.

The above cheatsheet didnt actually contain the tip I needed but a bit of googling came up with this:

```
kubectl get namespaces --show-labels
NAME              STATUS   AGE     LABELS
default           Active   141m    kubernetes.io/metadata.name=default
kube-system       Active   141m    kubernetes.io/metadata.name=kube-system
kube-public       Active   141m    kubernetes.io/metadata.name=kube-public
kube-node-lease   Active   141m    kubernetes.io/metadata.name=kube-node-lease
tim               Active   3m34s   kubernetes.io/metadata.name=tim
```

You can see my tim namespace listed as the last entry there. So based on doing that, I think I can update my concept diagram to look like this:



```
apiVersion: v1
kind: Pod
metadata:
  name: nginxpod
  namespace: tim
  labels:
    name: nginxpod
spec:
  containers:
  - name: web
    image: nginx
```

I saved the above as nginx.yml and was able to run it like this:

```
kubectl apply -f nginx.yml
```

Then I could check in the tim namespace to see if it was running:

```
kubectl get pods -A
NAMESPACE     NAME                                      READY   STATUS      RESTARTS   A
kube-system   local-path-provisioner-84bb864455-dsv47   1/1     Running     0          1
kube-system   helm-install-traefik-crd--1-xrhvf         0/1     Completed   0          1
kube-system   svclb-traefik-p9zwj                       2/2     Running     0          1
kube-system   helm-install-traefik--1-m2r2x             0/1     Completed   1          1
kube-system   coredns-96cc4f57d-5bzj8                   1/1     Running     0          1
kube-system   traefik-56c4b88c4b-mpwfm                  1/1     Running     0          1
kube-system   metrics-server-ff9dbcb6c-6gzt5            1/1     Running     0          1
default       nginx-6799fc88d8-7k4kd                    1/1     Running     0          6
tim           nginxpod                                  1/1     Running     0          1
```

We can see my nginx pod in my namespace as the last entry.

Installing Rancher on Rancher Desktop

I went here for instructions.

```
helm repo add rancher-latest https://releases.rancher.com/server-charts/latest
kubectl create namespace cattle-system
helm install rancher rancher-latest/rancher   --namespace cattle-system   --set hostname
```

A little note here: the above tutorial provides different pathways to get a certificate. I am using ingress.tls.source=secret because I am just running on my local sytstem. In production you probably

want to use a different option. Also I reduced replicas to 1 since I only have 1 pod in my local test environment.

After running, I got a nice message saying rancher is setting itself up:

```
NAME: rancher
LAST DEPLOYED: Sun Apr 24 11:25:45 2022
NAMESPACE: cattle-system
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
Rancher Server has been installed.

NOTE: Rancher may take several minutes to fully initialize. Please standby while Certifi

Check out our docs at https://rancher.com/docs/

If you provided your own bootstrap password during installation, browse to https://crest

If this is the first time you installed Rancher, get started by running this command anc
```

echo https://crest/dashboard/?setup=$(kubectl get secret --namespace cattle-system bootstrap-secret -o go-template='{{.data.bootstrapPassword|base64decode}}')

```
To get just the bootstrap password on its own, run:
```

kubectl get secret --namespace cattle-system bootstrap-secret -o go-template='{{.data.bootstrapPassword|base64decode}}{{ "\n" }}'

```
Happy Containering!
```

Let's use our experience from the simple nginx deployment to see what is running on the system now:

```
kubectl get pods -A
NAMESPACE                   NAME                                      READY   STATUS
kube-system                 helm-install-traefik-crd--1-xrhvf         0/1     Completed
kube-system                 helm-install-traefik--1-m2r2x             0/1     Completed
kube-system                 svclb-traefik-p9zwj                       2/2     Running
kube-system                 local-path-provisioner-84bb864455-dsv47   1/1     Running
kube-system                 coredns-96cc4f57d-5bzj8                   1/1     Running
tim                         nginxpod                                  1/1     Running
default                     nginx-6799fc88d8-7k4kd                    1/1     Running
kube-system                 traefik-56c4b88c4b-mpwfm                  1/1     Running
kube-system                 metrics-server-ff9dbcb6c-6gzt5            1/1     Running
cattle-system               rancher-6448c4dcdf-8wpsk                  1/1     Running
cattle-fleet-system         gitjob-cc9948fd7-jxgg5                    1/1     Running
cattle-fleet-system         fleet-controller-5746685958-f4rx5         1/1     Running
cattle-system               helm-operation-zfbfq                      0/2     Completed
cattle-system               helm-operation-5sg9s                      0/2     Completed
cattle-system               helm-operation-n6ggh                      2/2     Running
cattle-fleet-local-system   fleet-agent-6c6c8c45f8-vtbnm              0/1     ContainerC
cattle-system               rancher-webhook-6958cfcddf-z9rxr          0/1     ContainerC
```

We can see various jobs are still spinning up in the cattle-system.

Next I went on a little detour on creating a self signed certificate that I can install in my rancher instance.

```
openssl req -new -newkey rsa:4096 -x509 -sha256 -days 365 -nodes -out tls.crt -keyout tl
```

> **Note:** I believe it is required to name the key tls.* so as to match the secret name.

Which outputs this:

```
Generating a RSA private key
..............................++++
.....................................................................++++
writing new private key to 'tls.key'
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [XX]:pt
State or Province Name (full name) []:
Locality Name (eg, city) [Default City]:
Organization Name (eg, company) [Default Company Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (eg, your name or your server's hostname) []:
Email Address []:tim@kartoza.com
```

Then we have two certs in our directory:

```
$ls
tls.crt  tls.key  nginx.yml
```

Then on this rancher page, I followed these notes to install my cert:

```
$kubectl -n cattle-system create secret tls tls-rancher-ingress \
  --cert=tls.crt \
  --key=tls.key
secret/tls-rancher-ingress created
```

Ok then back to the main thread of the rancher installation tutorial I continued:

```
kubectl -n cattle-system rollout status deploy/rancher
```

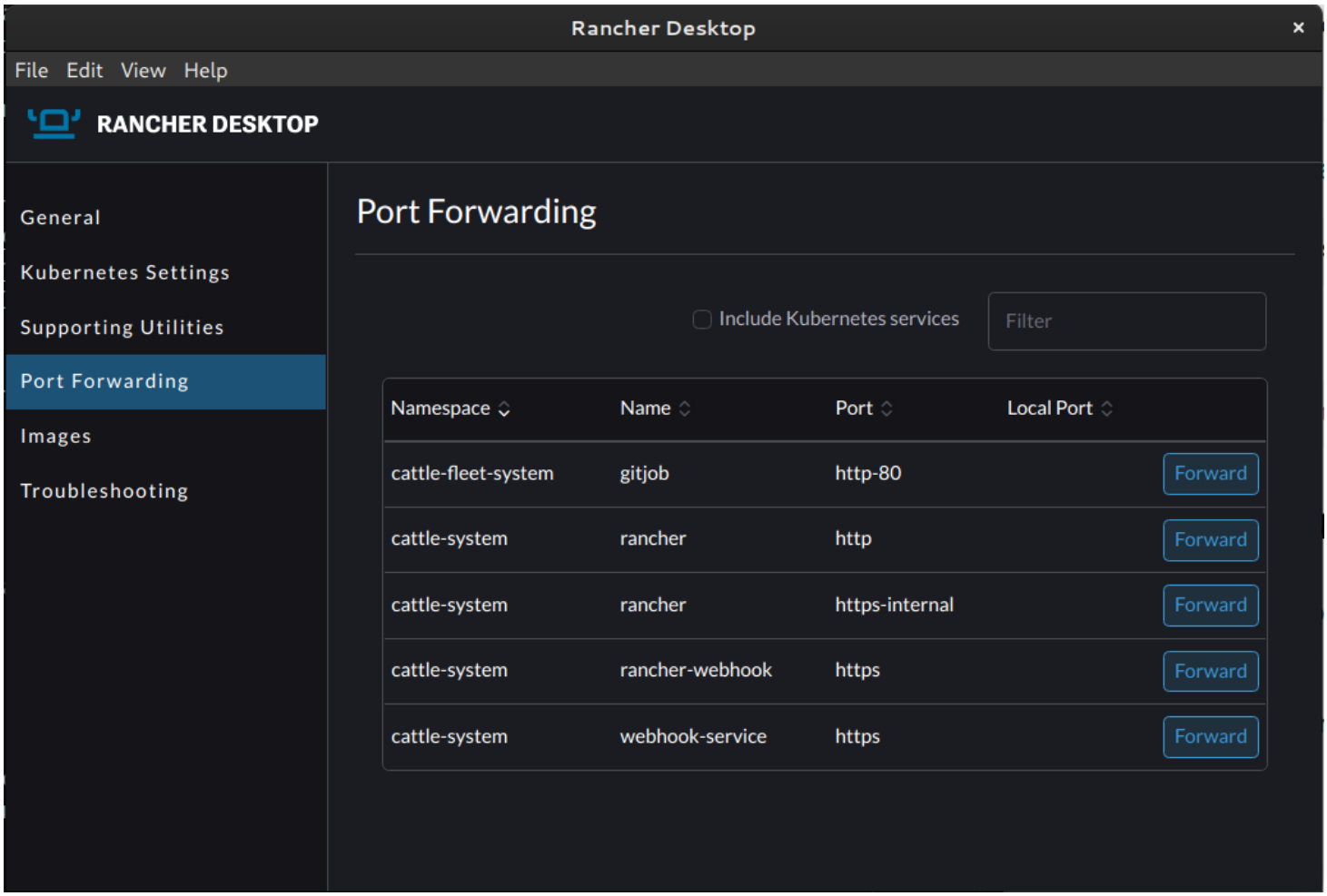
Which returns this:

```
deployment "rancher" successfully rolled out
```

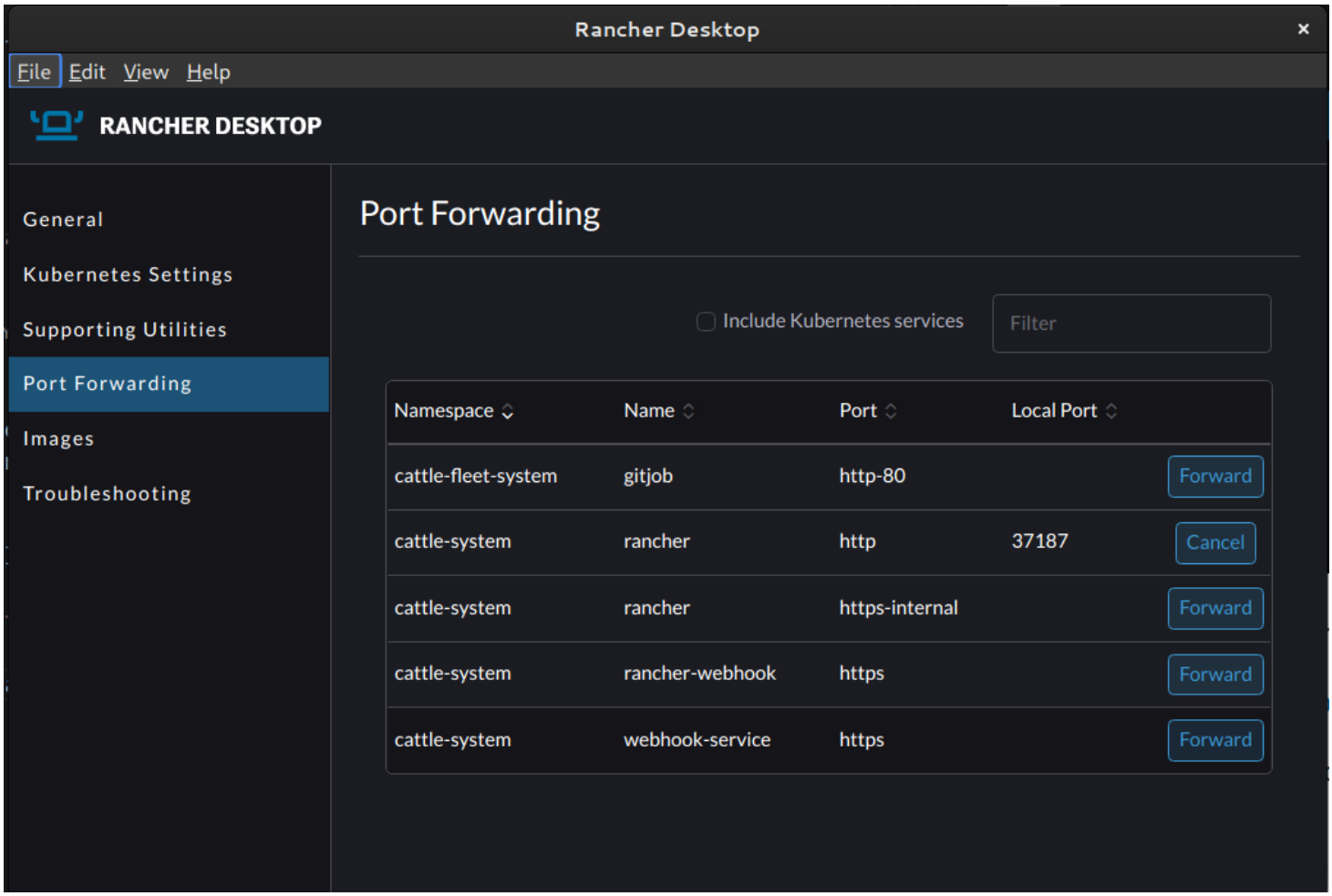
Testing it out

The instructions say to open the host in your browser (in my case I used my local hostname of crest), but nothing opened.

I took a look in rancher desktop and played with the port forwarding. The default install looked like this:

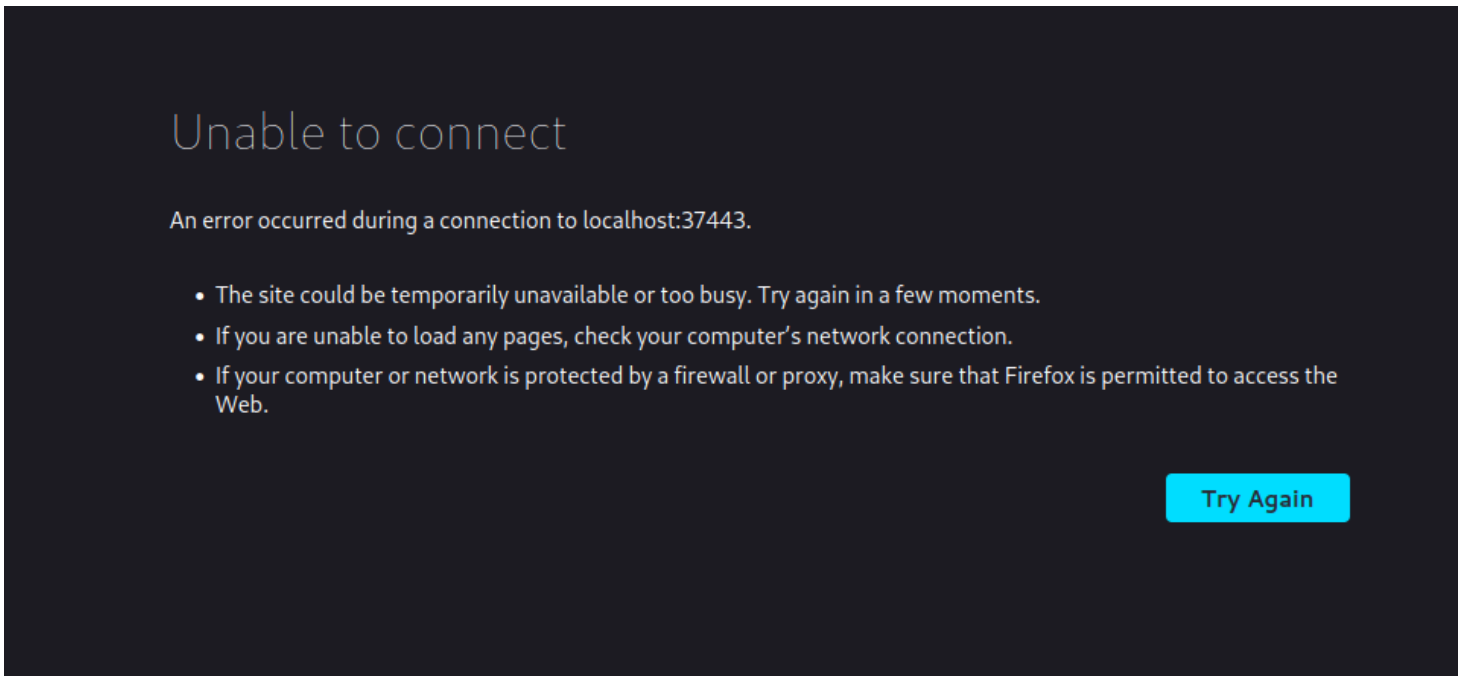


So I went ahead and tried to forward that rancher port:

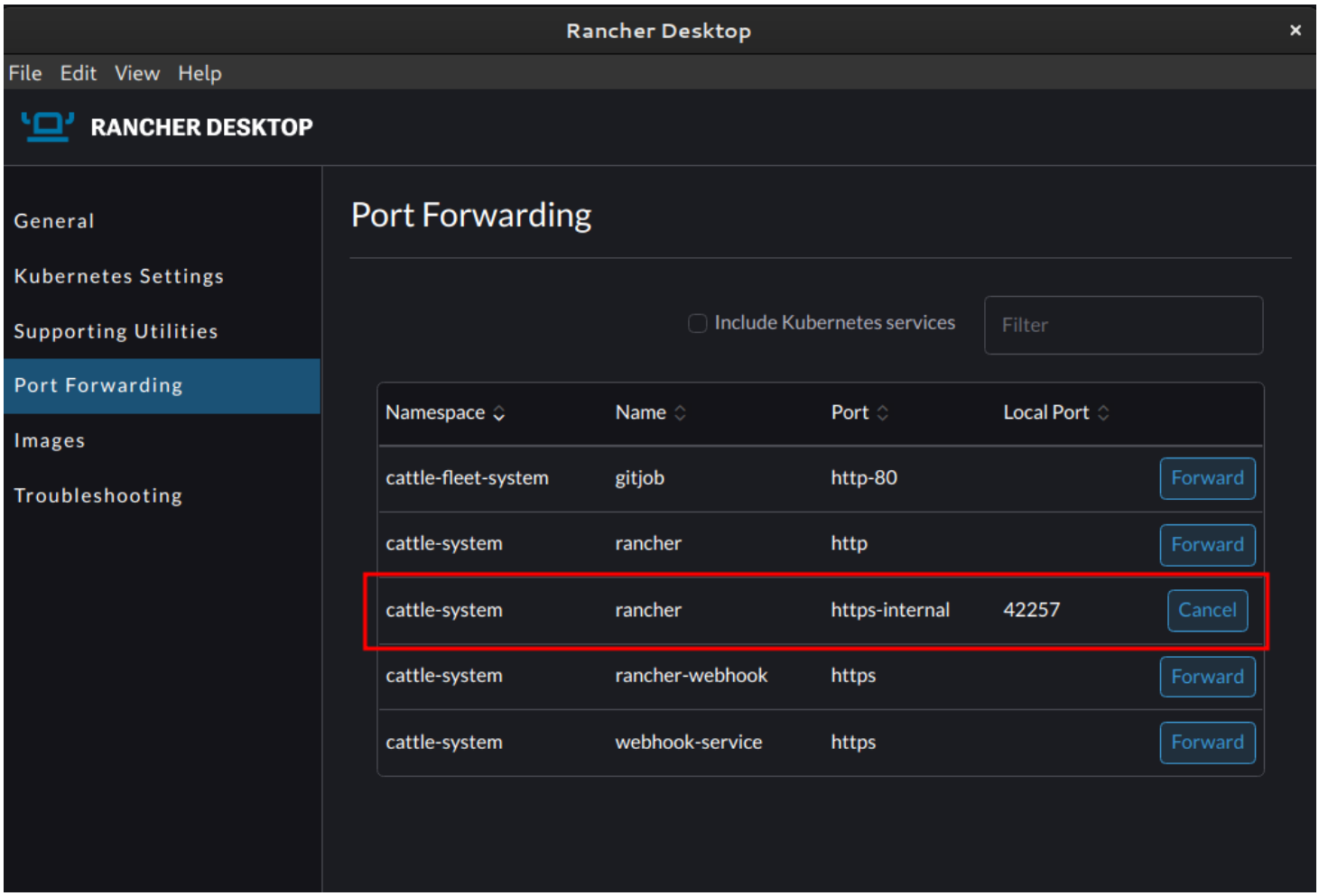


Then tried to open https://localhost:37443/

Which gave me an error:

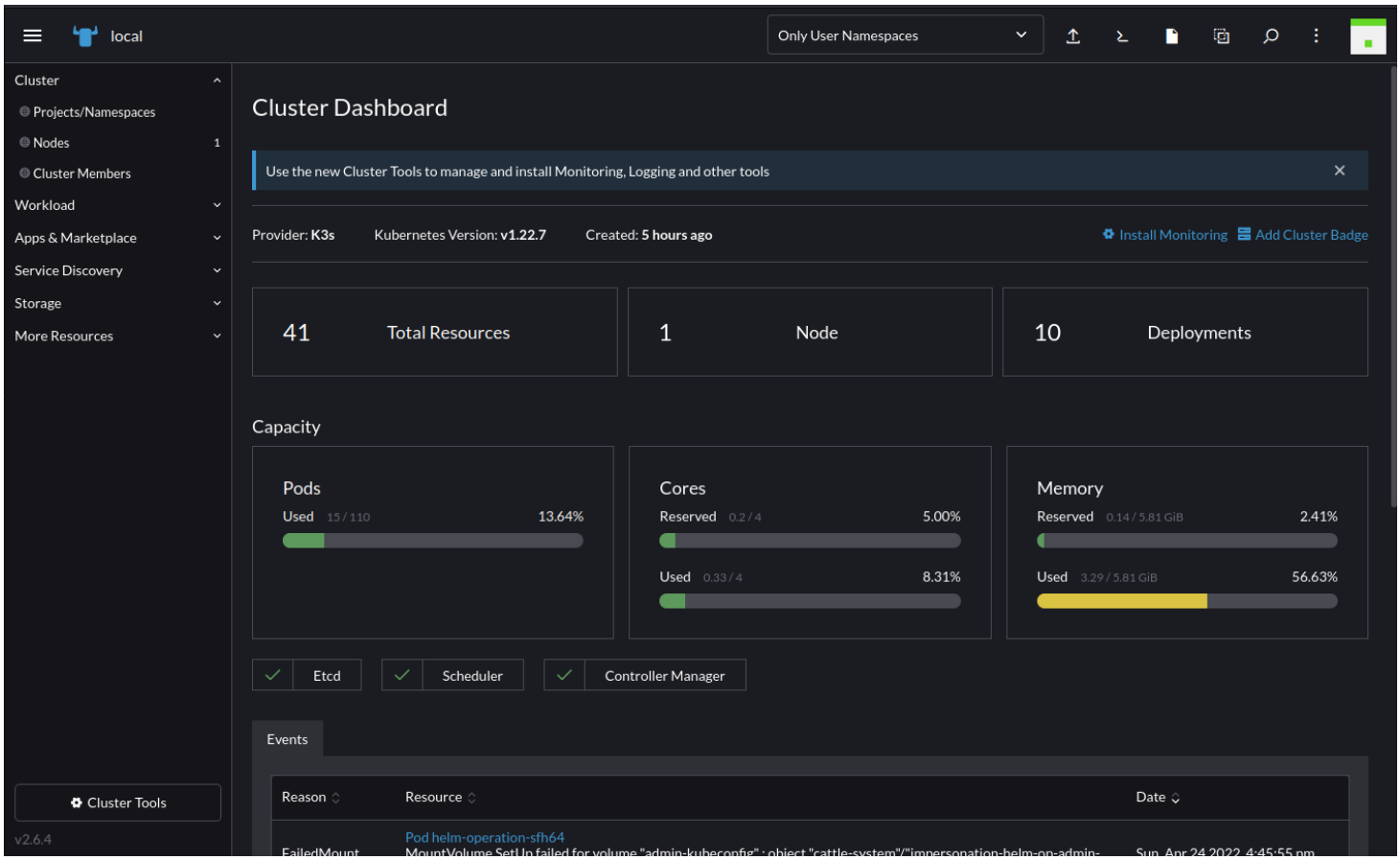


The thing seems to be that you need to rather forward this port:



Then I was able ot open the site (different port number now) an set up my credentials following the hints provided.

> **Note**: Since I am using a self signed cert I had to do the normal firefox security warning process to proceed to the site.


local
Only User Namespaces
Cluster
Projects/Namespaces
Nodes 1
Cluster Members
Workload
Apps & Marketplace
Service Discovery
Storage
More Resources
Cluster Tools
v2.6.4
Cluster Dashboard
Use the new Cluster Tools to manage and install Monitoring, Logging and other tools
Provider: K3s
Kubernetes Version: v1.22.7
Created: 5 hours ago
Install Monitoring
Add Cluster Badge
41 Total Resources
1 Node
10 Deployments
Capacity
Pods
Used 15 / 110 13.64%
Cores
Reserved 0.2 / 4 5.00%
Used 0.33 / 4 8.31%
Memory
Reserved 0.14 / 5.81 GiB 2.41%
Used 3.29 / 5.81 GiB 56.63%
Etcd
Scheduler
Controller Manager
Events
Reason
Resource
Date
FailedMount
Pod helm-operation-sfh64
MountVolume.SetUp failed for volume "admin-kubeconfig" : object "cattle-system"/"impersonation-helm-op-admin-
Sun, Apr 24 2022 4:45:55 pm