LAB 4

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Learning Kubernetes Basics

Part 1: Create A Cluster

I started minikube in my terminal.

```
C:\Users\sarah>minikube start
W0202 15:44:09.980307   27580 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\sarah\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 10 Home 10.0.19045.3930 Build 19045.3930
* Using the docker driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Pulling base image ...
* Restarting existing docker container for "minikube" ...
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
* Configuring bridge CNI (Container Networking Interface) ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default

C:\Users\sarah>minikube status
W0202 15:44:58.429855    9924 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\sarah\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured


C:\Users\sarah>
```

Installed kubectl.

```
C:\Users\sarah>kubectl version --client
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3

C:\Users\sarah>
```

Opened the minikube dashboard.

```
C:\Users\sarah>minikube dashboard
W0205 15:49:41.501077   21692 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
* Enabling dashboard ...
  - Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
  - Using image docker.io/kubernetesui/dashboard:v2.7.0
* Some dashboard features require the metrics-server addon. To enable all features please run:

        minikube addons enable metrics-server


* Verifying dashboard health ...
* Launching proxy ...
* Verifying proxy health ...
* Opening http://127.0.0.1:49180/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ in your default browser...
^C
C:\Users\sarah>
```

I used the kubectl create command to create a Deployment that manages a Pod and then viewed the Deployment.

```
C:\Users\sarah>kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.39 -- /agnhost netexec --http-port=8080
deployment.apps/hello-node created

C:\Users\sarah>kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
hello-node   0/1     1            0           14s

C:\Users\sarah>
```

I used this command to get the list of pods.

```
C:\Users\sarah>kubectl get pods
NAME                          READY   STATUS    RESTARTS   AGE
hello-node-ccf4b9788-cwvs4    1/1     Running   0          2m18s

C:\Users\sarah>
```

I used this command to view the cluster commands

```
C:\Users\sarah>kubectl get events
LAST SEEN   TYPE     REASON              OBJECT                          MESSAGE
3m19s       Normal   Scheduled           pod/hello-node-ccf4b9788-cwvs4   Successfully assigned default/hello-node-ccf4b9788-cwvs4 to minikube
3m19s       Normal   Pulling             pod/hello-node-ccf4b9788-cwvs4   Pulling image "registry.k8s.io/e2e-test-images/agnhost:2.39"
2m56s       Normal   Pulled              pod/hello-node-ccf4b9788-cwvs4   Successfully pulled image "registry.k8s.io/e2e-test-images/agnhost:2.39" in 23.028s (23.028s incl
uding waiting)
2m55s       Normal   Created             pod/hello-node-ccf4b9788-cwvs4   Created container agnhost
2m55s       Normal   Started             pod/hello-node-ccf4b9788-cwvs4   Started container agnhost
3m20s       Normal   SuccessfulCreate    replicaset/hello-node-ccf4b9788  Created pod: hello-node-ccf4b9788-cwvs4
3m20s       Normal   ScalingReplicaSet   deployment/hello-node            Scaled up replica set hello-node-ccf4b9788 to 1
```

I viewed the kubectl configuration.

```
C:\Users\sarah>kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority: C:\Users\sarah\.minikube\ca.crt
    extensions:
    - extension:
        last-update: Fri, 02 Feb 2024 15:44:45 GMT
        provider: minikube.sigs.k8s.io
        version: v1.32.0
      name: cluster_info
    server: https://127.0.0.1:60196
  name: minikube
contexts:
- context:
    cluster: minikube
    extensions:
    - extension:
        last-update: Fri, 02 Feb 2024 15:44:45 GMT
        provider: minikube.sigs.k8s.io
        version: v1.32.0
      name: context_info
    namespace: default
    user: minikube
  name: minikube
current-context: minikube
kind: Config
preferences: {}
users:
- name: minikube
  user:
    client-certificate: C:\Users\sarah\.minikube\profiles\minikube\client.crt
    client-key: C:\Users\sarah\.minikube\profiles\minikube\client.key

C:\Users\sarah>
```

I then viewed the application logs for a container in a pod.

```
C:\Users\sarah>kubectl logs hello-node-ccf4b9788-cwvs4
I0205 15:57:47.975453       1 log.go:195] Started HTTP server on port 8080
I0205 15:57:47.975705       1 log.go:195] Started UDP server on port  8081

C:\Users\sarah>
```

I used this command to expose the Pod to the public internet using the kubectl expose command

```
C:\Users\sarah>kubectl expose deployment hello-node --type=LoadBalancer --port=8080
service/hello-node exposed

C:\Users\sarah>
```

I then viewed the service I created

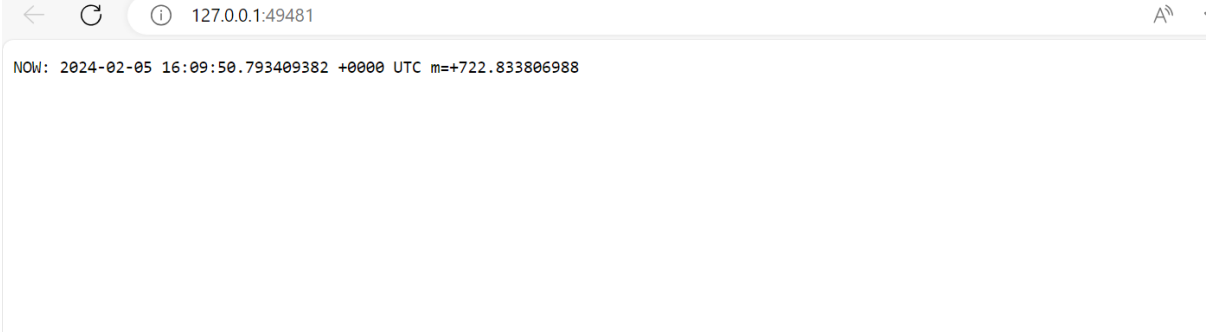
```
C:\Users\sarah>kubectl get services
NAME         TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
hello-node   LoadBalancer   10.99.114.235   <pending>     8080:31267/TCP   98s
kubernetes   ClusterIP      10.96.0.1       <none>        443/TCP          5d3h

C:\Users\sarah>
```

This opened up a browser window on my laptop that serves the app and shows the app's response

```
C:\Users\sarah>minikube service hello-node
W0205 16:09:48.146458   12296 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
|-----------|------------|-------------|--------------------------|
| NAMESPACE |    NAME    | TARGET PORT |           URL            |
|-----------|------------|-------------|--------------------------|
| default   | hello-node |        8080 | http://192.168.49.2:31267 |
|-----------|------------|-------------|--------------------------|
* Starting tunnel for service hello-node.
|-----------|------------|-------------|------------------------|
| NAMESPACE |    NAME    | TARGET PORT |          URL           |
|-----------|------------|-------------|------------------------|
| default   | hello-node |             | http://127.0.0.1:49481 |
|-----------|------------|-------------|------------------------|
* Opening service default/hello-node in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```


The browser window:



Enable Addons:

List of the currently supported addons.

```
C:\Users\sarah>minikube addons list
W0205 16:13:00.657412   19956 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
|-----------------------------|----------|-------------|--------------------------------|
|         ADDON NAME          | PROFILE  |   STATUS    |           MAINTAINER           |
|-----------------------------|----------|-------------|--------------------------------|
| ambassador                  | minikube | disabled    | 3rd party (Ambassador)         |
| auto-pause                  | minikube | disabled    | minikube                       |
| cloud-spanner               | minikube | disabled    | Google                         |
| csi-hostpath-driver         | minikube | disabled    | Kubernetes                     |
| dashboard                   | minikube | enabled     | Kubernetes                     |
| default-storageclass        | minikube | enabled     | Kubernetes                     |
| efk                         | minikube | disabled    | 3rd party (Elastic)            |
| freshpod                    | minikube | disabled    | Google                         |
| gcp-auth                    | minikube | disabled    | Google                         |
| gvisor                      | minikube | disabled    | minikube                       |
| headlamp                    | minikube | disabled    | 3rd party (kinvolk.io)         |
| helm-tiller                 | minikube | disabled    | 3rd party (Helm)               |
| inaccel                     | minikube | disabled    | 3rd party (InAccel             |
|                             |          |             | [info@inaccel.com])            |
| ingress                     | minikube | disabled    | Kubernetes                     |
| ingress-dns                 | minikube | disabled    | minikube                       |
| inspektor-gadget            | minikube | disabled    | 3rd party                      |
|                             |          |             | (inspektor-gadget.io)          |
| istio                       | minikube | disabled    | 3rd party (Istio)              |
| istio-provisioner           | minikube | disabled    | 3rd party (Istio)              |
| kong                        | minikube | disabled    | 3rd party (Kong HQ)            |
| kubeflow                    | minikube | disabled    | 3rd party                      |
| kubevirt                    | minikube | disabled    | 3rd party (KubeVirt)           |
| logviewer                   | minikube | disabled    | 3rd party (unknown)            |
| metallb                     | minikube | disabled    | 3rd party (MetalLB)            |
| metrics-server              | minikube | disabled    | Kubernetes                     |
| nvidia-device-plugin        | minikube | disabled    | 3rd party (NVIDIA)             |
| nvidia-driver-installer     | minikube | disabled    | 3rd party (Nvidia)             |
| nvidia-gpu-device-plugin    | minikube | disabled    | 3rd party (Nvidia)             |
| olm                         | minikube | disabled    | 3rd party (Operator Framework) |
| pod-security-policy         | minikube | disabled    | 3rd party (unknown)            |
| portainer                   | minikube | disabled    | 3rd party (Port                |
```

Example of enabling an addon such as metrics-server.

```
C:\Users\sarah>minikube addons enable metrics-server
W0205 16:14:05.038903   14904 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
* metrics-server is an addon maintained by Kubernetes. For any concerns contact minikube on GitHub.
You can view the list of minikube maintainers at: https://github.com/kubernetes/minikube/blob/master/OWNERS
  - Using image registry.k8s.io/metrics-server/metrics-server:v0.6.4
* The 'metrics-server' addon is enabled

C:\Users\sarah>
```

I view the Pod and Service I created by installing the addon:

```
C:\Users\sarah>kubectl get pod,svc -n kube-system
NAME                                   READY   STATUS    RESTARTS       AGE
pod/coredns-5dd5756b68-hcqpw           1/1     Running   1 (5d3h ago)   5d3h
pod/etcd-minikube                      1/1     Running   1 (5d3h ago)   5d3h
pod/kube-apiserver-minikube            1/1     Running   1 (5d3h ago)   5d3h
pod/kube-controller-manager-minikube   1/1     Running   1 (5d3h ago)   5d3h
pod/kube-proxy-rvj7p                   1/1     Running   1 (5d3h ago)   5d3h
pod/kube-scheduler-minikube            1/1     Running   1 (5d3h ago)   5d3h
pod/metrics-server-7c66d45ddc-sjpkl    0/1     Running   0              70s
pod/storage-provisioner                1/1     Running   3 (3d ago)     5d3h

NAME                     TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)                  AGE
service/kube-dns         ClusterIP   10.96.0.10     <none>        53/UDP,53/TCP,9153/TCP   5d3h
service/metrics-server   ClusterIP   10.102.88.67   <none>        443/TCP                  69s

C:\Users\sarah>
```

the output from metrics-server

```
C:\Users\sarah>kubectl top pods
NAME                          CPU(cores)   MEMORY(bytes)
hello-node-ccf4b9788-cwvs4    1m           13Mi

C:\Users\sarah>
```

I disabled metrics-server.

```
C:\Users\sarah>minikube addons disable metrics-server
W0205 16:19:44.736833   15244 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
* "The 'metrics-server' addon is disabled

C:\Users\sarah>
```

I cleaned up the resources I created in my cluster.

```
C:\Users\sarah>kubectl delete service hello-node
service "hello-node" deleted

C:\Users\sarah>kubectl delete deployment hello-node
deployment.apps "hello-node" deleted

C:\Users\sarah>
```

I then stopped the minikube cluster.

```
C:\Users\sarah>minikube stop
W0205 16:22:26.494927    9052 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
* Stopping node "minikube"  ...
* Powering off "minikube" via SSH ...
* 1 node stopped.

C:\Users\sarah>
```

Part 2: Deploy An App

I checked the kubectl version.

```
C:\Users\sarah>kubectl version
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.3

C:\Users\sarah>
```

Viewed the nodes in the cluster.

```
C:\Users\sarah>kubectl get nodes
NAME       STATUS   ROLES           AGE   VERSION
minikube   Ready    control-plane   6d    v1.28.3

C:\Users\sarah>
```

Deployed the first app on Kubernetes with the kubectl create deployment command.

```
C:\Users\sarah>kubectl create deployment kubernetes-bootcamp --image=gcr.io/google-samples/kubernetes-bootcamp:v
deployment.apps/kubernetes-bootcamp created

C:\Users\sarah>
```

List of deployments.

```
C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           4m30s
kubernetes-bootcamp   0/1     1            0           108s

C:\Users\sarah>
```

Open up a new terminal to start a proxy.

can see all those APIs hosted through the proxy endpoint.

```
C:\Users\sarah>curl http://localhost:8001/version
{
  "major": "1",
  "minor": "28",
  "gitVersion": "v1.28.3",
  "gitCommit": "a8a1abc25cad87333840cd7d54be2efaf31a3177",
  "gitTreeState": "clean",
  "buildDate": "2023-10-18T11:33:18Z",
  "goVersion": "go1.20.10",
  "compiler": "gc",
  "platform": "linux/amd64"
}
C:\Users\sarah>
```

First I had to get the pod name and then I had to store the pod name in a variable called POD_NAME.

```
C:\Users\sarah>kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
hello-node-ccf4b9788-hvzwl          1/1     Running            0          9m54s
kubernetes-bootcamp-c8455c5bb-svnd7   0/1     ImagePullBackOff   0          7m12s

C:\Users\sarah>set POD_NAME=kubernetes-bootcamp-c8455c5bb-svnd7

C:\Users\sarah>echo %POD_NAME%
kubernetes-bootcamp-c8455c5bb-svnd7

C:\Users\sarah>curl http://localhost:8001/api/v1/namespaces/default/pods/$POD_NAME/
{
  "kind": "Status",
  "apiVersion": "v1",
  "metadata": {},
  "status": "Failure",
  "message": "pods \"$POD_NAME\" not found",
  "reason": "NotFound",
  "details": {
    "name": "$POD_NAME",
    "kind": "pods"
  },
  "code": 404
}
C:\Users\sarah>curl http://localhost:8001/api/v1/namespaces/default/pods/%POD_NAME%/
{
  "kind": "Pod",
  "apiVersion": "v1",
  "metadata": {
    "name": "kubernetes-bootcamp-c8455c5bb-svnd7",
    "generateName": "kubernetes-bootcamp-c8455c5bb-",
    "namespace": "default",
    "uid": "a4a1a668-a6d8-4a21-b53d-7417b17281d4",
    "resourceVersion": "6705",
    "creationTimestamp": "2024-02-06T12:43:49Z",
    "labels": {
      "app": "kubernetes-bootcamp",
```

I can now access the Pod through the proxied API

```
C:\Users\sarah>curl http://localhost:8001/api/v1/namespaces/default/pods/%POD_NAME%/
{
  "kind": "Pod",
  "apiVersion": "v1",
  "metadata": {
    "name": "kubernetes-bootcamp-c8455c5bb-svnd7",
    "generateName": "kubernetes-bootcamp-c8455c5bb-",
    "namespace": "default",
    "uid": "a4a1a668-a6d8-4a21-b53d-7417b17281d4",
    "resourceVersion": "6705",
    "creationTimestamp": "2024-02-06T12:43:49Z",
    "labels": {
      "app": "kubernetes-bootcamp",
```

Part 3: Viewing Pods and Nodes

I used the get pods command to view the existing pods.

```
C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (9h ago)    21h
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0             3m41s

C:\Users\sarah>
```

I used the describe pods command to view the pods details.

```
C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (9h ago)    21h
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0             3m41s

C:\Users\sarah>kubectl describe pods
Name:             hello-node-ccf4b9788-hvzwl
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Tue, 06 Feb 2024 12:41:07 +0000
Labels:           app=hello-node
                  pod-template-hash=ccf4b9788
Annotations:      <none>
Status:           Running
IP:               10.244.0.43
IPs:
  IP:           10.244.0.43
Controlled By:  ReplicaSet/hello-node-ccf4b9788
Containers:
  agnhost:
    Container ID:  docker://d4f0da789399dc714a92618fdd49c11fdbf33b2d1c0b5b65aed93bea1aac1d45
    Image:         registry.k8s.io/e2e-test-images/agnhost:2.39
```

I then viewed the output of the application by running a curl request.

```
C:\Users\sarah>curl http://localhost:8001/api/v1/namespaces/default/pods/%POD_NAME%/
{
  "kind": "Pod",
  "apiVersion": "v1",
  "metadata": {
    "name": "kubernetes-bootcamp-c8455c5bb-svnd7",
    "generateName": "kubernetes-bootcamp-c8455c5bb-",
    "namespace": "default",
    "uid": "a4a1a668-a6d8-4a21-b53d-7417b17281d4",
    "resourceVersion": "7450",
    "creationTimestamp": "2024-02-06T12:43:49Z",
    "labels": {
      "app": "kubernetes-bootcamp",
      "pod-template-hash": "c8455c5bb"
    },
    "ownerReferences": [
      {
        "apiVersion": "apps/v1",
        "kind": "ReplicaSet",
        "name": "kubernetes-bootcamp-c8455c5bb",
        "uid": "aeb0d45b-60f2-4445-bd11-07f3976d4bff",
        "controller": true,
        "blockOwnerDeletion": true
      }
    ],
    "managedFields": [
      {
        "manager": "kube-controller-manager",
        "operation": "Update",
        "apiVersion": "v1",
```

```
  ],
  "managedFields": [
    {
      "manager": "kube-controller-manager",
      "operation": "Update",
      "apiVersion": "v1",
      "time": "2024-02-06T12:43:49Z",
      "fieldsType": "FieldsV1",
      "fieldsV1": {
        "f:metadata": {
          "f:generateName": {},
          "f:labels": {
            ".": {},
            "f:app": {},
            "f:pod-template-hash": {}
          },
          "f:ownerReferences": {
            ".": {},
            "k:{\"uid\":\"aeb0d45b-60f2-4445-bd11-07f3976d4bff\"}": {}
          }
        },
        "f:spec": {
          "f:containers": {
            "k:{\"name\":\"kubernetes-bootcamp\"}": {
              ".": {},
              "f:image": {},
              "f:imagePullPolicy": {},
              "f:name": {},
              "f:resources": {},
              "f:terminationMessagePath": {},
              "f:terminationMessagePolicy": {}
            }
          },
          "f:dnsPolicy": {},
          "f:enableServiceLinks": {},
          "f:restartPolicy": {},
          "f:schedulerName": {},
          "f:securityContext": {},
          "f:terminationGracePeriodSeconds": {}
        }
      }
```


I then viewed the container logs.

```
C:\Users\sarah>kubectl logs "%POD_NAME%"
Kubernetes Bootcamp App Started At: 2024-02-07T09:46:57.110Z | Running On:  kubernetes-bootcamp-f95c5b745-ls68n


C:\Users\sarah>
```

Listed the environment variables.

```
C:\Users\sarah>kubectl exec "%POD_NAME%" -- env
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
HOSTNAME=kubernetes-bootcamp-f95c5b745-ls68n
KUBERNETES_SERVICE_PORT_HTTPS=443
KUBERNETES_PORT=tcp://10.96.0.1:443
KUBERNETES_PORT_443_TCP=tcp://10.96.0.1:443
KUBERNETES_PORT_443_TCP_PROTO=tcp
KUBERNETES_PORT_443_TCP_PORT=443
KUBERNETES_PORT_443_TCP_ADDR=10.96.0.1
KUBERNETES_SERVICE_HOST=10.96.0.1
KUBERNETES_SERVICE_PORT=443
NPM_CONFIG_LOGLEVEL=info
NODE_VERSION=6.3.1
HOME=/root

C:\Users\sarah>
```

Started a bash session.

```
C:\Users\sarah>kubectl exec -ti %POD_NAME% -- bash
root@kubernetes-bootcamp-f95c5b745-ls68n:/#
```

Viewed the server.js file.

```
root@kubernetes-bootcamp-f95c5b745-ls68n:/# cat server.js
var http = require('http');
var requests=0;
var podname= process.env.HOSTNAME;
var startTime;
var host;
var handleRequest = function(request, response) {
  response.setHeader('Content-Type', 'text/plain');
  response.writeHead(200);
  response.write("Hello Kubernetes bootcamp! | Running on: ");
  response.write(host);
  response.end(" | v=1\n");
  console.log("Running On:" ,host, "| Total Requests:", ++requests,"| App Uptime:", (new Date() - startTime)/1000 , "sec
onds", "| Log Time:",new Date());
}
var www = http.createServer(handleRequest);
www.listen(8080,function () {
    startTime = new Date();;
    host = process.env.HOSTNAME;
    console.log ("Kubernetes Bootcamp App Started At:",startTime, "| Running On: " ,host, "\n" );
});
root@kubernetes-bootcamp-f95c5b745-ls68n:/#
```

Checked that the application is up and running by using the curl command.

```
root@kubernetes-bootcamp-f95c5b745-ls68n:/# curl http://localhost:8080
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-ls68n | v=1
root@kubernetes-bootcamp-f95c5b745-ls68n:/#
```

Part 4: Expose Your App Publicly

Used the get pods command to look for existing pods. I then used the get services command to list the current services from the cluster.

```
C:\Users\sarah>kubectl get pods
NAME                                   READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-hvzwl             1/1     Running   6 (10h ago)   21h
kubernetes-bootcamp-f95c5b745-ls68n    1/1     Running   0             14m

C:\Users\sarah>kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   6d21h

C:\Users\sarah>
```

I used the expose command to create a new service and expose it to external traffic. I then used the get services command to show the a running service called Kubernetes-bootcamp.

```
C:\Users\sarah>kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed

C:\Users\sarah>kubectl get services
NAME                  TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
kubernetes            ClusterIP   10.96.0.1      <none>        443/TCP          6d21h
kubernetes-bootcamp   NodePort    10.110.31.40   <none>        8080:32700/TCP   8s

C:\Users\sarah>
```

Found what port was opened externally.

```
C:\Users\sarah>kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   app=kubernetes-bootcamp
Annotations:              <none>
Selector:                 app=kubernetes-bootcamp
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.110.31.40
IPs:                      10.110.31.40
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  32700/TCP
Endpoints:                10.244.0.46:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>

C:\Users\sarah>
```

Since Im running minikube with Docker Desktop as the container driver, I ran this command in a separate terminal window.

```
Microsoft Windows [Version 10.0.19045.3930]
(c) Microsoft Corporation. All rights reserved.

C:\Users\sarah>minikube service kubernetes-bootcamp --url
W0207 10:03:28.660501   23324 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\sarah\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
http://127.0.0.1:62296
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

Then used the given URL to access the app.

```
C:\Users\sarah>curl http://127.0.0.1:62296
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-ls68n | v=1

C:\Users\sarah>
```

I used the describe deployment command to view the automatically created label for the pod.

```
C:\Users\sarah>kubectl describe deployment
Name:                   hello-node
Namespace:              default
CreationTimestamp:      Tue, 06 Feb 2024 12:41:07 +0000
Labels:                 app=hello-node
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=hello-node
Replicas:               1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=hello-node
  Containers:
   agnhost:
    Image:      registry.k8s.io/e2e-test-images/agnhost:2.39
    Port:       <none>
    Host Port:  <none>
    Command:
      /agnhost
      netexec
      --http-port=8080
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
```

I used this label to query the list of pods. I used the get pods command with -l as a parameter and followed by the label values. I did the same to list the existing services.

```
C:\Users\sarah>kubectl get pods -l app=kubernetes-bootcamp
NAME                                  READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0          21m

C:\Users\sarah>kubectl get services -l app=kubernetes-bootcamp
NAME                  TYPE       CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
kubernetes-bootcamp   NodePort   10.110.31.40   <none>        8080:32700/TCP   6m21s

C:\Users\sarah>
```

I applied a new label. I checked it with the describe pod command.

```
C:\Users\sarah>
C:\Users\sarah>kubectl label pods "%POD_NAME%" version=v1
pod/kubernetes-bootcamp-f95c5b745-ls68n labeled

C:\Users\sarah>kubectl describe pods "%POD_NAME%"
Name:             kubernetes-bootcamp-f95c5b745-ls68n
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Wed, 07 Feb 2024 09:46:37 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=f95c5b745
                  version=v1
Annotations:      <none>
Status:           Running
IP:               10.244.0.46
IPs:
  IP:           10.244.0.46
Controlled By:  ReplicaSet/kubernetes-bootcamp-f95c5b745
Containers:
  kubernetes-bootcamp:
    Container ID:   docker://52cfc5adf6c3c6f0bbc8490c3585bffedda7e6009fbc0a0672e9b191d5884a14
    Image:          gcr.io/google-samples/kubernetes-bootcamp:v1
    Image ID:       docker-pullable://gcr.io/google-samples/kubernetes-bootcamp@sha256:0d6b8ee63bb57c5f5b6156f446b3bc3b3
c143d233037f3a2f00e279c8fcc64af
```

I then queried the list of pods using the new label.

```
C:\Users\sarah>kubectl get pods -l version=v1
NAME                                READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0          30m

C:\Users\sarah>
```

I then deleted the service.

```
C:\Users\sarah>kubectl delete service -l app=kubernetes-bootcamp
service "kubernetes-bootcamp" deleted

C:\Users\sarah>kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   6d21h

C:\Users\sarah>
```

I then confirmed the service was gone.

```
C:\Users\sarah>minikube service kubernetes-bootcamp --url
W0207 10:24:13.746714   20692 main.go:291] Unable to resolve the current Docker CLI context "default": context "default": context not found: open C:\Users\sarah\.docker\con
texts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.

X Exiting due to SVC_NOT_FOUND: Service 'kubernetes-bootcamp' was not found in 'default' namespace.
You may select another namespace by using 'minikube service kubernetes-bootcamp -n <namespace>'. Or list out all the services using 'minikube service list'


C:\Users\sarah>
```

Part 5: Scaling Your App

Used the get deployments command to list my deployments.

```
C:\Users\sarah>kubectl get deployments
NAME                 READY   UP-TO-DATE   AVAILABLE   AGE
hello-node           1/1     1            1           21h
kubernetes-bootcamp   1/1     1            1           39m

C:\Users\sarah>
```

I viewed the ReplicaSet created by the deployment

```
C:\Users\sarah>kubectl get rs
NAME                           DESIRED   CURRENT   READY   AGE
hello-node-ccf4b9788           1         1         1       21h
kubernetes-bootcamp-f95c5b745   1         1         1       40m

C:\Users\sarah>
```

I then scaled the deployment to four replicas.

```
C:\Users\sarah>kubectl scale deployments/kubernetes-bootcamp --replicas=4
deployment.apps/kubernetes-bootcamp scaled

C:\Users\sarah>
```

I viewed the deployments.

```
C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           21h
kubernetes-bootcamp   4/4     4            4           41m

C:\Users\sarah>
```

I then checked if the number of pods changed. There are four pods now.

```
C:\Users\sarah>kubectl get pods -o wide
NAME                                  READY   STATUS    RESTARTS      AGE   IP           NODE       NOMINATED NODE   READINESS GATES
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (10h ago)   21h   10.244.0.43  minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-8k55d   1/1     Running   0             71s   10.244.0.48  minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-gnwqc   1/1     Running   0             71s   10.244.0.47  minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-gztql   1/1     Running   0             71s   10.244.0.49  minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0             41m   10.244.0.46  minikube   <none>           <none>

C:\Users\sarah>
```

Checked to see if the change was registered in the deployment events log.

```
C:\Users\sarah>kubectl describe deployments/kubernetes-bootcamp
Name:                   kubernetes-bootcamp
Namespace:              default
CreationTimestamp:      Wed, 07 Feb 2024 09:46:37 +0000
Labels:                 app=kubernetes-bootcamp
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=kubernetes-bootcamp
Replicas:               4 desired | 4 updated | 4 total | 4 available | 0 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=kubernetes-bootcamp
  Containers:
   kubernetes-bootcamp:
    Image:        gcr.io/google-samples/kubernetes-bootcamp:v1
    Port:         <none>
    Host Port:    <none>
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Progressing    True    NewReplicaSetAvailable
  Available      True    MinimumReplicasAvailable
OldReplicaSets:  <none>
NewReplicaSet:   kubernetes-bootcamp-f95c5b745 (4/4 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  42m   deployment-controller  Scaled up replica set kubernetes-bootcamp-f95c5b745 to 1
  Normal  ScalingReplicaSet  109s  deployment-controller  Scaled up replica set kubernetes-bootcamp-f95c5b745 to 4 from 1

C:\Users\sarah>
```

I found the exposed IP and Port.

```
C:\Users\sarah>kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed

C:\Users\sarah>kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   app=kubernetes-bootcamp
Annotations:              <none>
Selector:                 app=kubernetes-bootcamp
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.109.18.113
IPs:                      10.109.18.113
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  32412/TCP
Endpoints:                10.244.0.46:8080,10.244.0.47:8080,10.244.0.48:8080 + 1 more...
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>

C:\Users\sarah>
```

I used the curl command to the exposed IP address and port. I executed the command multiple times and noted that we hit a different pod with every request.

```
C:\Users\sarah>curl http://127.0.0.1:62650
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-gztql | v=1

C:\Users\sarah>curl http://127.0.0.1:62650
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-ls68n | v=1

C:\Users\sarah>curl http://127.0.0.1:62650
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-ls68n | v=1

C:\Users\sarah>curl http://127.0.0.1:62650
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-gnwqc | v=1

C:\Users\sarah>
```

Listed the deployments.

```
C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           21h
kubernetes-bootcamp   2/2     2            2           47m

C:\Users\sarah>
```

I scaled down the deployments to two replicas by running the scale command.

```
C:\Users\sarah>kubectl scale deployments/kubernetes-bootcamp --replicas=2
deployment.apps/kubernetes-bootcamp scaled
```

The number of replicas decreased to 2. I listed the number of pods with get pods command.

```
C:\Users\sarah>kubectl get pods -o wide
NAME                                  READY   STATUS    RESTARTS      AGE     IP            NODE       NOMINATED NODE   READINESS GATES
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (10h ago)   21h     10.244.0.43   minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-gztql   1/1     Running   0             7m17s   10.244.0.49   minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0             47m     10.244.0.46   minikube   <none>           <none>

C:\Users\sarah>
```

Part 6: Update Your App

I listed the running pods and viewed the current image version of the app and looked for the image field.

```
C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           21h
kubernetes-bootcamp   2/2     2            2           48m

C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (10h ago)   21h
kubernetes-bootcamp-f95c5b745-gztql   1/1     Running   0             8m11s
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Running   0             48m
```

```
Name:             kubernetes-bootcamp-f95c5b745-gztql
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Wed, 07 Feb 2024 10:27:18 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=f95c5b745
Annotations:      <none>
Status:           Running
IP:               10.244.0.49
IPs:
  IP:           10.244.0.49
Controlled By:  ReplicaSet/kubernetes-bootcamp-f95c5b745
Containers:
  kubernetes-bootcamp:
    Container ID:   docker://f6dd27884cd38d0d5d0f2c6686fd5e8299a1b40bf0030c5fc480001f48512b4c
    Image:          gcr.io/google-samples/kubernetes-bootcamp:v1
    Image ID:       docker-pullable://gcr.io/google-samples/kubernetes-bootcamp@sha256:0d6b8ee63bb57c5f5b6156f446b3bc3b3c143d233037f3a2f00e279c8fcc64af
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Wed, 07 Feb 2024 10:27:19 +0000
    Ready:          True
```

I updated the image of the application to version 2 by using the set image command.

```
C:\Users\sarah>kubectl set image deployments/kubernetes-bootcamp kubernetes-bootcamp=jocatalin/kubernetes-bootcamp:v2
deployment.apps/kubernetes-bootcamp image updated

C:\Users\sarah>
```

I then checked the status of the new Pods and viewed the one terminating with the get pods command.

```
C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS        RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running       6 (10h ago)   21h
kubernetes-bootcamp-65df967b7f-lvvdw  1/1     Running       0             20s
kubernetes-bootcamp-65df967b7f-zs6nc  1/1     Running       0             23s
kubernetes-bootcamp-f95c5b745-gztql   1/1     Terminating   0             10m
kubernetes-bootcamp-f95c5b745-ls68n   1/1     Terminating   0             51m

C:\Users\sarah>
```

I checked if the app is running and found the exposed IP address and port.

```
C:\Users\sarah>kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   app=kubernetes-bootcamp
Annotations:              <none>
Selector:                 app=kubernetes-bootcamp
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.109.18.113
IPs:                      10.109.18.113
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  32412/TCP
Endpoints:                10.244.0.50:8080,10.244.0.51:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>

C:\Users\sarah>
```

I then did a curl to the exposed IP and port.

```
C:\Users\sarah>curl http://127.0.0.1:62806
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-65df967b7f-zs6nc | v=2

C:\Users\sarah>
```

I confirmed the update by running the rollout status command.

```
C:\Users\sarah>kubectl rollout status deployments/kubernetes-bootcamp
deployment "kubernetes-bootcamp" successfully rolled out

C:\Users\sarah>
```

I then viewed the current image of the app by running the describe pods command.

```
C:\Users\sarah>kubectl rollout status deployments/kubernetes-bootcamp
deployment "kubernetes-bootcamp" successfully rolled out

C:\Users\sarah>kubectl describe pods
Name:             hello-node-ccf4b9788-hvzwl
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Tue, 06 Feb 2024 12:41:07 +0000
Labels:           app=hello-node
                  pod-template-hash=ccf4b9788
Annotations:      <none>
Status:           Running
IP:               10.244.0.43
IPs:
  IP:           10.244.0.43
Controlled By:  ReplicaSet/hello-node-ccf4b9788
Containers:
  agnhost:
    Container ID:  docker://d4f0da789399dc714a92618fdd49c11fdbf33b2d1c0b5b65aed93bea1aac1d45
    Image:         registry.k8s.io/e2e-test-images/agnhost:2.39
    Image ID:      docker-pullable://registry.k8s.io/e2e-test-images/agnhost@sha256:7e8bdd271312fd25fc5ff5a8f04727be84044eb3d7d8d03611972a6752e2e11e
    Port:          <none>
    Host Port:     <none>
    Command:
```

```
    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:                      <none>


Name:             kubernetes-bootcamp-65df967b7f-lvvdw
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Wed, 07 Feb 2024 10:37:18 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=65df967b7f
Annotations:      <none>
Status:           Running
IP:               10.244.0.51
IPs:
  IP:           10.244.0.51
Controlled By:  ReplicaSet/kubernetes-bootcamp-65df967b7f
Containers:
  kubernetes-bootcamp:
    Container ID:   docker://5b1cb832cedb4e05c932810ce9cb0cf4bd00a2ddff45d6f60fa95a4f4278e3b1
    Image:          jocatalin/kubernetes-bootcamp:v2
    Image ID:       docker-pullable://jocatalin/kubernetes-bootcamp@sha256:fb1a3ced00cecfc1f83f18ab5cd14199e30adc1b49aa4244f5d65ad3f5feb2a5
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Wed, 07 Feb 2024 10:37:19 +0000
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-dncdk (ro)
Conditions:
```

I performed another update and deployed an image tagged with v10.

```
C:\Users\sarah>kubectl set image deployments/kubernetes-bootcamp kubernetes-bootcamp=gcr.io/google-samples/kubernetes-bootcamp:v10
deployment.apps/kubernetes-bootcamp image updated

C:\Users\sarah>
```

I ran the get deployments command to see the status of the deployment but the output doesn't list the desired number of available pods. I then ran the get pods command to list all pods.

```
C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           22h
kubernetes-bootcamp   2/2     1            2           55m

C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS             RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running            6 (10h ago)   22h
kubernetes-bootcamp-65df967b7f-lvvdw  1/1     Running            0             4m59s
kubernetes-bootcamp-65df967b7f-zs6nc  1/1     Running            0             5m2s
kubernetes-bootcamp-7497bc6797-btx5w  0/1     ImagePullBackOff   0             53s

C:\Users\sarah>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           22h
kubernetes-bootcamp   2/2     1            2           55m

C:\Users\sarah>
```

I then ran the describe pods command to get insight into the problem of some of the pods having the status of ImagePullBackOff. I noticed in the events section of the output of the effected pods that the v10 image version did not exist in the repository.

```
Name:             kubernetes-bootcamp-7497bc6797-btx5w
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Wed, 07 Feb 2024 10:41:24 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=7497bc6797
Annotations:      <none>
Status:           Pending
IP:               10.244.0.52
IPs:
  IP:           10.244.0.52
Controlled By:  ReplicaSet/kubernetes-bootcamp-7497bc6797
Containers:
  kubernetes-bootcamp:
    Container ID:
    Image:          gcr.io/google-samples/kubernetes-bootcamp:v10
    Image ID:
    Port:           <none>
    Host Port:      <none>
    State:          Waiting
      Reason:       ImagePullBackOff
    Ready:          False
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-vsbm6 (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             False
  ContainersReady   False
  PodScheduled      True
```

```
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-vsbm6 (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             False
  ContainersReady   False
  PodScheduled      True
Volumes:
  kube-api-access-vsbm6:
    Type:                    Projected (a volume that contains injected data from multiple sources)
    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  2m14s              default-scheduler  Successfully assigned default/kubernetes-bootcamp-7497bc6797-btx5w to minikube
  Normal   Pulling    49s (x4 over 2m14s)  kubelet          Pulling image "gcr.io/google-samples/kubernetes-bootcamp:v10"
  Warning  Failed     48s (x4 over 2m13s)  kubelet          Failed to pull image "gcr.io/google-samples/kubernetes-bootcamp:v10": Error response from daemon: manifest for
 gcr.io/google-samples/kubernetes-bootcamp:v10 not found: manifest unknown: Failed to fetch "v10" from request "/v2/google-samples/kubernetes-bootcamp/manifests/v10".
  Warning  Failed     48s (x4 over 2m13s)  kubelet          Error: ErrImagePull
  Warning  Failed     22s (x6 over 2m13s)  kubelet          Error: ImagePullBackOff
  Normal   BackOff    7s (x7 over 2m13s)   kubelet          Back-off pulling image "gcr.io/google-samples/kubernetes-bootcamp:v10"

C:\Users\sarah>
```

I rolled back the deployment to the last working version. I used the get pods command to list the pods and used the describe pods command. The deployment is now using a stable version of the app (v2).

```
C:\Users\sarah>kubectl rollout undo deployments/kubernetes-bootcamp
deployment.apps/kubernetes-bootcamp rolled back

C:\Users\sarah>kubectl get pods
NAME                                  READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-hvzwl            1/1     Running   6 (10h ago)   22h
kubernetes-bootcamp-65df967b7f-lvvdw  1/1     Running   0             8m19s
kubernetes-bootcamp-65df967b7f-zs6nc  1/1     Running   0             8m22s

C:\Users\sarah>kubectl describe pods
Name:             hello-node-ccf4b9788-hvzwl
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Tue, 06 Feb 2024 12:41:07 +0000
Labels:           app=hello-node
                  pod-template-hash=ccf4b9788
Annotations:      <none>
Status:           Running
IP:               10.244.0.43
IPs:
  IP:           10.244.0.43
Controlled By:  ReplicaSet/hello-node-ccf4b9788
Containers:
  agnhost:
    Container ID:  docker://d4f0da789399dc714a92618fdd49c11fdbf33b2d1c0b5b65aed93bea1aac1d45
    Image:         registry.k8s.io/e2e-test-images/agnhost:2.39
    Image ID:      docker-pullable://registry.k8s.io/e2e-test-images/agnhost@sha256:7e8bdd271312fd25fc5ff5a8f04727be84044eb3d7d8d03611972a6752e2e11e
```

```
Volumes:
  kube-api-access-dvsfc:
    Type:                    Projected (a volume that contains injected data from multiple sources)
    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  8m30s  default-scheduler  Successfully assigned default/kubernetes-bootcamp-65df967b7f-zs6nc to minikube
  Normal  Pulling    8m30s  kubelet            Pulling image "jocatalin/kubernetes-bootcamp:v2"
  Normal  Pulled     8m27s  kubelet            Successfully pulled image "jocatalin/kubernetes-bootcamp:v2" in 2.465s (2.465s including waiting)
  Normal  Created    8m27s  kubelet            Created container kubernetes-bootcamp
  Normal  Started    8m27s  kubelet            Started container kubernetes-bootcamp

C:\Users\sarah>
```

I then cleaned up the local cluster.

```
C:\Users\sarah>kubectl delete deployments/kubernetes-bootcamp services/kubernetes-bootcamp
deployment.apps "kubernetes-bootcamp" deleted
service "kubernetes-bootcamp" deleted

C:\Users\sarah>
```