Exercise 12.1: Assign Pods Using Labels

Overview

While allowing the system to distribute Pods on your behalf is typically the best route, you may want to determine which nodes a Pod will use. For example you may have particular hardware requirements to meet for the workload. You may want to assign VIP Pods to new, faster hardware and everyone else to older hardware.

In this exercise we will use `labels` to schedule Pods to a particular node. Then we will explore `taints` to have more flexible deployment in a large environment.

1. Begin by getting a list of the nodes. They should be in the ready state and without added labels or taints.

```
student@cp:~$ kubectl get nodes
NAME        STATUS    ROLES                  AGE       VERSION
k8scp       Ready     control-plane,master   44h       v1.21.0
worker      Ready     <none>                 43h       v1.21.0
```

2. View the current labels and taints for the nodes.

```
student@cp:~$ kubectl describe nodes |grep -A5 -i label
Labels:             beta.kubernetes.io/arch=amd64
                    beta.kubernetes.io/os=linux
                    kubernetes.io/arch=amd64
                    kubernetes.io/hostname=k8scp
                    kubernetes.io/os=linux
                    node-role.kubernetes.io/control-plane=
--
Labels:             beta.kubernetes.io/arch=amd64
                    beta.kubernetes.io/os=linux
                    kubernetes.io/arch=amd64
                    kubernetes.io/hostname=worker
                    kubernetes.io/os=linux
                    system=secondOne
```

```
student@cp:~$ kubectl describe nodes |grep -i taint
Taints:                        <none>
Taints:                        <none>
```

3. Get a count of how many containers are running on both the cp and worker nodes. There are about 24 containers running on the cp in the following example, and eight running on the worker. There are status lines which increase the **wc** count. You may have more or less, depending on previous labs and cleaning up of resources. Take note of the number of containers, and then notice the numbers change due to scheduling. The change between nodes is the important information, not the particular number. If you are using **cri-o** you can view containers using **crictl ps**.

```
student@cp:~$ kubectl get deployments --all-namespaces
NAMESPACE     NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
accounting    nginx-one                 1/1     1            1           19h
default       anotherweb-apache         1/1     1            1           8h
default       web-one                   1/1     1            1           45m
default       web-two                   1/1     1            1           45m
kube-system   calico-kube-controllers   1/1     1            1           35h
<output_omitted>
```

```
student@cp:~$ sudo docker ps | wc -l   #<-- If using Docker
student@cp:~$ sudo crictl ps | wc -l   #<-- If using cri-o
24
```

```
student@cp:~$ sudo docker ps | wc -l   #<-- If using Docker
student@cp:~$ sudo crictl ps | wc -l   #<-- If using cri-o
21
```

4. For the purpose of the exercise we will assign the cp node to be VIP hardware and the secondary node to be for others.

```
student@cp:~$ kubectl label nodes k8scp status=vip
node/k8scp labeled
```

```
student@cp:~$ kubectl label nodes worker status=other
node/worker labeled
```

5. Verify your settings. You will also find there are some built in labels such as hostname, os and architecture type. The output below appears on multiple lines for readability.

```
student@cp:~$ kubectl get nodes --show-labels
NAME     STATUS   ROLES                  AGE   VERSION   LABELS
k8scp    Ready    control-plane,master   35h   v1.21.1   beta.kubernetes.io/arch=amd64,
beta.kubernetes.io/os=linux,kubernetes.io/arch=amd64,kubernetes.io/hostname=k8scp,
kubernetes.io/os=linux,node-role.kubernetes.io/control-plane=,node-role.kubernetes.io/master=,
node.kubernetes.io/exclude-from-external-load-balancers=,status=vip
worker   Ready    <none>                 35h   v1.21.1   beta.kubernetes.io/arch=amd64,
beta.kubernetes.io/os=linux,kubernetes.io/arch=amd64,kubernetes.io/hostname=worker,
kubernetes.io/os=linux,status=other,system=secondOne
```

6. Create `vip.yaml` to spawn four `busybox` containers which sleep the whole time. Include the `nodeSelector` entry.

```
student@cp:~$ vim vip.yaml
```

vip.yaml

```
apiVersion: v1
kind: Pod
metadata:
  name: vip
spec:
  containers:
  - name: vip1
    image: busybox
    args:
    - sleep
    - "1000000"
  - name: vip2
    image: busybox
    args:
    - sleep
    - "1000000"
  - name: vip3
```

```
      image: busybox
      args:
      - sleep
      - "1000000"
    - name: vip4
      image: busybox
      args:
      - sleep
      - "1000000"
    nodeSelector:
      status: vip
```

7. Deploy the new pod. Verify the containers have been created on the cp node. It may take a few seconds for all the containers to spawn. Check both the cp and the secondary nodes. From this point forward use **crictl** where the step lists **docker** if you have deployed your cluster with cri-o.

```
student@cp:~$ kubectl create -f vip.yaml
pod/vip created

student@cp:~$ sudo docker ps |wc -l
28

student@worker:~$ sudo docker ps |wc -l
21
```

8. Delete the pod then edit the file, commenting out the `nodeSelector` lines. It may take a while for the containers to fully terminate.

```
student@cp:~$ kubectl delete pod vip
pod "vip" deleted

student@cp:~$ vim vip.yaml
....
#  nodeSelector:
 #    status: vip
```

9. Create the pod again. Containers should now be spawning on either node. You may see pods for the `daemonsets` as well.

```
student@cp:~$ kubectl get pods
<output_omitted>

student@cp:~$ kubectl create -f vip.yaml
pod/vip created
```

10. Determine where the new containers have been deployed. They should be more evenly spread this time. Again, the numbers may be different, the change in numbers is what we are looking for. Due to lack of `nodeSelector` they could go to either node.

```
student@cp:~$ sudo docker ps |wc -l
```

```
24
```

```
student@worker:~$ sudo docker ps |wc -l
```

```
25
```

11. Create another file for other users. Change the names from vip to others, and uncomment the nodeSelector lines.

```
student@cp:~$ cp vip.yaml other.yaml
```

```
student@cp:~$ sed -i s/vip/other/g other.yaml
```

```
student@cp:~$ vim other.yaml
```

other.yaml

```
....
  nodeSelector:
    status: other
```

12. Create the other containers. Determine where they deploy.

```
student@cp:~$ kubectl create -f other.yaml
```

```
pod/other created
```

```
student@cp:~$ sudo docker ps |wc -l
```

```
24
```

```
student@worker:~$ sudo docker ps |wc -l
```

```
25
```

13. Shut down both pods and verify they terminated. Only our previous pods should be found.

```
student@cp:~$ kubectl delete pods vip other
```

```
pod "vip" deleted
pod "other" deleted
```

```
student@cp:~$ kubectl get pods
```

```
<output_omitted>
```