Static Pods

Introduction:

Static Pods are managed directly by the kubelet daemon on a specific node, without the API server observing them. Unlike Pods that are managed by the control plane

The kubelet automatically tries to create a mirror Pod on the Kubernetes API server for each static Pod. This means that the Pods running on a node are visible on the API server, but cannot be controlled from there. The Pod names will be suffixed with the node hostname with a leading hyphen.

The default location of static pods on each node (master and worker nodes) is **/etc/kubernetes/manifests**.

Objectives:

1. Create and delete a static pod on Master node
2. Create and delete a static pod on Worker node

1. Create and delete a static pod on Master node:

If we create a pod's Yaml file under **/etc/kubernetes/manifests** directory, Kubelet will automatically create a static pod and will append the nodes hostname to it.

Let's find out the number of static pods available in our cluster.

```
ls -l /etc/kubernetes/manifests
```

```
root@master:~#
root@master:~# ls -l /etc/kubernetes/manifests
total 20
-rw------- 1 root root 2177 Jan  9 10:09 etcd.yaml
-rw------- 1 root root 4514 Jan 10 18:12 kube-apiserver.yaml
-rw------- 1 root root 3466 Jan  8 10:00 kube-controller-manager.yaml
-rw------- 1 root root 1385 Jan  8 10:00 kube-scheduler.yaml
root@master:~#
```

So in that particular directory, we can see we have four files and these are the main management pods which Kubernetes is using to maintain the cluster.

```
root@master:~# kubectl get pods -A
NAMESPACE      NAME                                       READY   STATUS    RESTARTS   AGE
dev-team       dev-team                                   1/1     Running   10         7d20h
dev-team       dev-team1                                  1/1     Running   10         7d20h
dev-team       user-service                               1/1     Running   10         7d21h
dev            dev-pod                                    1/1     Running   6          5d21h
development    dev1                                       1/1     Running   10         7d21h
development    dev2                                       1/1     Running   10         7d21h
istio-system   web-pod                                    1/1     Running   6          5d23h
kube-system    calico-kube-controllers-846d7f49d8-rwnn2   1/1     Running   44         7d18h
kube-system    calico-node-7zc5t                          1/1     Running   9          7d18h
kube-system    calico-node-bsbmx                          1/1     Running   9          7d18h
kube-system    calico-node-dlnpv                          1/1     Running   9          7d18h
kube-system    coredns-558bd4d5db-6czq9                   1/1     Running   10         7d22h
kube-system    coredns-558bd4d5db-lv5wk                   1/1     Running   10         7d22h
kube-system    etcd-master                                1/1     Running   8          6d22h
kube-system    kube-apiserver-master                      1/1     Running   5          5d14h
kube-system    kube-controller-manager-master             1/1     Running   29         7d22h
kube-system    kube-proxy-8h4l2                           1/1     Running   10         7d22h
kube-system    kube-proxy-bkrxq                           1/1     Running   10         7d22h
kube-system    kube-proxy-vjfv2                           1/1     Running   10         7d22h
kube-system    kube-scheduler-master                      1/1     Running   28         7d22h
monitoring     test-pod                                   1/1     Running   6          5d23h
network1       network1-pod                               1/1     Running   0          110m
network2       network2-pod                               1/1     Running   0          110m
production     frontend-cdc94dfcb-b4whz                   1/1     Running   1          14h
production     frontend-cdc94dfcb-sfwch                   1/1     Running   1          14h
production     frontend-cdc94dfcb-wq2g9                   1/1     Running   1          14h
testing        test                                       1/1     Running   10         7d21h
yavin          pod1                                       1/1     Running   10         7d20h
yavin          pod2                                       1/1     Running   10         7d20h
root@master:~#
```

In above output, we can see that we have four static pods and master is appended with the name of the pod.

Let's use a pod's Yaml file and we are not going to apply it. Kubelet will automatically create a static pod.

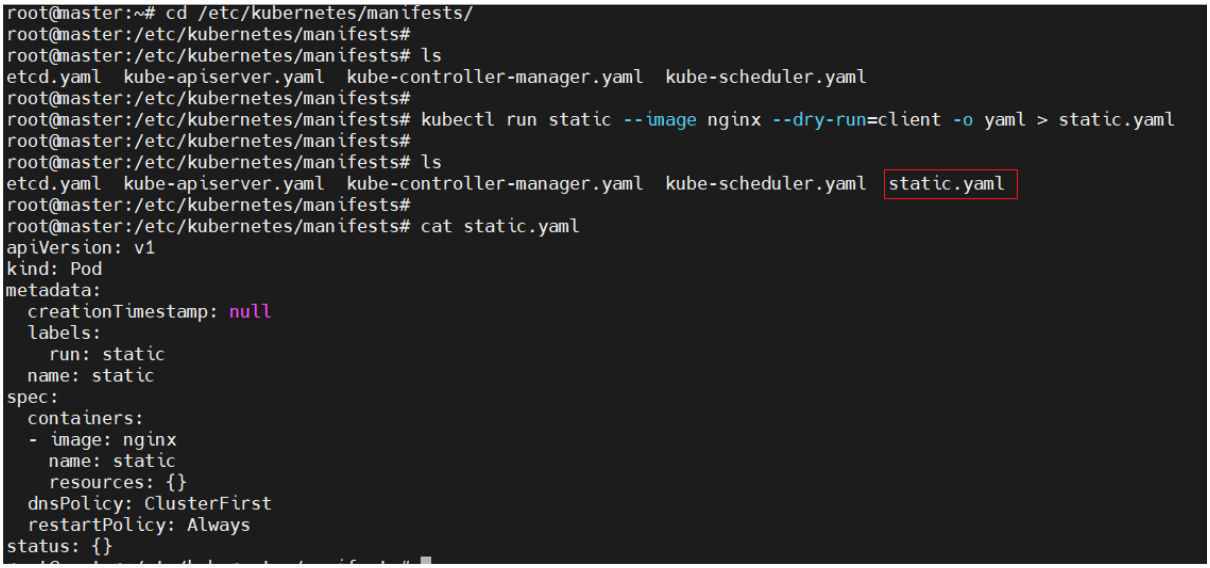
Firstly, go inside **/etc/kubernetes/manifests** directory and create a template of a pod or use below Yaml file.

```
/etc/kubernetes/manifests
```

```
kubectl run static --image nginx --dry-run=client -o yaml > static.yaml
```

Above command will create the below Yaml file which will be used by Kubelet to create a static pod.

```
apiVersion: v1
kind: Pod
metadata:
  creationTimestamp: null
  labels:
    run: static
  name: static
spec:
  containers:
  - image: nginx
    name: static
    resources: {}
  dnsPolicy: ClusterFirst
  restartPolicy: Always
```



Now let’s check if our pod is running or not.

```
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# kubectl get pods -A
NAMESPACE     NAME                                       READY   STATUS    RESTARTS   AGE
default       static-master                              1/1     Running   0          5m29s
dev-team      dev-team                                   1/1     Running   10         7d21h
dev-team      dev-team1                                  1/1     Running   10         7d21h
dev-team      user-service                               1/1     Running   10         7d21h
dev           dev-pod                                    1/1     Running   6          5d21h
development   dev1                                       1/1     Running   10         7d21h
development   dev2                                       1/1     Running   10         7d21h
istio-system  web-pod                                    1/1     Running   6          5d23h
kube-system   calico-kube-controllers-846d7f49d8-rwnn2   1/1     Running   44         7d18h
kube-system   calico-node-7zc5t                          1/1     Running   9          7d18h
kube-system   calico-node-bsbmx                          1/1     Running   9          7d18h
kube-system   calico-node-dlnpv                          1/1     Running   9          7d18h
kube-system   coredns-558bd4d5db-6czq9                   1/1     Running   10         7d22h
kube-system   coredns-558bd4d5db-lv5wk                   1/1     Running   10         7d22h
kube-system   etcd-master                                1/1     Running   8          6d22h
kube-system   kube-apiserver-master                      1/1     Running   5          5d14h
kube-system   kube-controller-manager-master             1/1     Running   29         7d22h
kube-system   kube-proxy-8h4l2                           1/1     Running   10         7d22h
kube-system   kube-proxy-bkrxq                           1/1     Running   10         7d22h
kube-system   kube-proxy-vjfv2                           1/1     Running   10         7d22h
kube-system   kube-scheduler-master                      1/1     Running   28         7d22h
monitoring    test-pod                                   1/1     Running   6          5d23h
network1      network1-pod                               1/1     Running   0          121m
network2      network2-pod                               1/1     Running   0          121m
production    frontend-cdc94dfcb-b4whz                   1/1     Running   1          15h
production    frontend-cdc94dfcb-sfwch                   1/1     Running   1          15h
production    frontend-cdc94dfcb-wq2g9                   1/1     Running   1          15h
testing       test                                       1/1     Running   10         7d21h
yavin         pod1                                       1/1     Running   10         7d21h
yavin         pod2                                       1/1     Running   10         7d21h
root@master:/etc/kubernetes/manifests#
```

Above output shows that a pod has been created by Kubelet with a name **static-master** and this master has been appended by Kubelet as this is a static pod.

If we try to delete this pod, it will be recreated again. So, the only way to delete the pod is to delete the definition file itself which is available in **/etc/kubernetes/manifest** directory. The result can be seen in below output.

```
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# kubectl delete pod static-master
pod "static-master" deleted
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# kubectl get pods
NAME            READY   STATUS    RESTARTS   AGE
static-master   1/1     Running   0          10s
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# rm -rf static.yaml
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# kubectl get pods
No resources found in default namespace.
root@master:/etc/kubernetes/manifests#
```

2. **<u>Create and delete a static pod on Worker node:</u>**

Even our worker node is also having the same **/etc/kubernetes/manifests** directory and we can create a Yaml file there to create a static pod.

Let's use below definition file on worker1 node under **/etc/kubernetes/manifests** directory.

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    run: static
  name: static-pod
spec:
  containers:
  - image: nginx
    name: static
```

Kubelet will take care of pod creation and we can see in below output that our pod is running now and **worker1** name has been appended with pod's name.

```
root@worker1:/etc/kubernetes/manifests#
root@worker1:/etc/kubernetes/manifests# ls -l
total 4
-rw-r--r-- 1 root root 228 Jan 16 08:37 static.yaml
root@worker1:/etc/kubernetes/manifests#
```

```
root@master:/etc/kubernetes/manifests#
root@master:/etc/kubernetes/manifests# kubectl get pods
NAME                READY   STATUS    RESTARTS   AGE
static-pod-worker1  1/1     Running   0          7s
root@master:/etc/kubernetes/manifests#
```

So to delete this pod we have to delete the file itself and our static pod will be deleted.