Kubernetes Pods Health Check using Liveness and Readiness

Agenda:

1. What is Probes/Health Check
2. Pod with a Liveness Probe and No Restart Policy
3. Creating a Pod Running a Container with a Liveness Probe and a Restart Policy
4. Creating a Pod Running a Container with a Readiness Probe

Probes/Health Checks

- It can be configured to check the health of the containers running in a pod.
- used to determine whether a container is running or ready to receive requests

A probe/health check may return the following results:

Success: The container passed the health check.

Failure: The container failed the health check.

Unknown: The health check failed for unknown reasons.

Types of Probes

1. **Liveness Probe**

- used to determine whether a particular container is running or not.
- If a container fails the liveness probe, the controller will try to restart the pod on the same node according to the restart policy configured for the pod.

Restart Policy

We can define the restart Policy in the pod to instruct the controller about the conditions required to restart the Pod

Default value is `always`

Values for the `Restart Policy` as follows

- **Always**: Always restart the pod when it terminates.
- **OnFailure**: Restart the pod only when it terminates with failure.
- **Never**: Never restart the pod after it terminates.

Pod with a Liveness Probe and No Restart Policy

In this yaml file we will define the Liveness Probe and no restart Policy.

If we don't specify the restart Policy then by default it is `always`

```
kind: Pod
apiVersion: v1
metadata:
  name: liveness-probe
spec:
  containers:
  - name: ubuntu-container
    image: ubuntu
    command:
        - /bin/bash
        - -ec
        - touch /tmp/live; sleep 30; rm /tmp/live; sleep 600
    livenessProbe:
       exec:
         command:
            - cat
            - /tmp/live
       initialDelaySeconds: 5
       periodSeconds: 5
```

Pod configuration

- Creating a container with ubuntu image
- When container starts it will create a file `/tmp/live` then sleep for 30 seconds and at last remove the file `/tmp/live`
- This means the file will be available only for 30 seconds and after that it is no longer available in the container
- In liveness configuration—It will try to find the file every 5 seconds with an initial delay of 5 seconds

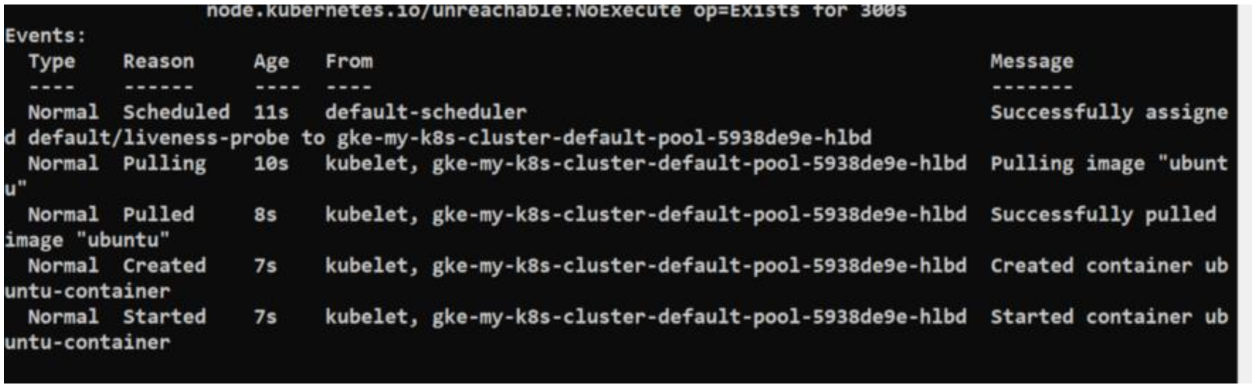
`initalDelaySeonds` : Number of seconds controller will wait before launching the probe

`periodSeconds` : Number of seconds after which the probe will be repeated periodically

Create a pod

```
kubectl create -f liveness-probe.yaml
kubectl describe pod liveness-probe
```

You will see the `liveness-probe` is succeed because the command is executed successfully

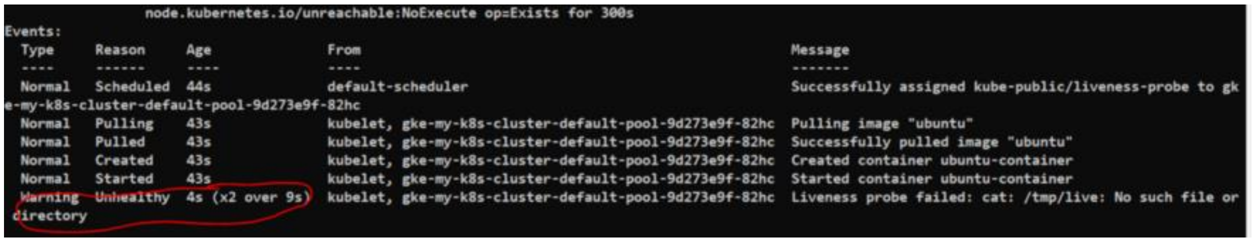


```
                 node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age   From                                                    Message
  ----    ------     ----  ----                                                    -------
  Normal  Scheduled  11s   default-scheduler                                       Successfully assigne
d default/liveness-probe to gke-my-k8s-cluster-default-pool-5938de9e-hlbd
  Normal  Pulling    10s   kubelet, gke-my-k8s-cluster-default-pool-5938de9e-hlbd  Pulling image "ubunt
u"
  Normal  Pulled     8s    kubelet, gke-my-k8s-cluster-default-pool-5938de9e-hlbd  Successfully pulled
image "ubuntu"
  Normal  Created    7s    kubelet, gke-my-k8s-cluster-default-pool-5938de9e-hlbd  Created container ub
untu-container
  Normal  Started    7s    kubelet, gke-my-k8s-cluster-default-pool-5938de9e-hlbd  Started container ub
untu-container
```

Now wait for 30 seconds and the run the below command

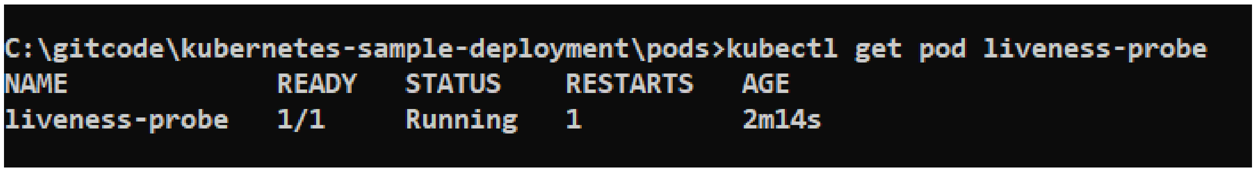
```
kubectl describe pod liveness-probe
```

You will see that `liveness-probe` has failed

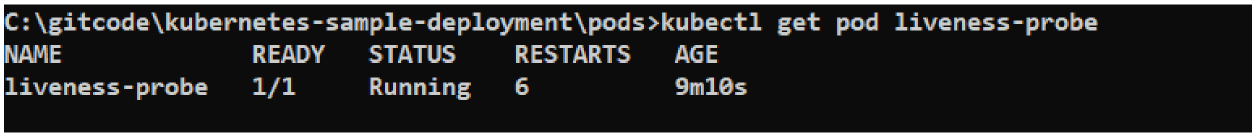


```
                 node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type     Reason     Age              From                                                    Message
  ----     ------     ----             ----                                                    -------
  Normal   Scheduled  44s              default-scheduler                                       Successfully assigned kube-public/liveness-probe to gk
e-my-k8s-cluster-default-pool-9d273e9f-82hc
  Normal   Pulling    43s              kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-82hc  Pulling image "ubuntu"
  Normal   Pulled     43s              kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-82hc  Successfully pulled image "ubuntu"
  Normal   Created    43s              kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-82hc  Created container ubuntu-container
  Normal   Started    43s              kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-82hc  Started container ubuntu-container
  Warning  Unhealthy  4s (x2 over 9s)  kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-82hc  Liveness probe failed: cat: /tmp/live: No such file or
directory
```

Now you can see that container is restarting again and again because of the default Restart policy



```
C:\gitcode\kubernetes-sample-deployment\pods>kubectl get pod liveness-probe
NAME             READY   STATUS    RESTARTS   AGE
liveness-probe   1/1     Running   1          2m14s
```



```
C:\gitcode\kubernetes-sample-deployment\pods>kubectl get pod liveness-probe
NAME             READY   STATUS    RESTARTS   AGE
liveness-probe   1/1     Running   6          9m10s
```

Creating a Pod Running a Container with a Liveness Probe and a Restart Policy

Now we will use the same pod configuration but with Restart policy as `Never`

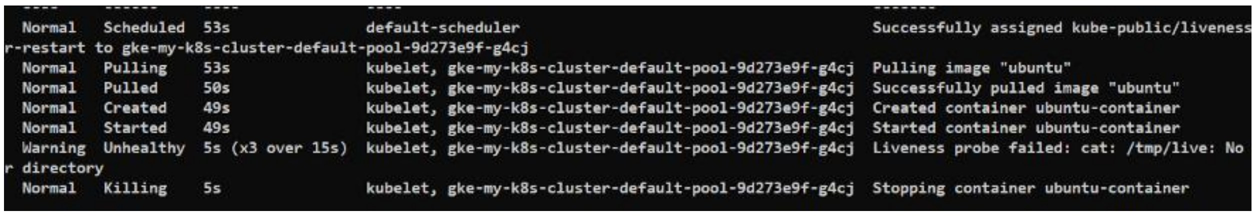
```
kind: Pod
apiVersion: v1
metadata:
  name: liveness-probe-never-restart
spec:
  restartPolicy: Never
  containers:
  - name: ubuntu-container
    image: ubuntu
    command:
        - /bin/bash
        - -ec
        - touch /tmp/live; sleep 30; rm /tmp/live; sleep 100
    livenessProbe:
       exec:
         command:
            - cat
            - /tmp/live
       initialDelaySeconds: 5
       periodSeconds: 5
```

Create a pod

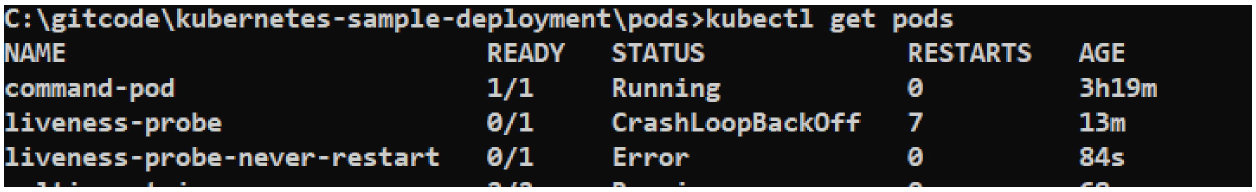
```
kubectl create -f liveness-probe-with-restart-policy.yaml
```

Wait for a minute and then run the below command

```
kubectl describe pod liveness-probe-never-restart
```



```
  Normal   Scheduled  53s                default-scheduler                                  Successfully assigned kube-public/liveness
r-restart to gke-my-k8s-cluster-default-pool-9d273e9f-g4cj
  Normal   Pulling    53s                kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Pulling image "ubuntu"
  Normal   Pulled     50s                kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Successfully pulled image "ubuntu"
  Normal   Created    49s                kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Created container ubuntu-container
  Normal   Started    49s                kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Started container ubuntu-container
  Warning  Unhealthy  5s (x3 over 15s)   kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Liveness probe failed: cat: /tmp/live: No
r directory
  Normal   Killing    5s                 kubelet, gke-my-k8s-cluster-default-pool-9d273e9f-g4cj  Stopping container ubuntu-container
```



```
C:\gitcode\kubernetes-sample-deployment\pods>kubectl get pods
NAME                           READY   STATUS             RESTARTS   AGE
command-pod                    1/1     Running            0          3h19m
liveness-probe                 0/1     CrashLoopBackOff   7          13m
liveness-probe-never-restart   0/1     Error              0          84s
```

From the output you can see that controller killed the container and never attempted to restart the Pod.

Readiness Probe

- used to determine whether a particular container is ready to receive requests or not.
- For ex- A container which serving a web-application, readiness mean that container has loaded all the static assets, database connection, started the webserver and opened a port to start serving request

What happen if container fails its readiness probe ?

Kubernetes controller will ensure that the pod doesn’t receive any requests.

Readiness Probe States

Failure—is the default state until the readiness probe succeeds.

Success- The container will start receiving requests only after the readiness probe returns with the **Success** state.

If no readiness probe is configured, the container will start receiving requests as soon as it starts.

Creating a Pod Running a Container with a Readiness Probe

In this yaml file we will define the Readiness Probe

```
kind: Pod
apiVersion: v1
metadata:
  name: readiness-probe
spec:
  containers:
  - name: ubuntu-container
    image: ubuntu
    command:
        - /bin/bash
        - -ec
        - sleep 30; touch /tmp/ready; sleep 600
    readinessProbe:
       exec:
         command:
            - cat
```

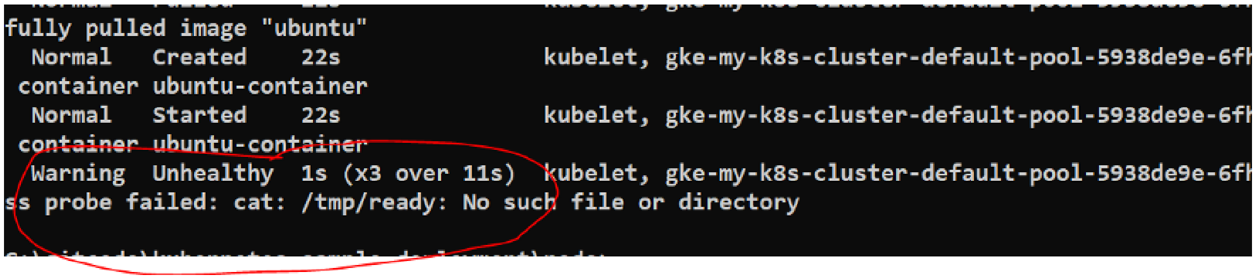
```
          - /tmp/ready
        initialDelaySeconds: 10
        periodSeconds: 5
```

Pod configuration

- Creating a container with ubuntu image
- When container starts it will sleep for 30 seconds and then create file `/tmp/ready`
- This means the file will be available only after 30 seconds
- In readiness configuration—It will try to find the file every 5 seconds with an initial delay of 10 seconds

Create a pod

```
kubectl create -f readiness-probe.yaml
kubectl get pod readiness-probe
kubectl describe pod readiness-probe
```



```
fully pulled image "ubuntu"
  Normal   Created    22s                kubelet, gke-my-k8s-cluster-default-pool-5938de9e-6fh
 container ubuntu-container
  Normal   Started    22s                kubelet, gke-my-k8s-cluster-default-pool-5938de9e-6fh
 container ubuntu-container
  Warning  Unhealthy  1s (x3 over 11s)  kubelet, gke-my-k8s-cluster-default-pool-5938de9e-6fh
ss probe failed: cat: /tmp/ready: No such file or directory
```

Wait for a minute and then run the below command

```
kubectl describe pod readiness-probe
```

Best Practices while using Probes

Liveness Probes

`initialDelaySeconds` : should be more then the application start up time so that container doesn't get stuck in a restart Loop

Readiness Probes

`initialDelaySeconds` : could be small because we want to enable the traffic to the pod as soon as container is ready