

Practice4: Probes

1. First we will create and test liveness probe with exec test. Create a file named probes_exec.yaml with following content

```
D: > kubernetes > ! probes_exec.yaml
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    labels:
5      test: liveness
6      name: liveness-exec
7  spec:
8    containers:
9      - name: liveness
10      image: k8s.gcr.io/busybox
11      args:
12        - /bin/sh
13        - -c
14        - touch /tmp/healthy; sleep 30; rm -rf /tmp/healthy; sleep 600
15      livenessProbe:
16        exec:
17          command:
18            - cat
19            - /tmp/healthy
20        initialDelaySeconds: 5
21        periodSeconds: 5
```

2. Run `kubectl create -f probes_exec.yaml`.
3. Run `kubectl describe pod liveness-exec` immediately after you deploy the pod. The output should indicate that no liveness probes have failed yet

```

State:      Running
Started:    Sun, 09 Apr 2023 21:13:58 +0200
Ready:      True
Restart Count: 0
Liveness:   exec [cat /tmp/healthy] delay=5s timeout=1s period=5s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-kctpx (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-kctpx:
    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   18s   default-scheduler   Successfully assigned default/liveness-exec to aks-agentpool-37021570-vmss000002
  Normal   Pulling     17s   kubelet         Pulling image "k8s.gcr.io/busybox"
  Normal   Pulled      17s   kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 464.885286ms
  Normal   Created     17s   kubelet         Created container liveness
  Normal   Started     17s   kubelet         Started container liveness

```

4. After 35 seconds, view the Pod events again. Run `kubectl describe pod liveness-exec`

```

Ready:      True
Restart Count: 1
Liveness:   exec [cat /tmp/healthy] delay=5s timeout=1s period=5s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-kctpx (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-kctpx:
    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   2m12s   default-scheduler   Successfully assigned default/liveness-exec to aks-agentpool-37021570-vmss000002
  Normal   Pulled      2m11s   kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 464.885286ms
  Normal   Pulling     56s (x2 over 2m11s)   kubelet         Pulling image "k8s.gcr.io/busybox"
  Normal   Created     56s (x2 over 2m11s)   kubelet         Created container liveness
  Normal   Started     56s (x2 over 2m11s)   kubelet         Started container liveness
  Normal   Pulled      56s (x2 over 2m11s)   kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 288.524101ms
  Warning  Unhealthy   11s (x6 over 96s)     kubelet         Liveness probe failed: cat: can't open '/tmp/healthy': No such file or directory
  Normal   Killing     11s (x2 over 86s)     kubelet         Container liveness failed liveness probe, will be restarted

```

7. Wait another 30 seconds, and verify that the container has been restarted. Run `kubectl get pod liveness-exec`.

```
Ready:      True
Restart Count: 2
Liveness:   exec [cat /tmp/healthy] delay=5s timeout=1s period=5s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-kctpx (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-kctpx:
    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   2m51s        default-scheduler    Successfully assigned default/liveness-exec to aks-agentpool-37021570-vmss000002
  Normal    Pulled      2m50s        kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 464.885286ms
  Normal    Pulled      95s          kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 288.524191ms
  Warning   Unhealthy   50s (x6 over 2m15s)  kubelet         Liveness probe failed: cat: can't open '/tmp/healthy': No such file or directory
  Normal    Killing     50s (x2 over 2m5s)   kubelet         Container liveness failed liveness probe, will be restarted
  Normal    Pulling     20s (x3 over 2m50s)  kubelet         Pulling image "k8s.gcr.io/busybox"
  Normal    Created     20s (x3 over 2m50s)  kubelet         Created container liveness
  Normal    Started     20s (x3 over 2m50s)  kubelet         Started container liveness
  Normal    Pulled      20s          kubelet         Successfully pulled image "k8s.gcr.io/busybox" in 314.060434ms
```

===The output should show that **RESTARTS** has been incremented===

9. Create file named probes_http.yaml with following content

```
! probes_http.yaml X
D: > kubernetes > ! probes_http.yaml
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    labels:
5      test: liveness
6      name: liveness-http
7  spec:
8    containers:
9      - name: liveness
10     image: k8s.gcr.io/liveness
11     args:
12       - /server
13     livenessProbe:
14       httpGet:
15         path: /healthz
16         port: 8080
17         httpHeaders:
18           - name: Custom-Header
19             value: Awesome
20         initialDelaySeconds: 3
21         periodSeconds: 3
```

For the first 10 seconds that the container is alive, the /healthz handler returns a status of 200. After that, the handler returns a status of 500

-Run **kubectrl create -f probes_http.yaml**.

-Immediately run (you only have 10 secs to run this command) **kubectrl describe pod liveness-http**

```
Ready: False
Restart Count: 0
Liveness: http-get http://:8080/healthz delay=3s timeout=1s period=3s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-fn24t (ro)
Conditions:
  Type           Status
  Initialized     True
  Ready           False
  ContainersReady False
  PodScheduled    True
Volumes:
  kube-api-access-fn24t:
    Type:
    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   4s     default-scheduler  Successfully assigned default/liveness-http to aks-agentpool-37021570-vmss000002
  Normal  Pulling     4s     kubelet        Pulling image "k8s.gcr.io/echoserver:1.4"
```

After 10 seconds, view Pod events to verify that liveness probes have failed and the container has been restarted. Run again **kubectl describe pod liveness-http**

```
Ready: False
Restart Count: 2
Liveness: http-get http://:8080/healthz delay=3s timeout=1s period=3s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-fn24t (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             False
  ContainersReady   False
  PodScheduled      True
Volumes:
  kube-api-access-fn24t:
    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   26s    default-scheduler  Successfully assigned default/liveness-http to aks-agentpool-37021570-vmss000002
  Normal  Pulling     26s    kubelet        Pulling image "k8s.gcr.io/echoserver:1.4"
  Normal  Pulled      22s    kubelet        Successfully pulled image "k8s.gcr.io/echoserver:1.4" in 3.410420255s
  Normal  Created     3s (x3 over 22s)  kubelet        Created container liveness
  Warning Failed       3s (x3 over 21s)  kubelet        Error: failed to create containerd task: failed to create shim task: OCI runtime create failed: container: l
```

Create file named **probes_tcp.yaml** with following content:

```
! probes_tcp.yaml ●
D: > kubernetes > ! probes_tcp.yaml
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    name: liveness-tcp
5    labels:
6      app: goproxy
7  spec:
8    containers:
9      - name: goproxy
10       image: k8s.gcr.io/goproxy:0.1
11       ports:
12         - containerPort: 8080
13       livenessProbe:
14         tcpSocket:
15           port: 8080 # Updated port to match containerPort
16         initialDelaySeconds: 15
17         periodSeconds: 20
18
```

In the lab tcpSocket/port value was 9999

```
Ready: True
Restart Count: 3
Liveness: tcp-socket :9999 delay=15s timeout=1s period=20s #success=1 #failure=3
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-n57b6 (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-n57b6:
    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   3m9s     default-scheduler   Successfully assigned default/liveness-tcp to aks-agentpool-37021570-vmss000002
  Normal   Pulled      9s (x4 over 3m9s)   kubelet             Container image "k8s.gcr.io/goproxy:0.1" already present on machine
  Normal   Created     9s (x4 over 3m9s)   kubelet             Created container goproxy
  Normal   Started     9s (x4 over 3m8s)   kubelet             Started container goproxy
  Warning  Unhealthy   9s (x9 over 2m49s)  kubelet             liveness probe failed: dial tcp 10.244.0.36:9999: connect: connection refused
  Normal   Killing     9s (x3 over 2m9s)   kubelet             Container goproxy failed liveness probe, will be restarted
```

And we can see that it failed.

After the update of the port to 8080 like in the picture above we can see that liveness-tcp pod is running .

```
Events:
  Type     Reason      Age      From          Message
  ----     -
  Normal   Scheduled   27s     default-scheduler   Successfully assigned default/liveness-tcp to aks-agentpool-37021570-vmss000002
  Normal   Pulled      27s     kubelet             Container image "k8s.gcr.io/goproxy:0.1" already present on machine
  Normal   Created     27s     kubelet             Created container goproxy
  Normal   Started     27s     kubelet             Started container goproxy
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
liveness-exec 0/1     CrashLoopBackOff   16 (2m40s ago)    45m
liveness-http 0/1     CrashLoopBackOff   10 (104s ago)     27m
liveness-tcp  1/1     Running                0                 2m9s
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$
```


Create file named **readiness_http.yaml** with following content:

```
D: > kubernetes > ! readiness_http.yaml
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    name: readiness-http
5    labels:
6      app: test
7  spec:
8    containers:
9      - name: nginx
10        image: nginx
11        ports:
12          - containerPort: 80
13        readinessProbe:
14          initialDelaySeconds: 1
15          periodSeconds: 2
16          timeoutSeconds: 1
17          successThreshold: 1
18          failureThreshold: 1
19          httpGet:
20            host:
21              scheme: HTTP
22              path: /
23            httpHeaders:
24              - name: Host
25                value: myapplication1.com
26            port: 80
27
```

```
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl create -f readiness_http.yaml
pod/readiness-http created
```

Run **kubectl get pods** to see the status of your pod.

```
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
liveness-exec 1/1     Running   20 (8s ago) 56m
liveness-http 0/1     CrashLoopBackOff 12 (2m49s ago) 39m
liveness-tcp   1/1     Running   0           13m
readiness-http 1/1     Running   0           85s
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$
```

Run **kubectl describe pod readiness-http**. Examine the events for this pod. Everything should be OK

```
node.kubernetes.io/unreachable:NoExecute-Op-Exists for 500s
```

Events:				
Type	Reason	Age	From	Message
Normal	Scheduled	6m4s	default-scheduler	Successfully assigned default/readiness-http to aks-agentpool-37021570-vmss000002
Normal	Pulling	6m3s	kubelet	Pulling image "nginx"
Normal	Pulled	6m3s	kubelet	Successfully pulled image "nginx" in 181.14537ms
Normal	Created	6m3s	kubelet	Created container nginx
Normal	Started	6m3s	kubelet	Started container nginx

Now delete the pod and edit the `readiness_http.yaml` so that the port parameter has **81** value.

Run again **kubectl create -f readiness_http.yaml**.

Run **kubectl get pods** to see the status of your pod. You should see that the pod is running but it is not in ready state

```
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl delete pod readiness-http
pod "readiness-http" deleted
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl create -f readiness_http.yaml
pod/readiness-http created
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl get pods
NAME                READY   STATUS              RESTARTS   AGE
liveness-exec       1/1     Running             22 (36s ago)  64m
liveness-http       0/1     CrashLoopBackOff    14 (34s ago)  47m
liveness-top        1/1     Running             0           21m
readiness-http      0/1     Running             0           15s
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$
```

Describe the pod. Run **kubectl describe pod readiness-http**.

```
node.kubernetes.io/unreachable:NoExecute-Op-Exists for 500s
```

Events:				
Type	Reason	Age	From	Message
Normal	Scheduled	74s	default-scheduler	Successfully assigned default/readiness-http to aks-agentpool-37021570-vmss000002
Normal	Pulling	74s	kubelet	Pulling image "nginx"
Normal	Pulled	74s	kubelet	Successfully pulled image "nginx" in 149.35503ms
Normal	Created	74s	kubelet	Created container nginx
Normal	Started	73s	kubelet	Started container nginx
Warning	Unhealthy	36s (x21 over 72s)	kubelet	Readiness probe failed: Get "http://10.244.0.30:81/": dial tcp 10.244.0.30:81: connect: connection refused

===From the events we can see that readiness probe failed due to the connection being refused therefore pod will not receive any traffic===

Delete all pods under the default namespace.

```
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$ kubectl delete pods --all -n default
pod "liveness-exec" deleted
pod "liveness-http" deleted
pod "liveness-tcp" deleted
pod "readiness-http" deleted
andrej@DESKTOP-8840HSK:/mnt/d/kubernetes$
```