



## Exercise 8.1: Troubleshooting: Monitor Applications

### Overview

Troubleshooting can be difficult in a multi-node, decoupled and transient environment. Add in the rapid pace of change and it becomes more difficult. Instead of focusing and remembering a particular error and the fix it may be more useful to learn a flow of troubleshooting and revisit assumptions until the pace of change slows and various areas further mature.

1. View the `secondapp` pod, it should show as `Running`. This may not mean the application within is working properly, but that the pod is running. The restarts are due to the command we have written to run. The pod exists when done, and the controller restarts another container inside. The count depends on how long the labs have been running.

```
student@cp/app2:~$ cd
student@cp:~$ kubectl get pods secondapp
```

NAME	READY	STATUS	RESTARTS	AGE
secondapp	2/2	Running	49	2d

2. Look closer at the pod. Working slowly through the output check each line. If you have issues, are other pods having issues on the same node or volume? Check the state of each container. Both `busy` and `webserver` should report as `Running`. Note `webserver` has a restart count of zero while `busy` has a restart count of 49. We expect this as, in our case, the pod has been running for 49 hours.

```
student@cp:~$ kubectl describe pod secondapp
```

```
Name:          secondapp
Namespace:     default
Node:          worker-wdrq/10.128.0.2
Start Time:    Fri, 13 Apr 2022 20:34:56 +0000
Labels:        example=second
Annotations:   <none>
Status:        Running
IP:            192.168.55.91
Containers:
  webserver:
    <output_omitted>
    State:      Running
      Started:   Fri, 13 Apr 2022 20:34:58 +0000
      Ready:     True
      Restart Count: 0
    <output_omitted>

  busy:
    <output_omitted>

    State:      Running
      Started:   Sun, 15 Apr 2022 21:36:20 +0000
    Last State: Terminated
      Reason:    Completed
      Exit Code: 0
      Started:   Sun, 15 Apr 2022 20:36:18 +0000
      Finished:  Sun, 15 Apr 2022 21:36:18 +0000
    Ready:      True
    Restart Count: 49
    Environment: <none>
```

3. There are three values for conditions. Check that the pod reports Initialized, Ready and scheduled.

```
<output_omitted>
Conditions:
  Type           Status
  Initialized     True
  Ready           True
  PodScheduled    True
<output_omitted>
```

4. Check if there are any events with errors or warnings which may indicate what is causing any problems.

```
Events:
  Type           Reason      Age           From           Message
  ----           -
  Normal        Pulling     34m (x50 over 2d) kubelet, worker-wdrq pulling
image "busybox"
  Normal        Pulled      34m (x50 over 2d) kubelet, worker-wdrq Successfully
pulled image "busybox"
  Normal        Created     34m (x50 over 2d) kubelet, worker-wdrq Created
container
  Normal        Started     34m (x50 over 2d) kubelet, worker-wdrq Started
container
```

5. View each container log. You may have to sift errors from expected output. Some containers may have no output at all, as is found with busy.

```
student@cp:~$ kubectl logs secondapp webserver
```

```
192.168.55.0 - - [13/Apr/2022:21:18:13 +0000] "GET / HTTP/1.1" 200
612 "-" "curl/7.47.0" "-"
192.168.55.0 - - [13/Apr/2022:21:20:35 +0000] "GET / HTTP/1.1" 200
612 "-" "curl/7.53.1" "-"
127.0.0.1 - - [13/Apr/2022:21:25:29 +0000] "GET" 400 174 "-" "-" "-"
127.0.0.1 - - [13/Apr/2022:21:26:19 +0000] "GET index.html" 400 174
 "-" "-" "-"
<output_omitted>
```

```
student@cp:~$ kubectl logs secondapp busy
```

```
student@cp:~$
```

6. Check to make sure the container is able to use DNS and communicate with the outside world. Remember we still have limited the UID for secondapp to be UID **2000**, which may prevent some commands from running. It can also prevent an application from completing expected tasks, and other errors.

```
student@cp:~$ kubectl exec -it secondapp -c busy -- sh
```



### On Container

```
/ $ nslookup www.linuxfoundation.org
```



```
/ $ nslookup www.linuxfoundation.org
Server:          10.96.0.10
Address:         10.96.0.10:53

Non-authoritative answer:
Name:           www.linuxfoundation.org
Address: 23.185.0.2

*** Can't find www.linuxfoundation.org: No answer
```

```
/ $ cat /etc/resolv.conf
```

```
nameserver 10.96.0.10
search default.svc.cluster.local svc.cluster.local
cluster.local c.endless-station-188822.internal
google.internal
options ndots:5
```

7. Test access to a remote node using **nc (NetCat)**. There are several options to **nc** which can help troubleshoot if the problem is the local node, something between nodes or in the target. In the example below the connect never completes and a **control-c** was used to interrupt.

```
/ $ nc www.linux.com 25
```

```
^Cpunt!
```

8. Test using an IP address in order to narrow the issue to name resolution. In this case the IP in use is a well known IP for Google's DNS servers. The following example shows that Internet name resolution is working, but our UID issue prevents access to the `index.html` file.

```
/ $ wget http://www.linux.com/
```

```
Connecting to www.linux.com (151.101.45.5:80)
Connecting to www.linux.com (151.101.45.5:443)
wget: can't open 'index.html': Permission denied

/ $ exit
```

9. Make sure traffic is being sent to the correct Pod. Check the details of both the service and endpoint. Pay close attention to ports in use as a simple typo can prevent traffic from reaching the proper pod. Make sure labels and selectors don't have any typos as well.

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

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP	10d
nginx	ClusterIP	10.108.95.67	<none>	443/TCP	10d
registry	ClusterIP	10.105.119.236	<none>	5000/TCP	10d
secondapp	LoadBalancer	10.109.26.21	<pending>	80:32000/TCP	1d
thirdpage	NodePort	10.109.250.78	<none>	80:31230/TCP	1h

```
student@cp:~$ kubectl get svc secondapp -o yaml
```

```
<output_omitted>
clusterIP: 10.109.26.21
externalTrafficPolicy: Cluster
ports:
```

```
- nodePort: 32000
  port: 80
  protocol: TCP
  targetPort: 80
  selector:
    example: second
<output_omitted>
```

10. Verify an endpoint for the service exists and has expected values, including namespaces, ports and protocols.

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

```
NAME           ENDPOINTS          AGE
kubernetes     10.128.0.3:6443    10d
nginx          192.168.55.68:443  10d
registry       192.168.55.69:5000 10d
secondapp      192.168.55.91:80   1d
thirdpage      192.168.241.57:80  1h
```

```
student@cp:~$ kubectl get ep secondapp -o yaml
```

```
apiVersion: v1
kind: Endpoints
metadata:
  creationTimestamp: 2022-04-14T05:37:32Z
<output_omitted>
```

11. If the containers, services and endpoints are working the issue may be with an infrastructure service like **kube-proxy**. Ensure it's running, then look for errors in the logs. As we have two nodes we will have two proxies to look at. As we built our cluster with **kubeadm** the proxy runs as a container. On other systems you may need to use **journalctl** or look under `/var/log/kube-proxy.log`.

```
student@cp:~$ ps -elf |grep kube-proxy
```

```
<output_omitted>
4 S root      2652  2621  0  80   0 - 186908 -      15:23 ?           00:00:03
↪ /usr/local/bin/kube-proxy
--config=/var/lib/kube-proxy/config.conf --hostname-override=cp
0 S student  31656  9707  0  80   0 - 3715 pipe_w 19:02 pts/0    00:00:00 grep --color=auto
↪ kube-proxy
```

```
student@cp:~$ journalctl -a | grep proxy
```

```
Apr 15 15:44:43 worker-nzjr audit[742]: AVC apparmor="STATUS"
operation="profile_load" profile="unconfined" \
name="/usr/lib/lxd/lxd-bridge-proxy" pid=742 comm="apparmor_parser"
Apr 15 15:44:43 worker-nzjr kernel: audit: type=1400
audit(1523807083.011:11): apparmor="STATUS" \
operation="profile_load" profile="unconfined" \
name="/usr/lib/lxd/lxd-bridge-proxy" pid=742 comm="apparmor_parser"
Apr 15 15:45:17 worker-nzjr kubelet[1248]: I0415 15:45:17.153670
1248 reconciler.go:217] operationExecutor.VerifyControllerAttachedVolume\
started for volume "xtables-lock" \
(UniqueName: "kubernetes.io/host-path/e701fc01-38f3-11e8-a142-\
42010a800003-xtables-lock") \
pod "kube-proxy-t8k4w" (UID: "e701fc01-38f3-11e8-a142-42010a800003")
```

12. Look at both of the proxy logs. Lines which begin with the character **I** are info, **E** are errors. In this example the last message says access to listing an endpoint was denied by RBAC. It was because a default installation via Helm wasn't RBAC aware. This is only an example, you (hopefully) won't see any errors on your lab nodes.

If not using command line completion, view the possible pod names first.

```
student@cp:~$ kubectl -n kube-system get pod
```

```
student@cp:~$ kubectl -n kube-system logs kube-proxy-fsdf
```

```
I0405 17:28:37.091224      1 feature_gate.go:190] feature gates: map[]
W0405 17:28:37.100565      1 server_others.go:289] Flag proxy-mode=""
unknown, assuming iptables proxy
I0405 17:28:37.101846      1 server_others.go:138] Using iptables Proxier.
I0405 17:28:37.121601      1 server_others.go:171] Tearing down
inactive rules.
<output_omitted>
E0415 15:45:17.086081      1 reflector.go:205] \
k8s.io/kubernetes/pkg/client/informers/informers_generated/
internalversion/factory.go:85: \
Failed to list *core.Endpoints: endpoints is forbidden: \
User "system:serviceaccount:kube-system:kube-proxy" cannot \
list endpoints at the cluster scope:\
[clusterrole.rbac.authorization.k8s.io "system:node-proxier" not found, \
clusterrole.rbac.authorization.k8s.io "system:basic-user" not found, \
clusterrole.rbac.authorization.k8s.io \
"system:discovery" not found]
```

13. Check that the proxy is creating the expected rules for the problem service. Find the destination port being used for the service, **32000** in this case.

```
student@cp:~$ sudo iptables-save |grep secondapp
```

```
-A KUBE-NODEPORTS -p tcp -m comment --comment "default/secondapp:" \
-m tcp --dport 32000 -j KUBE-MARK-MASQ
-A KUBE-NODEPORTS -p tcp -m comment --comment "default/secondapp:" \
-m tcp --dport 32000 -j KUBE-SVC-DAASHM5XQZF5XI3E
-A KUBE-SERVICES ! -s 192.168.0.0/16 -d 10.109.26.21/32 -p tcp \
-m comment --comment "default/secondapp: \
cluster IP" -m tcp --dport 80 -j KUBE-MARK-MASQ
-A KUBE-SERVICES -d 10.109.26.21/32 -p tcp -m comment --comment \
"default/secondapp: cluster IP" -m tcp \
--dport 80 -j KUBE-SVC-DAASHM5XQZF5XI3E
<output_omitted>
```

14. Ensure the proxy is working by checking the port targeted by **iptables**. If it fails open a second terminal and view the proxy logs when making a request as it happens.

```
student@cp:~$ curl localhost:32000
```

```
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<output_omitted>
```