

## Exercise 11.2: Ingress Controller

We will use the **Helm** tool we learned about earlier to install an ingress controller.

1. Create two deployments, `web-one` and `web-two`, one running `httpd`, the other `nginx`. Expose both as ClusterIP services. Use previous content to determine the steps if you are unfamiliar. Test that both ClusterIPs work before continuing to the next step.
2. Linkerd does not come with an ingress controller, so we will add one to help manage traffic. We will leverage a **Helm** chart to install an ingress controller. Search the hub to find that there are many available.

```
student@cp:~$ helm search hub ingress
```

URL	DESCRIPTION	CHART VERSION
APP VERSION		
https://artifacthub.io/packages/helm/k8s-as-hel...		1.0.2
v1.0.0	Helm Chart representing a single Ingress Kubern...	
https://artifacthub.io/packages/helm/openstack-...		0.2.1
v0.32.0	OpenStack-Helm Ingress Controller	
<output_omitted>		
https://artifacthub.io/packages/helm/api/ingres...		3.29.1
0.45.0	Ingress controller for Kubernetes using NGINX a...	
https://artifacthub.io/packages/helm/wener/ingr...		3.31.0
0.46.0	Ingress controller for Kubernetes using NGINX a...	
https://artifacthub.io/packages/helm/nginx/ngin...		0.9.2
1.11.2	NGINX Ingress Controller	
<output_omitted>		

3. We will use a popular ingress controller provided by **NGINX**.

```
student@cp:~$ helm repo add ingress-nginx https://kubernetes.github.io/ingress-nginx
```

```
"ingress-nginx" has been added to your repositories
```

```
student@cp:~$ helm repo update
```

```
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "ingress-nginx" chart repository
Update Complete. -Happy Helming!-
```

4. Download and edit the `values.yaml` file and change it to use a DaemonSet instead of a Deployment. This way there will be a pod on every node to handle traffic.

```
student@cp:~$ helm fetch ingress-nginx/ingress-nginx --untar
```

```
student@cp:~$ cd ingress-nginx
```

```
student@cp:~/ingress-nginx$ ls
```

```
CHANGELOG.md Chart.yaml OWNERS README.md ci templates values.yaml
```

```
student@cp:~/ingress-nginx$ vim values.yaml
```



## values.yaml

```

1 ....
2   ## DaemonSet or Deployment
3   ##
4   kind: DaemonSet                                #<-- Change to DaemonSet, around line 150
5
6   ## Annotations to be added to the controller Deployment or DaemonSet
7   ....

```

5. Now install the controller using the chart. Note the use of the dot (.) to look in the current directory.

```
student@cp:~/ingress-nginx$ helm install myingress .
```

```

NAME: myingress
LAST DEPLOYED: Thu Feb 23 13:47:16 2023
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
The ingress-nginx controller has been installed.
It may take a few minutes for the LoadBalancer IP to be available.
You can watch the status by running
'kubectl --namespace default get services -o wide -w myingress-ingress-nginx-controller'

An example Ingress that makes use of the controller:
<output_omitted>

```

6. We now have an ingress controller running, but no rules yet. View the resources that exist. Use the **-w** option to watch the ingress controller service show up. After it is available use **ctrl-c** to quit and move to the next command.

```
student@cp:~$ kubectl get ingress --all-namespaces
```

```
No resources found
```

```
student@cp:~$ kubectl --namespace default get services -o wide -w myingress-ingress-nginx-controller
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP
myingress-ingress-nginx-controller	LoadBalancer	10.104.227.79	<pending>
80:32558/TCP,443:30219/TCP	47s	app.kubernetes.io/component=controller,	app.kubernetes.io/instance=myingress,app.kubernetes.io/name=ingress-nginx

```
student@cp:~$ kubectl get pod --all-namespaces |grep nginx
```

default	myingress-ingress-nginx-controller-mrqt5	1/1	Running	0	20s
default	myingress-ingress-nginx-controller-pkdxm	1/1	Running	0	62s
default	nginx-b68dd9f75-h6ww7	1/1	Running	0	21h

7. Now we can add rules which match HTTP headers to services.

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



## ingress.yaml

```

1 apiVersion: networking.k8s.io/v1
2 kind: Ingress

```



```

3 metadata:
4   name: ingress-test
5   annotations:
6     kubernetes.io/ingress.class: nginx
7   namespace: default
8 spec:
9   rules:
10  - host: www.external.com
11    http:
12      paths:
13      - backend:
14          service:
15            name: web-one
16            port:
17              number: 80
18          path: /
19          pathType: ImplementationSpecific
20 status:
21   loadBalancer: {}

```

8. Create then verify the ingress is working. If you don't pass a matching header you should get a 404 error.

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

```
ingress.networking.k8s.io/ingress-test created
```

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

NAME	CLASS	HOSTS	ADDRESS	PORTS	AGE
ingress-test	<none>	www.external.com		80	5s

```
student@cp:~$ kubectl get pod -o wide |grep myingress
```

myingress-ingress-nginx-controller-mrqt5	1/1	Running	0	8m9s	192.168.219.118
cp <none>	<none>				
myingress-ingress-nginx-controller-pkdxm	1/1	Running	0	8m9s	192.168.219.118
cp <none>	<none>				

```
student@cp:~/ingress-nginx$ curl 192.168.219.118
```

```

<html>
<head><title>404 Not Found</title></head>
<body>
<center><h1>404 Not Found</h1></center>
<hr><center>nginx</center>
</body>
</html>

```

9. Check the ingress service and expect another 404 error, don't use the admission controller.

```
student@cp:~/ingress-nginx$ kubectl get svc |grep ingress
```

myingress-ingress-nginx-controller	LoadBalancer	10.104.227.79	<pending>
80:32558/TCP,443:30219/TCP		10m	
myingress-ingress-nginx-controller-admission	ClusterIP	10.97.132.127	<none>
443/TCP		10m	

```
student@cp:~/ingress-nginx$ curl 10.104.227.79
```

```
<html>
<head><title>404 Not Found</title></head>
<body>
<center><h1>404 Not Found</h1></center>
<hr><center>nginx</center>
</body>
</html>
```

10. Now pass a header which matches a URL to one of the services we exposed in an earlier step. You should see the default nginx or httpd web server page.

```
student@cp:~/ingress-nginx$ curl -H "Host: www.external.com" http://10.104.227.79
```

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

11. We can add an annotation to the ingress pods for Linkerd. You will get some warnings, but the command will work.

```
student@cp:~/ingress-nginx$ kubectl get ds myingress-ingress-nginx-controller -o yaml | \
  linkerd inject --ingress - | kubectl apply -f -
```

```
daemonset "myingress-ingress-nginx-controller" injected

Warning: resource daemonsets/myingress-ingress-nginx-controller is missing the
kubectl.kubernetes.io/last-applied-configuration annotation which is required
by kubectl apply. kubectl apply should only be used on resources created
declaratively by either kubectl create --save-config or kubectl apply. The
missing annotation will be patched automatically.
daemonset.apps/myingress-ingress-nginx-controller configured
```

12. Go to the Top page, change the namespace to default and the resource to daemonset/myingress-ingress-nginx-controller. Press start then pass more traffic to the ingress controller and view traffic metrics via the GUI. Let top run so we can see another page added in an upcoming step.

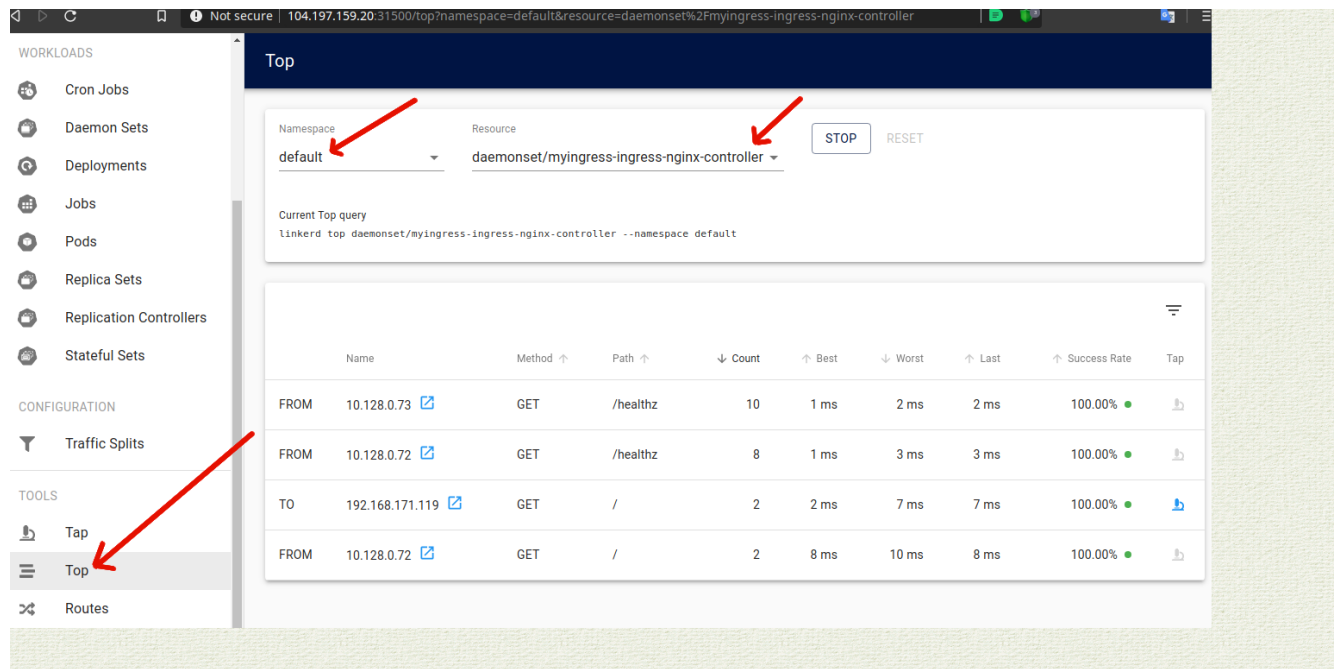


Figure 11.6: Ingress Traffic

13. At this point we would keep adding more and more servers. We'll configure one more, which would then could be a process continued as many times as desired.

Customize the web-two (or whichever deployment is running nginx) welcome page. Run a bash shell inside the web-two pod. Your pod name will end differently. Install **vim** or an editor inside the container then edit the `index.html` file of nginx so that the title of the web page will be Internal Welcome Page. Much of the command output is not shown below.

```
student@cp:~$ kubectl exec -it web-two- <Tab> -- /bin/bash
```



### On Container

```
root@web-two-...-:/# apt-get update

root@web-two-...-:/# apt-get install vim -y

root@web-two-...-:/# vim /usr/share/nginx/html/index.html

<!DOCTYPE html>
<html>
<head>
<title>Internal Welcome Page</title>    #<-- Edit this line
<style>
<output_omitted>

root@thirdpage-:/# exit
```

Edit the ingress rules to point the thirdpage service. It may be easiest to copy the existing `host` stanza and edit the `host` and `name`.

14. `student@cp:~$ kubectl edit ingress ingress-test`



## ingress-test

```

1  ....
2  spec:
3    rules:
4      - host: internal.org
5        http:
6          paths:
7            - backend:
8                service:
9                  name: web-two
10                 port:
11                   number: 80
12                 path: /
13                 pathType: ImplementationSpecific
14      - host: www.external.com
15        http:
16          paths:
17            - backend:
18                service:
19                  name: web-one
20                 port:
21                   number: 80
22                 path: /
23                 pathType: ImplementationSpecific
24  status:
25  ....

```

15. Test the second Host: setting using **curl** locally as well as from a remote system, be sure the <title> shows the non-default page. Use the main IP of either node. The Linkerd GUI should show a new T0 line, if you select the small blue box with an arrow you will see the traffic is going to internal.org.

```
student@cp:~$ curl -H "Host: internal.org" http://10.128.0.7/
```

```

<!DOCTYPE html>
<html>
<head>
<title>Internal Welcome Page</title>
<style>
<output_omitted>

```



FROM	192.168.74.128 	GET	/	3	4 ms	11 ms																
TO	192.168.74.152 	GET	/	2	2 ms	2 ms																
TO	192.168.74.153	<table><tr><th colspan="2">Source</th><th colspan="2">Destination</th></tr><tr><td><a href="#">ds/myingress-ingress-nginx-controller</a></td><td>→</td><td><a href="#">deploy/web-two</a></td><td></td></tr><tr><td><a href="#">po/myingress-ingress-nginx-controller-tgt7w</a></td><td>→</td><td><a href="#">po/web-two-7bfc4687c5-rxd6g</a></td><td></td></tr><tr><td>192.168.171.115</td><td>→</td><td>192.168.74.153</td><td></td></tr></table>					Source		Destination		<a href="#">ds/myingress-ingress-nginx-controller</a>	→	<a href="#">deploy/web-two</a>		<a href="#">po/myingress-ingress-nginx-controller-tgt7w</a>	→	<a href="#">po/web-two-7bfc4687c5-rxd6g</a>		192.168.171.115	→	192.168.74.153	
Source		Destination																				
<a href="#">ds/myingress-ingress-nginx-controller</a>	→	<a href="#">deploy/web-two</a>																				
<a href="#">po/myingress-ingress-nginx-controller-tgt7w</a>	→	<a href="#">po/web-two-7bfc4687c5-rxd6g</a>																				
192.168.171.115	→	192.168.74.153																				

Figure 11.7: Linkerd Top Metrics