Kubernetes have advanced networking capabilities that allow Pods and Services to communicate inside the cluster's network. An Ingress enables inbound connections to the cluster, allowing external traffic to reach the correct Pod.

Ingress enables externally-reachable urls, load balance traffic, terminate SSL, offer name based virtual hosting for a Kubernetes cluster.

In this scenario you will learn how to deploy and configure Ingress rules to manage incoming HTTP requests.

Step 1 - Create Deployment

To start, deploy an example HTTP server that will be the target of our requests. The deployment contains three deployments, one called *webapp1* and a second called *webapp2*, and a third called *webapp3* with a service for each.

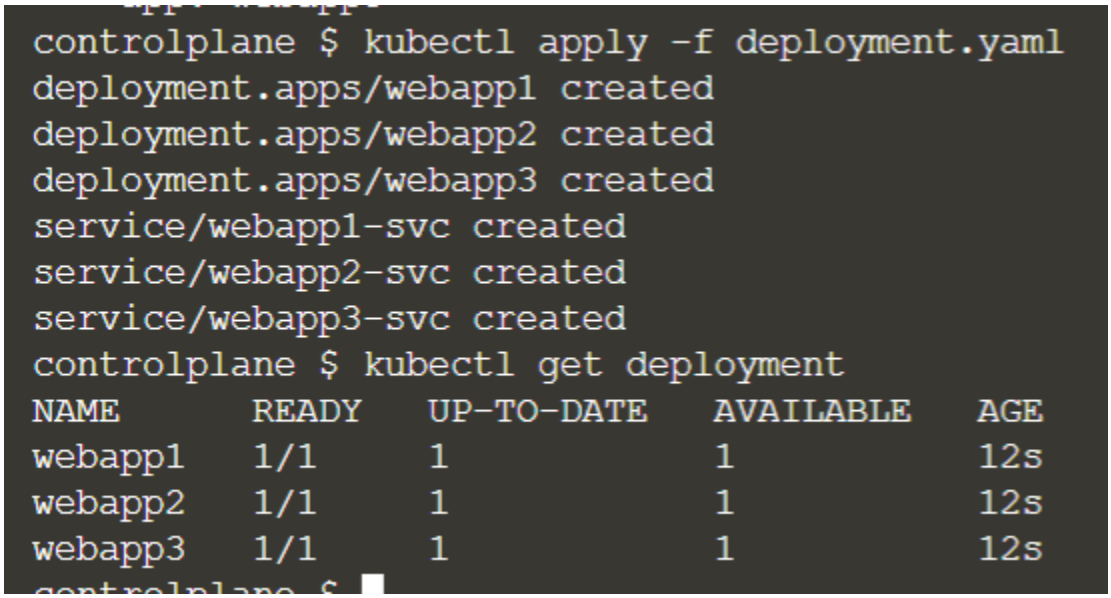
```
controlplane $ cat deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: webapp1
spec:
  replicas: 1
  selector:
    matchLabels:
      app: webapp1
  template:
    metadata:
      labels:
        app: webapp1
    spec:
      containers:
      - name: webapp1
        image: katacoda/docker-http-server:latest
        ports:
        - containerPort: 80
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: webapp2
spec:
  replicas: 1
  selector:
    matchLabels:
      app: webapp2
  template:
    metadata:
      labels:
        app: webapp2
    spec:
      containers:
      - name: webapp2
```

```
        image: katacoda/docker-http-server:latest
        ports:
        - containerPort: 80
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: webapp3
spec:
  replicas: 1
  selector:
    matchLabels:
      app: webapp3
  template:
    metadata:
      labels:
        app: webapp3
    spec:
      containers:
      - name: webapp3
        image: katacoda/docker-http-server:latest
        ports:
        - containerPort: 80
---
apiVersion: v1
kind: Service
metadata:
  name: webapp1-svc
  labels:
    app: webapp1
spec:
  ports:
  - port: 80
  selector:
    app: webapp1
---
apiVersion: v1
kind: Service
metadata:
  name: webapp2-svc
  labels:
    app: webapp2
spec:
  ports:
  - port: 80
  selector:
    app: webapp2
---
apiVersion: v1
kind: Service
metadata:
  name: webapp3-svc
  labels:
    app: webapp3
spec:
  ports:
```

```
  - port: 80
  selector:
    app: webapp3
```

Deploy the definitions with `kubectl apply -f deployment.yaml`

The status can be viewed with `kubectl get deployment`



Step 2 - Deploy Ingress

The YAML file *ingress.yaml* defines a Nginx-based Ingress controller together with a service making it available on Port 80 to external connections using ExternalIPs. If the Kubernetes cluster was running on a cloud provider then it would use a LoadBalancer service type.

The ServiceAccount defines the account with a set of permissions on how to access the cluster to access the defined Ingress Rules. The default server secret is a self-signed certificate for other Nginx example SSL connections and is required by the Nginx Default Example.

```
controlplane $ cat ingress.yaml
apiVersion: v1
kind: Namespace
metadata:
  name: nginx-ingress
---
apiVersion: v1
kind: Secret
metadata:
  name: default-server-secret
  namespace: nginx-ingress
type: kubernetes.io/tls
data:
```

```
  tls.crt:
LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUN2akNDQWFZQ0NRREFPRjl0THNhWFhEQU5
CZ2txaGtpRzl3MEJBUXNGQURBaE1SOHdIUVlEVlFRRERCWk8KUjBsT1dFbHVaM0psYzNORGlyNTBj
bTlzYkdWeU1CNFhEVEU0TURreE1qRTRNRE16TlZvWERUSXpNRGt4TVRFNApNRE16TlZvd0lURWZ
NQjBHQTFVRUF3d1dUa2RKVGxoSmJtZHlaWE56UTI5dWRISnZiR3hsY2pDQ0FTSXdEUVlKCktvWklod
mNOQVFFQkJRQURnZ0VQQURDQ0FRb0NnZ0VCQUwvN2hIUEtFWGRMdjNyaUM3QlBrMTNpWkt5eT
lyQ08KR2xZUXYyK2EzUDF0azIrS3YwVGF5aGRCbDRrcnNUcTZzZm8vWUk1Y2Vhbkw4WGM3U1pyQk
VRYm9EN2REbWs1Qgo4eDZLS2xHWU5lWlg0Rm5UZ0VPaStlM2ptTFFxRlBSY1kzVnNPazFFeUZBL0J
nWlJVbkNHZUtGeERSN0tQdGhyCmtqSXVuektURXUyaDU4Tlp0S21ScUJHdDEwcTNRYzhZT3ExM2Fn
bmovUWRjc0ZYYTJnMjB1K1lYZDdoZ3krZksKWk4vVUkxQUQ0YzZyM1lma1ZWUmVHd1lxQVp1WXN2
V0RKbW1GNWRwdEMzN011cDBPRUxVTExSakZJOTZXNXIwSAo1TmdPc25NWFJNV1hYVlpiNWRxT3
R0SmRtS3FhZ25TZ1JQQVpQN2MwQjFQU2FqYzZjNGZRVXpNQ0F3RUFBVEFOCkJna3Foa2lHOXcw
QkFRc0ZBQU9DQVFFQWpLb2tRdGRPcEsrTzhibWVPc3lySmdJSXJycVFVY2ZOUitjb0hZVUoKdGhrYn
hITFMzR3VBTWI5dm15VExPY2xxeC9aYzJPblEwMEJCLzlTb0swcitFZ1U2UlVrRWtWcitTTFA3NTdUWg
ozZWI4dmdPdEduMS9ienM3bzNBaS9kclkrcUI5Q2k1S3lPc3FHTG1US2xFaUtOYkcyR1ZyTWxjS0ZYQU
80YTY3Cklnc1hzYktNbTQwV1U3cG9mcGltU1ZmaXFSdkV5YmN3N0NYODF6cFErUyt1eHRYK2VBZ3V
0NHh3VlI5d2IyVXYKelhuZk9HbWhWNThDd1dIQnNKa0kxNXhaa2VUWXdSN0diaEFMSkZUUkk3dkhvQ
XprTWIzbjAxQjQyWjNrN3RXNQpJUDFmTlpIOFUvOWxiUHNoT21FRFZkdjF5ZytVRVJxbStGSis2R0oxeF
JGcGZnPT0KLS0tLS1FTkQgQ0VSVElGSUNBVEUtLS0tLQo=
  tls.key:
LS0tLS1CRUdJTiBSU0EgUFJJVkFURSBLRVktLS0tLQpNSUlFcEFJQkFBS0NBUUVBdi91RWM4b1JkM
HUvZXVJTHNFK1RYZUprckxMMnNJNGFWaEMvYjVyYy9XMlRiNHEvClJOcktGMEdYaVN1eE9ycXgrajln
amx4NXFjdnhkenRKbXNFUkJ1Z1B0ME9hVGtIekhvb3FVWmcwZGxmZ1dkT0EKUTZMNTdlT1l0Q29VO
UZ4amRXdzZUVVRJVUQ4R0JsRlNjSVo0b1hFTkhzbysyR3VTTWk2Zk1wTVM3YUhudzFtMApxWkdvRW
EzWFNyZEJ6eGc2clhkcUNlUDlCMXl3VmRyYURiUzc1aGQzdUdETDU4cGszOVFqVUFQaHpxdmRoK1J
WClZGNGJCaW9CbTVpeTlZTW1hWVhsMm0wTGZzeTZuUTRRdFFzdEdNVWozcGJtdlFmazJBNnljeGR
FeFpkZFZsdmwKMm82MjBsMllxcHFDZEtCRThCay90elFIVTlKcU56cHpoOUJUTXdJREFRQUJBb0lCQV
FDZklHbXowOHhRVmorNwpLZnZJUXQwQ0YzR2MxNld6eDhVNml4MHg4Mm15d1kxUUNlL3BzWE9LZl
RxT1h1SENyUlp5TnUvZ2IvUUQ4bUFOCmxOMjRZTWl0TWRJODg5TEZoTkp3QU5OODJDeTczckM5bz
VvUDlkazAvYzRlbjAzSkVYNzZ5QjgzQm9rR1FvYksKMjhMNk0rdHUzUmFqNjd6Vmc2d2szaEhrU0pXSzB
wV1YrSjdrUkRWYmhDYUZhNk5nMUZNRWxhTlozVDhhUUtyQgpDUDNDeEFTdjYxWTk5TEI4KzNXWV
FIK3NYaTVGM01pYVNBZ1BkQUk3WEh1dXFET1IvMU5PL0JoSGt1aVg2QnRtCnorNTZud2pZMy8yUytS
RmNBc3JMTnIwMDJZZi9oY0IraVlDNzVWYmcydVd6WTY3TWdOTGQ5VW9RU3BDRkYrVm4KM0cyUn
hybnhBb0dCQU40U3M0ZVlPU2huMVpQQjdhTUZsY0k2RHR2S2ErTGZTTXFyY2pOZjJlSEpZNnhubmxK
dgpGenpGL2RiVWVTbWxSekR0WkdlcXZXaHFISy9iTjIyeWJhOU1WMDlRQ0JFTk5jNmtWajJTVHpUWk
JVbEx4QzYrCk93Z0wyZHhKendWelU0VC84ajdHalRUN05BZVpFS2FvRHFyRG5BYWkyaW5oZU1JVW
ZHRXFGKzJyQW9HQkFOMVAKK0tZL0lsS3RWRzRKSklQNzBjUis3RmpyeXJpY05iWCtQVzUvOXFHaW
xnY2grZ3l4b25BWlBpd2NpeDN3QVpGdwpaZC96ZFB2aTBkWEppc1BSZjRMazg5b2pCUmpiRmRmc2l5
UmJYbyt3TFU4NUhRU2NGMnN5aUFPaTVBRHdVU0FkCm45YWFweUNweEFkREtERHdObit3ZFhtaTZ
0OHRpSFRkK3RoVDhkaVpBb0dCQUt6Wis1bG9OOTBtYlF4VVh5YUwKMjFSUm9tMGJjcndsTmVCaWN
FSmlzaEhYa2xpSVVxZ3hSZklNM2hhUVRUcklKZENFaHFsV01aV0xPb2I2NTNyZgo3aFlMSXM1ZUtka3o
0aFRVdnpldm9TMHVXcm9CV2xOVHlGanIrSWhKZnZUc0hpOGdsU3FkbXgySkJhZUFVWUNXCndNdlQ
4NmNLclNyNkQrZG8wS05FZzFsL0FvR0FlMkFVdHVFbFNqLzBmRzgrV3hHc1RFV1JqclRNUzRSUjhRW
XQKeXdjdFA4aDZxTGxKUTRCWGxQU05rMXZLTmtOUkxIb2pZT2pCQTViYjhibXNVU1BlV09NNENoaFJ
4QnlHbmR2eAphYkJDRkFwY0IvbEg4d1R0alVZYlN5T294ZGt5OEp0ek90ajJhS0FiZHd6NlArWDZDODhj
ZmxYVFo5MWpYL3RMCjF3TmRKS2tDZ1lCbyt0UzB5TzJ2SWFmK2UwSkN5TGhzVDQ5cTN3Zis2QWV
qWGx2WDJ1VnRYejN5QTZnbXo5aCsKcDNlK2JMRUxwb3B0WFhNdUFRR0xhUkcrYlNNcjR5dERYbE5
ZSndUeThXczNKY3dlSTdqZVp2b0ZpbmNvVlVlMwphdmxoTUVCRGYxSjltSDB5cDBwWUNaS2ROdHNv
ZEZtQktzVEtQMjJhTmtsVVhCS3gyZzR6cFE9PQotLS0tLUVORCBSU0EgUFJJVkFURSBLRVktLS0tLQo
=
---
apiVersion: v1
kind: ServiceAccount
metadata:
  name: nginx-ingress
  namespace: nginx-ingress
```

```
---
kind: ConfigMap
apiVersion: v1
metadata:
  name: nginx-config
  namespace: nginx-ingress
data:
---
# Described at: https://docs.nginx.com/nginx-ingress-controller/installation/installation-with-manifests/
# Source from:
https://github.com/nginxinc/kubernetes-ingress/blob/master/deployments/common/ingress-class.yaml
apiVersion: networking.k8s.io/v1beta1
kind: IngressClass
metadata:
  name: nginx
  # annotations:
  #   ingressclass.kubernetes.io/is-default-class: "true"
spec:
  controller: nginx.org/ingress-controller
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-ingress
  namespace: nginx-ingress
spec:
  replicas: 1
  selector:
    matchLabels:
      app: nginx-ingress
  template:
    metadata:
      labels:
        app: nginx-ingress
    spec:
      serviceAccountName: nginx-ingress
      containers:
      - image: nginx/nginx-ingress:edge
        imagePullPolicy: Always
        name: nginx-ingress
        ports:
        - name: http
          containerPort: 80
        - name: https
          containerPort: 443
        env:
        - name: POD_NAMESPACE
          valueFrom:
            fieldRef:
              fieldPath: metadata.namespace
        - name: POD_NAME
          valueFrom:
            fieldRef:
              fieldPath: metadata.name
        args:
          - -nginx-configmaps=$(POD_NAMESPACE)/nginx-config
```

```
        - -default-server-tls-secret=$(POD_NAMESPACE)/default-server-secret
---
apiVersion: v1
kind: Service
metadata:
  name: nginx-ingress
  namespace: nginx-ingress
spec:
  type: NodePort
  ports:
  - port: 80
    targetPort: 80
    protocol: TCP
    name: http
  - port: 443
    targetPort: 443
    protocol: TCP
    name: https
  selector:
    app: nginx-ingress
  externalIPs:
    - 10.0.0.6
```

Task

The Ingress controllers are deployed in a familiar fashion to other Kubernetes objects with `kubectl create -f ingress.yaml`

The status can be identified using `kubectl get deployment -n nginx-ingress`

```
controlplane $ kubectl create -f ingress.yaml
namespace/nginx-ingress created
secret/default-server-secret created
serviceaccount/nginx-ingress created
configmap/nginx-config created
ingressclass.networking.k8s.io/nginx created
deployment.apps/nginx-ingress created
service/nginx-ingress created
controlplane $ kubectl get deployment -n nginx-ingress
NAME            READY   UP-TO-DATE   AVAILABLE   AGE
nginx-ingress   0/1     1            0           3s
```

Step 3 - Deploy Ingress Rules

Ingress rules are an object type with Kubernetes. The rules can be based on a request host (domain), or the path of the request, or a combination of both.

An example set of rules are defined within `cat ingress-rules.yaml`

The important parts of the rules are defined below.

The rules apply to requests for the host *my.kubernetes.example*. Two rules are defined based on the path request with a single catch all definition. Requests to the path */webapp1* are forwarded onto the service *webapp1-svc*. Likewise, the requests to */webapp2* are forwarded to *webapp2-svc*. If no rules apply, *webapp3-svc* will be used.

This demonstrates how an application's URL structure can behave independently about how the applications are deployed.

```
controlplane $ cat ingress-rules.yaml
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: webapp-ingress
spec:
  ingressClassName: nginx
  rules:
  - host: my.kubernetes.example
    http:
      paths:
      - path: /webapp1
        backend:
          serviceName: webapp1-svc
          servicePort: 80
      - path: /webapp2
        backend:
          serviceName: webapp2-svc
          servicePort: 80
      - backend:
          serviceName: webapp3-svc
          servicePort: 80
```

Task
As with all Kubernetes objects, they can be deployed via

```
kubectl create -f ingress-rules.yaml
```

Once deployed, the status of all the Ingress rules can be discovered via

```
kubectl get ing
```

```
controlplane $ kubectl create -f ingress-rules.yaml
ingress.extensions/webapp-ingress created
controlplane $ kubectl get ing
NAME             CLASS   HOSTS                   ADDRESS   PORTS   AGE
webapp-ingress   nginx   my.kubernetes.example             80      4s
```

Step 4 - Test

With the Ingress rules applied, the traffic will be routed to the defined place.

The first request will be processed by the *webapp1* deployment.

```
curl -H "Host: my.kubernetes.example" 10.0.0.6/webapp1
```

The second request will be processed by the *webapp2* deployment.

```
curl -H "Host: my.kubernetes.example" 10.0.0.6/webapp2
```

Finally, all other requests will be processed by *webapp3* deployment.

```
curl -H "Host: my.kubernetes.example" 10.0.0.6
```