NGINX Ingress Controller on GKE

In Kubernetes, Ingress allows external users and client applications access to HTTP services. Ingress consists of two components: an *Ingress Resource* and an *Ingress Controller*:

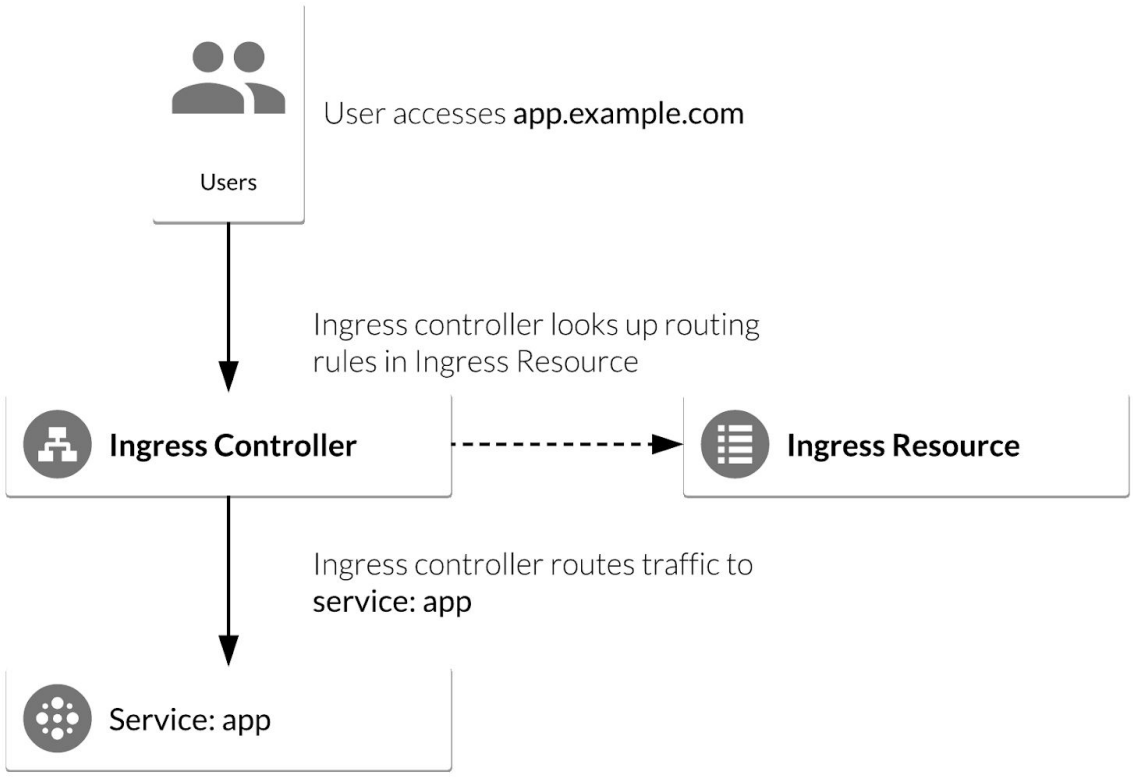
- **Ingress Resource** is a collection of rules for the inbound traffic to reach Services. These are Layer 7 (L7) rules that allow hostnames (and optionally paths) to be directed to specific Services in Kubernetes.
- **Ingress Controller** acts upon the rules set by the Ingress Resource, typically via an HTTP or L7 load balancer. It is vital that both pieces are properly configured so that traffic can be routed from an outside client to a Kubernetes Service.

NGINX—a high performance web server—is a popular choice for an Ingress Controller because of its robustness and the many features it boasts. For example, it supports:

- **Websockets**, which allows you to load balance Websocket applications.
- **SSL Services**, which allows you to load balance HTTPS applications.
- **Rewrites**, which allows you to rewrite the URI of a request before sending it to the application.
- **Session Persistence** (NGINX Plus only), which guarantees that all the requests from the same client are always passed to the same backend container.

- **JWTs** (NGINX Plus only), which allows NGINX Plus to authenticate requests by validating JSON Web Tokens (JWTs).

The following diagram illustrates the basic flow of an Ingress Controller in Google Cloud and gives you a rough idea of what you'll be building:



In this lab, you will configure a Kubernetes deployment with an Ingress Resource. You will use NGINX as an Ingress Controller, which you will use to route and load balance traffic from external clients to the deployment. More specifically, you will:

- Deploy a simple Kubernetes web application.
- Deploy an NGINX Ingress Controller using a stable Helm Chart.

- Deploy an Ingress Resource for the application that uses NGINX Ingress as the controller.
- Test NGINX Ingress functionality by accessing the Google Cloud L4 (TCP/UDP) Load Balancer frontend IP and ensure it can access the web application

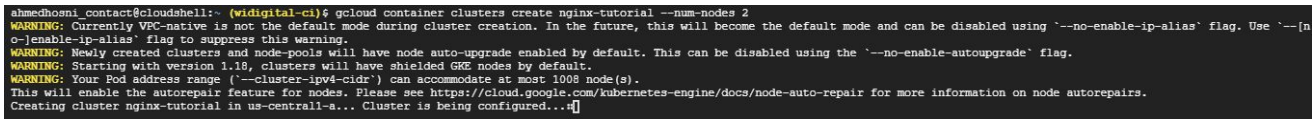
- **Set a zone**

```
gcloud compute zones list
```

```
gcloud config set compute/zone us-central1-a
```

- **Create a Kubernetes cluster**

```
gcloud container clusters create nginx-tutorial --num-nodes 2
```



- **Deploy an application in Kubernetes Engine**

Now that you have Helm configured, let's deploy a simple web-based application from the Google Cloud Repository. This application will be used as the backend for the Ingress.

```
kubectl create deployment hello-app --image=gcr.io/google-samples/hello-app:1.0
kubectl expose deployment hello-app  --port=8080
```

1- Deploy NGINX Ingress Controller

Let's go ahead and deploy the NGINX Ingress Controller. Run the following command to do so:

```
helm install nginx-ingress stable/nginx-ingress --set rbac.create=true
```

```
kubectl get ingress
```

```
ahmedhosni_contact@cloudshell:~$ kubectl get services
NAME                                          TYPE           CLUSTER-IP     EXTERNAL-IP      PORT(S)                      AGE
cd-redis-master                               ClusterIP      10.7.249.168   <none>           6379/TCP                     7h44m
cd-spinnaker-halyard                          ClusterIP      None           <none>           8064/TCP                     7h44m
esp-srv                                       NodePort       10.7.245.216   <none>           80:30591/TCP                 42d
hello-app                                     ClusterIP      10.7.248.154   <none>           8080/TCP                     2m49s
incendiary-beetle-nginx-ingress-controller    LoadBalancer   10.7.249.41    104.154.77.34    80:31653/TCP,443:30746/TCP   42d
incendiary-beetle-nginx-ingress-default-backend ClusterIP    10.7.253.119   <none>           80/TCP                       42d
kubernetes                                    ClusterIP      10.7.240.1     <none>           443/TCP                      42d
mycache-mcrouter                              ClusterIP      None           <none>           5000/TCP                     9d
mycache-memcached                             ClusterIP      None           <none>           11211/TCP                    9d
nginx-ingress-controller                      LoadBalancer   10.7.245.101   34.123.127.207   80:30708/TCP,443:32503/TCP   102s
nginx-ingress-default-backend                 ClusterIP      10.7.248.241   <none>           80/TCP                       102s
spinnaker-1598656841-minio                    ClusterIP      10.7.243.204   <none>           9000/TCP                     7h14m
spinnaker-1598656841-redis-headless           ClusterIP      None           <none>           6379/TCP                     7h14m
spinnaker-1598656841-redis-master             ClusterIP      10.7.253.208   <none>           6379/TCP                     7h14m
spinnaker-1598656841-spi-halyard              ClusterIP      None           <none>           8064/TCP                     7h14m
```

Note the second service, `nginx-ingress-default-backend`. The default backend is a Service which handles all URL paths and hosts the NGINX controller. The default backend exposes two URLs:

- `/healthz` that returns 200
- `/` that returns 404

Wait a few moments while the Google Cloud L4 Load Balancer gets deployed. Confirm that the `nginx-ingress-controller` Service has been deployed and that you have an external IP address associated with the service by running the following command:

```
kubectl get service nginx-ingress-controller
```

You receive a similar output:

```
ahmedhosni_contact@cloudshell:~$ kubectl get service nginx-ingress-controller
NAME                       TYPE           CLUSTER-IP     EXTERNAL-IP      PORT(S)                      AGE
nginx-ingress-controller   LoadBalancer   10.7.245.101   34.123.127.207   80:30708/TCP,443:32503/TCP   5m56s
```

2- Configure Ingress Resource to use NGINX Ingress Controller

An Ingress Resource object is a collection of L7 rules for routing inbound traffic to Kubernetes Services.

Multiple rules can be defined in one Ingress Resource or they can be split up into multiple Ingress Resource manifests. The Ingress Resource also determines which controller to utilize to serve traffic.

This can be set with an annotation, `kubernetes.io/ingress.class`, in the metadata section of the Ingress Resource. For the NGINX controller, you will use the `nginx` value as shown below:

```
annotations: kubernetes.io/ingress.class: nginx
```

On Kubernetes Engine, if no annotation is defined under the metadata section, the Ingress Resource uses the Google Cloud GCLB L7 load balancer to serve traffic. This method can also be forced by setting the annotation's value to `gce`, like below:

```
annotations: kubernetes.io/ingress.class: gce
```

Let's create a simple Ingress Resource YAML file which uses the NGINX Ingress Controller and has one path rule defined by typing the following commands:

```
touch ingress-resource.yaml
nano ingress-resource.yaml
```

Add the following content in `ingress-resource.yaml` file:

```
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: ingress-resource
  annotations:
    kubernetes.io/ingress.class: nginx
    nginx.ingress.kubernetes.io/ssl-redirect: "false"
spec:
  rules:
  - http:
      paths:
      - path: /hello
        backend:
          serviceName: hello-app
          servicePort: 8080
```

then press **Ctrl-X**, then press **Y**, then press **Enter** to save the file.

The `kind: Ingress` dictates it is an Ingress Resource object. This Ingress Resource defines an inbound L7 rule for path `/hello` to service `hello-app` on port `8080`.
Run the following command to apply those rules to our Kubernetes application:

```
kubectl apply -f ingress-resource.yaml
```

Verify that Ingress Resource has been created:

```
ahmedhosni_contact@cloudshell:~$ kubectl apply -f ingress-resource.yaml
ingress.extensions/ingress-resource created
```

Note: The IP address for the Ingress Resource will not be defined right away. Wait a few moments for the ADDRESS field to get populate

Your output should resemble the following:

```
ahmedhosni_contact@cloudshell:~$ kubectl get ingress ingress-resource
NAME               HOSTS   ADDRESS        PORTS   AGE
ingress-resource   *       34.68.80.96    80      2m6s
```

3- Test Ingress and default backend

You should now be able to access the web application by going to the `EXTERNAL-IP/hello` address of the **NGINX ingress controller** (found by running `kubectl get service nginx-ingress-controller`).
Open a new tab and go to the following, replacing the `external-ip-of-ingress-controller` with the external IP address of the NGINX ingress controller:

```
http://external-ip-of-ingress-controller/hello
```

Your page should look similar to the following:

To check if the `default-backend` service is working properly, access any path (other than the path `/hello` defined in the Ingress Resource) and ensure you receive a `404` message. For example:

```
http://external-ip-of-ingress-controller/test
```