Exposing Kubernetes Applications using Services

Agenda:

1. Create a Kubernetes Cluster
2. Firewall Rules Configured
3. Create a POD
4. ClusterIp Service
5. NodePort Service
6. LoadBalancer Service

Create a Kubernetes cluster

To get more details about how to create, please follow this blog.

VPC Create

```
gcloud compute networks create vpc-k8s
```

Firewall rule with tag `cluster`

```
gcloud compute firewall-rules create allow-ext1 --allow tcp:22,tcp:6443,icmp --networ
k vpc-k8s  --target-tags=cluster --source-ranges 0.0.0.0/0
```

Cluster using the tag `cluster`

```
gcloud container clusters create my-k8s-cluster --num-nodes 3 --network vpc-k8s --zon
e us-central1-a --tags cluster --scopes=storage-rw,compute-ro
```

Cluster is ready and you can run some basic commands like `kubectl get nodes`

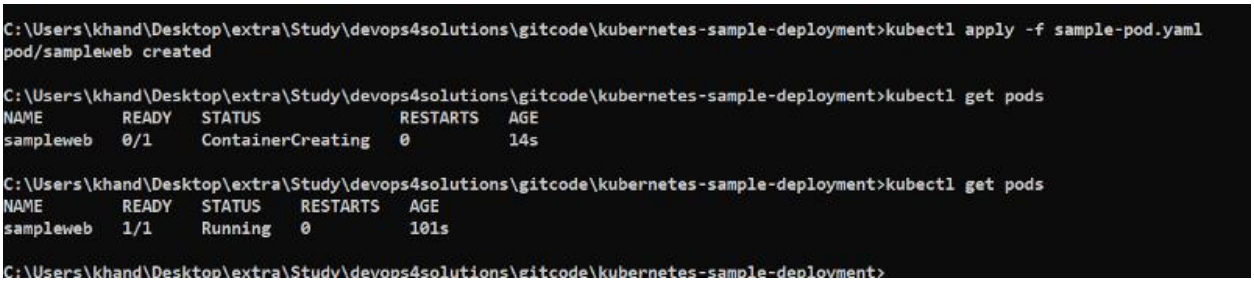
Create a Pod

This yaml file will create a pod using this docker image

```
kind: Pod
apiVersion: v1
metadata:
  name: sampleweb
  labels:
    tier: frontend
spec:
  containers:
  - name: sampleweb
    image: nikhilnidhi/samplewebapp
```

Apply the changes and check the pods details

```
kubectl apply -f sample-pod.yaml
kubectl get pods
kubectl get pod -o wide
```



- Each Kubernetes Pod gets its own IP address.
- used for pod-to-pod communication
- not for routing external traffic to pods

Hence, you will not be able to access this IP outside the cluster.

Access the url from inside the pod using the `pod-ip` and the `port` on which your application is listening using below command:

```
kubectl exec -it sampleweb -- sh
curl 10.32.2.7:8080/LoginWebApp-1/
```

`samplweb` – podname

`10.32.2.7` – internal IP of the pod

`8080` – port on which my application is running

This is how you can access your application from inside the pod.

Kubernetes Services

Kubernetes provides a concept called a **Service** to abstract the network access to your application's pods.

A Service acts as a network proxy to accept network traffic from external users and then distributes it to internal pods.

How we will be create a relation between pods and services ? How a service will know about the Pods?

Kubernetes uses labels, which are defined in the pod definitions, and label selectors, which are defined in the Service definition, to describe this relationship.

Types of Services

1. ClusterIP
2. NodePort
3. LoadBalancer

ClusterIP

`cluster-ip` is the default service if you don't provide the type in yaml then this service will automatically get created.

It is good for debugging purposes

Let's create a Service using this file

```
kind: Service
apiVersion: v1
metadata:
  name: sampleweb
spec:
  selector:
    tier: frontend
  type: ClusterIP
  ports:
    - port: 82
      targetPort: 8080
```

Run the command

```
kubectl apply -f sample-service-clusterIP.yaml
```

```
C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kubernetes-sample-deployment>kubectl apply -f sample-service-clusterIP.yaml
service/sampleweb created

C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kubernetes-sample-deployment>
```

```
kubectl get pods --show-label
```

```
C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kubernetes-sample-deployment>kubectl get pods --show-labels
NAME        READY   STATUS    RESTARTS   AGE   LABELS
sampleweb   1/1     Running   0          14m   tier=frontend
```

Check the Service—You should be able to see the service `sampleweb`

```
kubectl get svc
```

```
NAME         TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.35.240.1    <none>        443/TCP   19m
sampleweb    ClusterIP   10.35.246.29   <none>        82/TCP    2m19s
```

Now we can access using the cluster IP of your service

```
kubectl exec -it sampleweb -- sh
curl http://10.35.246.29:82/LoginWebApp-1
```

```
# curl http://10.35.246.29:82/LoginWebApp-1/

<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>JSP Example</title>
    </head>
    <body bgcolor="silver">
        <form method="post" action="login.jsp">
            <center>
            <table border="0" width="30%" cellpadding="3">
                <thead>
                    <tr>
                        <th colspan="2">Login Page</th>
                    </tr>
                </thead>
                <tbody>
                    <tr>
                        <td>Username</td>
                        <td><input type="text" name="userName" value="" /></td>
                    </tr>
                    <tr>
                        <td>Password</td>
                        <td><input type="password" name="password" value="" /></td>
                    </tr>
                    <tr>
```

NodePort

Now we will create a **NodePort** Service to enable external users to access the internal pods without entering the cluster.

If the nodes in your cluster have external IP addresses, find the external IP address of one of your nodes using below command:

```
kubectl get nodes --output wide
```

Let's create a NodePort Service using this file

You can specify the nodePort also in the yaml file or you can let cluster automatically generated a port for you.

```
kind: Service
apiVersion: v1
metadata:
  name: sampleweb
spec:
  selector:
    tier: frontend
  type: NodePort
  ports:
```

```
    - port: 82
      targetPort: 8080
```

Check the service

```
kubectl get service
```

```
C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kubernetes-sample-deployment>kubectl get service
NAME         TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
kubernetes   ClusterIP   10.35.240.1    <none>        443/TCP        25m
sampleweb    NodePort    10.35.246.29   <none>        82:30345/TCP   8m9s
```

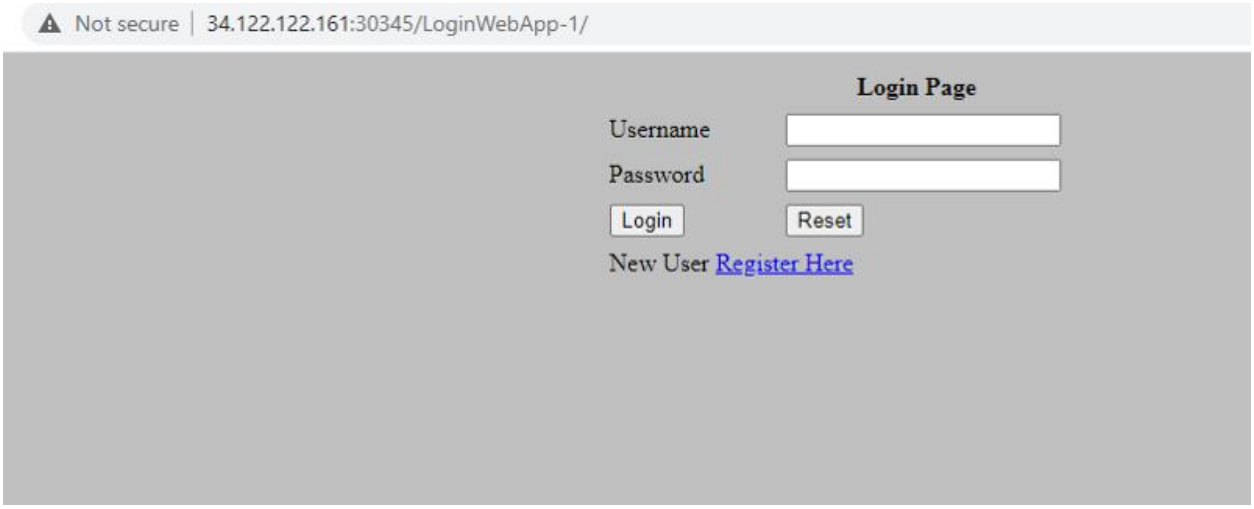
`Port 30345` is an auto-generated port that's exposed on every node, which is done intentionally so that external users can access it.

For you to access it on the browser you need to open this port using below command

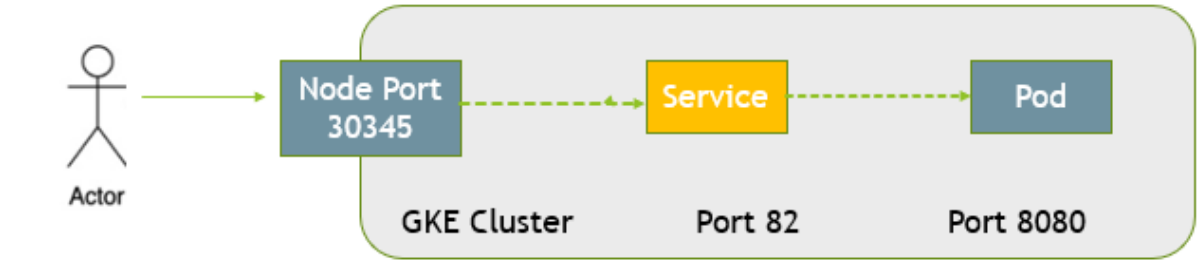
```
gcloud compute firewall-rules update allow-ext1 --allow tcp:30345
```

After this you can use the `node-externalip` and browse it using below url

```
http://node-externalip:30345/LoginWebApp-1
```



Under the hood, there are several layers of traffic transitions that make this happen:



- The first layer is from the external user to the machine IP at the auto-generated random port (30345).
- The second layer is from the random port (30345) to the Service IP (10.X.X.X) at port **82**.
- The third layer is from the Service IP (10.X.X.X) ultimately to the pod IP at port **8080**.

LoadBalancer

Create a LoadBalancer service

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-deployment-50001
spec:
  selector:
    matchLabels:
      app: products
      department: sales
  replicas: 3
  template:
    metadata:
      labels:
        app: products
        department: sales
    spec:
      containers:
      - name: hello
        image: "gcr.io/google-samples/hello-app:2.0"
        env:
        - name: "PORT"
          value: "50001"
```

Run the below command

```
kubectl apply -f sample-deployment.yaml
```

Create a service

```
apiVersion: v1
kind: Service
metadata:
  name: my-lb-service
spec:
  type: LoadBalancer
  selector:
    app: products
    department: sales
  ports:
  - protocol: TCP
    port: 60000
    targetPort: 50001
```

Run the below command

```
kubectl apply -f
```

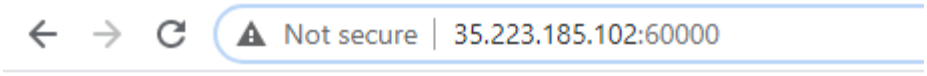
```
C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kubernetes-sample-deployment>kubectl get service
NAME            TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)           AGE
kubernetes      ClusterIP      10.35.240.1     <none>        443/TCP           27h
my-lb-service   LoadBalancer   10.35.253.104   <pending>     60000:30991/TCP   14s
sampleweb       ClusterIP      10.35.255.154   <none>        82/TCP            22h
```

`kubectl get service my-lb-service --output yaml`

```
C:\Users\khand\Desktop\extra\Study\devops4solutions\gitcode\kuberne
apiVersion: v1
kind: Service
metadata:
  annotations:
    kubectl.kubernetes.io/last-applied-configuration: |
      {"apiVersion":"v1","kind":"Service","metadata":{"annotations"
protocol":"TCP","targetPort":50001}],"selector":{"app":"products","
  creationTimestamp: "2020-12-10T20:07:51Z"
  finalizers:
  - service.kubernetes.io/load-balancer-cleanup
  name: my-lb-service
  namespace: default
  resourceVersion: "422086"
  selfLink: /api/v1/namespaces/default/services/my-lb-service
  uid: d69b85eb-d2c1-4523-baf1-b933b8483440
spec:
  clusterIP: 10.35.253.104
  externalTrafficPolicy: Cluster
  ports:
  - nodePort: 30991
    port: 60000
    protocol: TCP
    targetPort: 50001
  selector:
    app: products
    department: sales
  sessionAffinity: None
  type: LoadBalancer
status:
  loadBalancer:
    ingress:
    - ip: 35.223.185.102
```

Wait a few minutes for GKE to configure the load balancer.

In your browser's address bar, enter the following:




```
Hello, world!
Version: 2.0.0
Hostname: my-deployment-50001-5949f77949-mbtjj
```