

# Despliegue de un Apache HTTP Server en Oracle Kubernetes Engine (OKE)

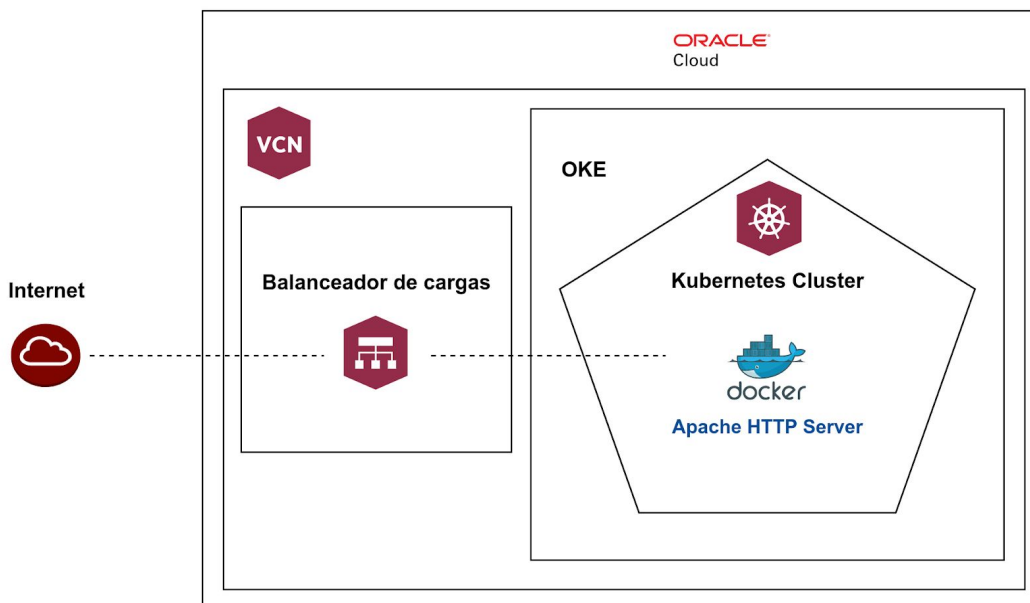
## Introducción

En este documento se expone una serie de pasos para realizar el despliegue de un Apache HTTP Server en Oracle Kubernetes Engine (OKE), con el fin de obtener un servicio contenerizado y orquestado por la solución de Kubernetes disponible en Oracle Cloud Infrastructure (OCI).

Obs: Para el correcto entendimiento del ejercicio se debe tener claro conceptos básicos sobre: Oracle Cloud Infrastructure (OCI), Apache HTTP Server, Microservicios, Docker y Kubernetes.

## Visión General

En el siguiente gráfico se puede observar la arquitectura a implementar a alto nivel:



Todos los componentes deben ser creados en la infraestructura cloud proporcionada por Oracle.

A continuación, se presentan las secciones en las que está dividido este artículo:

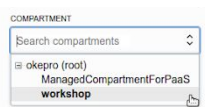
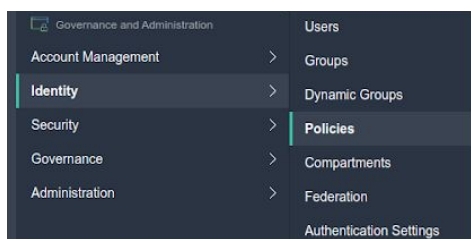
- **Aprovisionamiento y configuración del OKE en OCI**
- **Despliegue del Apache HTTP Server en el clúster Kubernetes (Cloud Shell)**

## Desarrollo

### 1. Aprovisionamiento y configuración del OKE en OCI

Primero, se debe agregar la siguiente política en el compartimiento raíz:

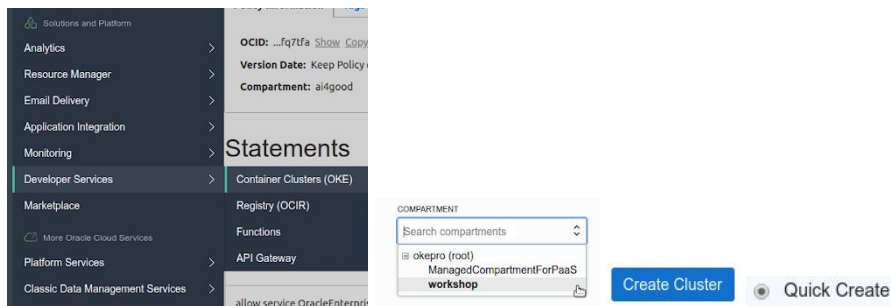
*allow service OKE to manage all-resources in tenancy*



PSM-root-policy  
OCID: ...fq7tfa Show Copy

Add Policy Statement

Después, se crea una instancia de OKE.



NAME

cluster1

COMPARTMENT

workshop

okepro (root)/workshop

KUBERNETES VERSION ⓘ

v1.15.7

CHOOSE VISIBILITY TYPE

**Private**

The Kubernetes worker nodes that are created will be hosted in private subnet(s)

✓

**Public**

The Kubernetes worker nodes that are created will be hosted in public subnet(s)

SHAPE ⓘ

VM.Standard2.1

NUMBER OF NODES ⓘ


3

[Show Advanced Options](#)

Add Ons

☒ Kubernetes Dashboard Enabled

☒ Tiller (Helm) Enabled



ACTIVE

## cluster1

[Access Kubeconfig](#) [Delete Cluster](#)

Cluster Details

### Cluster Information

Cluster Status: Active

Node Pools: 1

Cluster Id: [...cywgzbtrmtvg](#) [Show](#) [Copy](#)

Compartment: okepro (root)/workshop

Launched: Mon, 16 Mar 2020 14:24:54 GMT

Created By: junior.palomino@oracle.com

### Network Information

VCN Name: [oke-von-quick-cluster1-288076fb8](#)

VCN Id: [...rzp6myg](#) [Show](#) [Copy](#)

Compartment: okepro (root)/workshop

Kubernetes Version: v1.15.7

Kubernetes Address: [...207.6443](#) [Show](#) [Copy](#)

Kubernetes Dashboard: Enabled

Tiller (Helm): Not Enabled

Encryption Key: Not Enabled

Pods CIDR: 10.244.0.0/16

Services CIDR: 10.96.0.0/16

Service LB Subnet 1: [...078fb8-regional](#) [Show](#) [Copy](#)

Service LB Subnet 2: -

## 2. Despliegue del Apache HTTP Server en el clúster Kubernetes (Cloud Shell)

Para el despliegue del servidor de aplicaciones en el clúster de OKE provisionado, se usa la nueva función de línea de comandos de OCI, llamado Cloud Shell. Cloud Shell básicamente es el terminal de una máquina virtual que tiene instalado *oci cli*, *git*, *docker* y *kubectl*.



cluster1

Access Kubeconfig Delete Cluster

Cluster Details

**Cluster Information**

Cluster Status: Active

Node Pools: 1

Cluster ID: ...cywgbtmvtg [Show Copy](#)

Compartment: okepro (root)/workshop

Launched: Mon, 16 Mar 2020 14:24:54 GMT

Created By: junior.palomino@oracle.com

**Network Information**

VCN Name: [oke-vcn-quick-cluster1-288076fb8](#)

VCN ID: ...rzp8myq [Show Copy](#)

Kubernetes Version: v1.15.7

Kubernetes Address: ...207:6443 [Show Copy](#)

Kubernetes Dashboard: Enabled

Tiller (Helm): Not Enabled

Encryption Key: Not Enabled

Pods CIDR: 10.244.0.0/16

Services CIDR: 10.96.0.0/16

Welcome to Oracle Cloud Shell.

Your Cloud Shell machine comes with 56G of storage for your home directory. Type 'help' for more info.

junior\_pal@cloudshell:~ (us-ashburn-1) \$

En el terminal se procede a bajar la imagen docker **httpd** y se verifican que imagenes de docker se tiene.

```
$ docker pull httpd
```

```
$ docker images
```

```
junior_pal@cloudshell:~ (us-ashburn-1) $ docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
junior_pal@cloudshell:~ (us-ashburn-1) $ docker pull httpd
Using default tag: latest
Trying to pull repository docker.io/library/httpd ...
latest: Pulling from docker.io/library/httpd
88ced04f68ab: Pull complete
35d35f1e0dc9: Pull complete
8a018b70ae55: Pull complete
d7b9f2dbc195: Pull complete
d56c468bde81: Pull complete
Digest: sha256:946c54069130dbf136903fe658fe7d113bd8db8004de31282e20b262a3e106fb
Status: Downloaded newer image for httpd:latest
httpd:latest
junior_pal@cloudshell:~ (us-ashburn-1) $ docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
httpd         latest    c5a012f9cf45   2 weeks ago    165MB
junior_pal@cloudshell:~ (us-ashburn-1) $
```

Seguidamente, se sube la imagen al repositorio local imágenes docker en OCI, conocido com Oracle Cloud Infrastructure Registry (OCIR).

**Object Storage Namespace:** *idu2plmeyer7*

**Auth Token:** *W<Qoe#QNs}OdOvA5BCD4*

```
$ docker login -u idu2plmeyer7/junior.palomino@oracle.com iad.ocir.io (password es el auth token)
```

```
$ docker tag httpd iad.ocir.io/idu2plmeyer7/httpd-k8s:v1
```

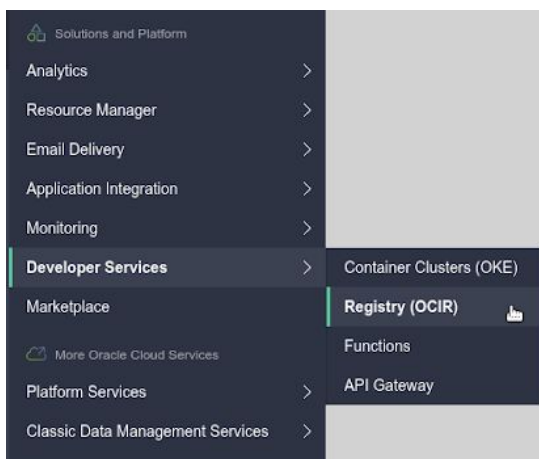
```
$ docker push iad.ocir.io/idu2plmeyer7/httpd-k8s:v1
```

```
ORACLE Cloud

junior_pal@cloudshell:~ (us-ashburn-1)$ docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
junior_pal@cloudshell:~ (us-ashburn-1)$ docker pull httpd
Using default tag: latest
Trying to pull repository docker.io/library/httpd ...
latest: Pulling from docker.io/library/httpd
68ced04f60ab: Pull complete
35d35f1e0dc0: Pull complete
8a918bf9ae55: Pull complete
d7b9f2dbc195: Pull complete
d56c468bde81: Pull complete
Digest: sha256:946c54969136dbf136903fe658fe7d113bd8db8094de31282e20b262a3e196fb
Status: Downloaded newer image for httpd:latest
httpd:latest
junior_pal@cloudshell:~ (us-ashburn-1)$ docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
httpd                latest             c5a012f9cf45       2 weeks ago        165MB
junior_pal@cloudshell:~ (us-ashburn-1)$ docker login -u idu2plmeyir7/junior.palomino@oracle.com iad.ocir.io
Password:
WARNING! Your password will be stored unencrypted in /home/junior_pal/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
junior_pal@cloudshell:~ (us-ashburn-1)$ docker tag httpd iad.ocir.io/idu2plmeyir7/httpd-k8s:v1
junior_pal@cloudshell:~ (us-ashburn-1)$ docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
httpd                latest             c5a012f9cf45       2 weeks ago        165MB
iad.ocir.io/idu2plmeyir7/httpd-k8s  v1                c5a012f9cf45       2 weeks ago        165MB
junior_pal@cloudshell:~ (us-ashburn-1)$ docker push iad.ocir.io/idu2plmeyir7/httpd-k8s:v1
The push refers to repository [iad.ocir.io/idu2plmeyir7/httpd-k8s]
25a92079dbfe: Pushed
b5432b464616: Pushed
e6690b4fc2e3: Pushed
762ba19e7ef1: Pushed
f2cb0ecef392: Pushed
v1: digest: sha256:d3df077ec2ddb0a62279c672b9c792055b96f6d22ed1e45371bcd70393730f9 size: 1367
junior_pal@cloudshell:~ (us-ashburn-1)$
```

Se verifica que la imagen se subió correctamente al OCIR y se cambia a público.



## Registry

Create Repository

idu2plmeyir7

- httpd-k8s
  - v1
    - madhack-rest (Public)

httpd-k8s

User: ...567iiqxe7nvmppza [Show](#) [Copy](#)Size: 58.99 MB

Created: 5 minutes agoLast Push: 4 minutes ago

Access: Private

Readme

No readme has been created yet for this repository.

Containers

- Clusters
- Registry

Create Repository

idu2plmeyir7

- httpd-k8s
  - v1
    - madhack-rest (Public)

httpd-k8s

User: ...567iiqxe7nvmppza [Show](#) [Copy](#)Size: 58.99 MB

Created: 5 minutes agoLast Push: 4 minutes ago

Access: Private

Readme

No readme has been created yet for this repository.

Change to Public

Delete Repository

The screenshot displays the Oracle Cloud console interface. A modal dialog titled "How to Access Kubeconfig" is open, providing instructions on how to access the kubeconfig for a specific cluster. The dialog includes a "Launch Cloud Shell" button and a code block with a command to run in the shell. The background shows the "cluster1" details page, which includes sections for "Cluster Information", "Network Information", and "Node Pools".

**How to Access Kubeconfig**

Manage the cluster via Cloud Shell.

- 1 Launch Cloud Shell
- 2 To access the kubeconfig for your cluster, copy the following command to Cloud Shell:

```
oc1 ce cluster create-kubeconfig --cluster-id oc1d1.cluster.oc1.iad.aaaaaaazgcmzwgy4wiyrsg5rgczbhfstgmjsgy3dkytcgywgbtmvtg/cloudshell=true --file $HOME/.kube/config --region us-ashburn-1 --token-version 2.0.0
```

[Copy](#)

[Learn more about Cloud Shell](#)

[Close](#)

**Cluster Information**

Cluster Status: ✔ Active  
 Node Pools: 1  
 Cluster ID: ...cywgbtmvtg  
 Compartment: okepro  
 Launched: Mon, 16 Mar 2020 14:24:54 GMT  
 Created By: junior.palomino@oracle.com

**Network Information**

VCN Name: oke-ycn-quick-cluster1-288078fb0  
 VCN ID: ...rzp6myq [Show](#) [Copy](#)  
 Compartment: okepro (root)/workshop

**Node Pools**

[Add Node Pool](#)

pool1

**Resources**

[Node Pools](#)  
[Work Requests](#)

**Cloud Shell**

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```
junior_pal@cloudshell:~ (us-ashburn-2) $ ls -lha
total 24K
drwxr-xr-x. 3 junior_pal oci 112 Mar 16 22:42 .
drwxr-xr-x. 1 root root 35 Mar 16 22:45 ..
-rw-r-----. 1 junior_pal oci 588 Mar 16 22:50 .bash_history
-rw-r--r--. 1 junior_pal oci 18 Mar 14 11:14 .bash_logout
-rw-r--r--. 1 junior_pal oci 193 Mar 14 11:14 .bash_profile
-rw-r--r--. 1 junior_pal oci 261 Mar 14 11:14 .bashrc
drwx-----. 2 junior_pal oci 25 Mar 16 22:42 .docker
-rw-r--r--. 1 junior_pal oci 334 Mar 14 11:14 .emacs
junior_pal@cloudshell:~ (us-ashburn-2) $ oc cluster create-kubeconfig --cluster-id ocid1.cluster.oci.iad.aaaaaaazgcwmy4w1rs9sgczbhfstqmgjsg3dktgycwqzbtmvtg --file $HOME/.kube/config --region us-ashburn-1 --token-version 2.6.0
junior_pal@cloudshell:~ (us-ashburn-2) $ oc cluster create-kubeconfig --cluster-id ocid1.cluster.oci.iad.aaaaaaazgcwmy4w1rs9sgczbhfstqmgjsg3dktgycwqzbtmvtg --file $HOME/.kube/config --region us-ashburn-1 --token-version 2.6.0
junior_pal@cloudshell:~ (us-ashburn-2) $ ls -lha
total 24K
drwxr-xr-x. 4 junior_pal oci 125 Mar 16 22:52 .
drwxr-xr-x. 1 root root 35 Mar 16 22:45 ..
-rw-r-----. 1 junior_pal oci 796 Mar 16 22:52 .bash_history
-rw-r--r--. 1 junior_pal oci 18 Mar 14 11:14 .bash_logout
-rw-r--r--. 1 junior_pal oci 193 Mar 14 11:14 .bash_profile
-rw-r--r--. 1 junior_pal oci 261 Mar 14 11:14 .bashrc
drwx-----. 2 junior_pal oci 25 Mar 16 22:42 .docker
-rw-r--r--. 1 junior_pal oci 334 Mar 14 11:14 .emacs
drwxr-xr-x. 2 junior_pal oci 20 Mar 16 22:52 .kube
junior_pal@cloudshell:~ (us-ashburn-2) $
```

```
junior_palm@cloudshell:~ - (us-ashburn-1)$ cat .kube/config
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJTBWYUZSUZURVRSRStS9Cck1JSURqRENQdWZTSTZFSUBzBVlRNyN2VkaG90dXhoYWVkrYSR3FEUldmZXR2cndRRnRpdlpjaHZjJTFRwMQ1Fbd1hqNkVWbHQHTFRVU3Q1TUWMy148g6eTUAjTzCWMLQ1ZS6v9PnpMUTB3FFZFZRUFdCpCzFnHwMpwNz48eq8TKrI6T2CO
    server: https://190.33.102.207:443
name: cluster-cywgbtmvtg
contexts:
- context:
    cluster: cluster-cywgbtmvtg
    user: user-cywgbtmvtg
name: cluster-cywgbtmvtg
current-context: context-cywgbtmvtg
kind: ""
users:
- name: user-cywgbtmvtg
  exec:
    apiVersion: client.authentication.k8s.io/v1beta1
    args:
    - --cluster
    - generate-token
    - --server-id
    - ocid1_cluster.oc1.iad.saaaaaaaazcgzcwy4dy4ysgr5gczhbfstqjsy3kytyggcywgbtmvtg
    - --region
    - us-ashburn-1
    command: oci
    env: []
junior_palm@cloudshell:~ - (us-ashburn-1)$
```

```
$ git clone https://github.com/obi10/httpd_k8s.git
$ cd http_k8s
```



```

junior_pal@cloudshell:~ (us-ashburn-1)$ git clone https://github.com/obi10/httpd_k8s.git
Cloning into 'httpd_k8s'...
remote: Enumerating objects: 4, done.
remote: Counting objects: 100% (4/4), done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 4 (delta 0), reused 4 (delta 0), pack-reused 0
Unpacking objects: 100% (4/4), done.
junior_pal@cloudshell:~ (us-ashburn-1)$ ls
httpd_k8s
junior_pal@cloudshell:~ (us-ashburn-1)$ cd httpd_k8s/
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ ls
app_kubernetes.yaml service.yaml
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$

```

Se debe modificar el nombre del namespace (idu2plmeyir7) en el siguiente archivo:  
*app\_kubernetes.yaml*

```

GNU nano 2.3.1
apiVersion: apps/v1
kind: Deployment
metadata:
  name: httpd-k8s-deployment
  labels:
    app: httpd-k8s
spec:
  replicas: 3
  selector:
    matchLabels:
      app: httpd-k8s
  template:
    metadata:
      labels:
        app: httpd-k8s
    spec:
      containers:
      - name: httpd-k8s
        image: iad.ocir.io/idu2plmeyir7/httpd-k8s:v1
        ports:
        - containerPort: 80

```

Luego ejecutar los siguientes comandos:

*\$ kubectl get all*

*\$ kubectl apply -f app\_kubernetes.yaml*

```

junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl get all
NAME                TYPE        CLUSTER-IP    EXTERNAL-IP  PORT(S)    AGE
service/kubernetes  ClusterIP   10.96.0.1     <none>        443/TCP    8h
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl apply -f app_kubernetes.yaml
deployment.apps/httpd-k8s-deployment created
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl get all
NAME                READY     STATUS              RESTARTS   AGE
pod/httpd-k8s-deployment-f65c8dfb-9s5qr  0/1      ContainerCreating   0           7s
pod/httpd-k8s-deployment-f65c8dfb-17n5f  0/1      ContainerCreating   0           7s
pod/httpd-k8s-deployment-f65c8dfb-qv4tw  0/1      ContainerCreating   0           7s

NAME                TYPE        CLUSTER-IP    EXTERNAL-IP  PORT(S)    AGE
service/kubernetes  ClusterIP   10.96.0.1     <none>        443/TCP    8h

NAME                READY     UP-TO-DATE   AVAILABLE   AGE
deployment.apps/httpd-k8s-deployment  0/3       3             0           7s

NAME                DESIRED   CURRENT   READY   AGE
replicaset.apps/httpd-k8s-deployment-f65c8dfb  3         3         0       7s
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl get all
NAME                READY     STATUS              RESTARTS   AGE
pod/httpd-k8s-deployment-f65c8dfb-9s5qr  1/1      Running         0          56s
pod/httpd-k8s-deployment-f65c8dfb-17n5f  1/1      Running         0          56s
pod/httpd-k8s-deployment-f65c8dfb-qv4tw  1/1      Running         0          56s

NAME                TYPE        CLUSTER-IP    EXTERNAL-IP  PORT(S)    AGE
service/kubernetes  ClusterIP   10.96.0.1     <none>        443/TCP    8h

NAME                READY     UP-TO-DATE   AVAILABLE   AGE
deployment.apps/httpd-k8s-deployment  3/3       3             3          57s

NAME                DESIRED   CURRENT   READY   AGE
replicaset.apps/httpd-k8s-deployment-f65c8dfb  3         3         3       57s
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$

```

*\$ kubectl apply -f service.yaml*

*\$ kubectl get all*

```

junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl apply -f service.yaml
service/httpd-k8s-service created
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$
junior_pal@cloudshell:httpd_k8s (us-ashburn-1)$ kubectl get all
NAME                                READY    STATUS    RESTARTS   AGE
pod/httpd-k8s-deployment-f65c8dfb-9s5qr  1/1      Running   0           4m31s
pod/httpd-k8s-deployment-f65c8dfb-17n5f  1/1      Running   0           4m31s
pod/httpd-k8s-deployment-f65c8dfb-qv4tw  1/1      Running   0           4m31s

NAME                                TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
service/httpd-k8s-service           LoadBalancer  10.96.181.22  <pending>      8080:30949/TCP   11s
service/kubernetes                   ClusterIP      10.96.0.1     <none>         443/TCP          8h

NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
deployment.apps/httpd-k8s-deployment  3/3      3              3            4m31s

NAME                                DESIRED    CURRENT    READY    AGE
replicaset.apps/httpd-k8s-deployment-f65c8dfb  3          3          3        4m31s

```

```

junior_pal@cloudshell:~ (us-ashburn-1)$ kubectl get all
NAME                                READY    STATUS    RESTARTS   AGE
pod/httpd-k8s-deployment-f65c8dfb-9s5qr  1/1      Running   0           7m44s
pod/httpd-k8s-deployment-f65c8dfb-17n5f  1/1      Running   0           7m44s
pod/httpd-k8s-deployment-f65c8dfb-qv4tw  1/1      Running   0           7m44s

NAME                                TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
service/httpd-k8s-service           LoadBalancer  10.96.181.22  150.136.0.161  8080:30949/TCP   3m24s
service/kubernetes                   ClusterIP      10.96.0.1     <none>         443/TCP          8h

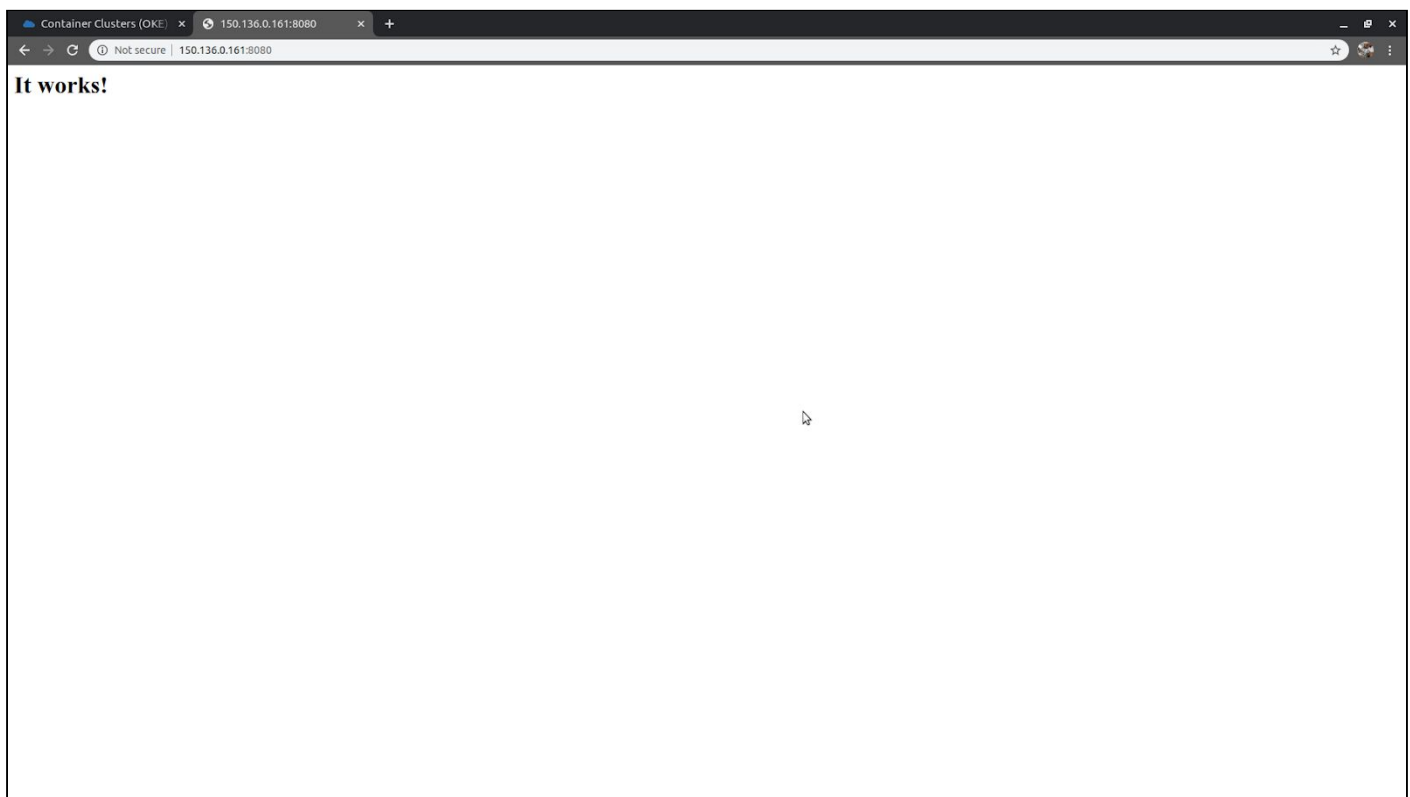
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
deployment.apps/httpd-k8s-deployment  3/3      3              3            7m44s

NAME                                DESIRED    CURRENT    READY    AGE
replicaset.apps/httpd-k8s-deployment-f65c8dfb  3          3          3        7m44s
junior_pal@cloudshell:~ (us-ashburn-1)$

```

ip pública del servicio: 150.136.0.161

Introducir "<ip pública de su servicio>:8080" en el browser para visualizar el mensaje de "It works".



**Autor:** Ygnacio Junior Palomino Reyes, Bachiller en Ing. Mecatrónica - Pontificia Universidad Católica del Perú (PUCP), actualmente me desempeño como GenO en Oracle Perú. **Contacto:** [y.palomino@pucp.pe](mailto:y.palomino@pucp.pe)