

Date	04 November 2022
Team ID	PNT2022TMID11934
Project Name	Inventory Management System for Retailers

Team Leader: Venkatesh J

Team Member: 1. Sedhuragavan L

2. Mohana raj K

3. Shankar K R

Deploying to Kubernetes on IBM Cloud Overview

Overview:

This tutorial shows how to deploy a look Back onto Kubernetes on the IBM Cloud.

Prerequisite:

You'll need the following:

Node.js 10 or higher

Docker 18.06 or higher

Signup for an IBM Cloud Account if you don't have one already

IBM Cloud CLI, Container registry CLI, etc

1. Kubernetes CLI (kubectl)

2. LoopBack4CLI

Let's install the LoopBack 4 CLI :

Step 1: Scaffold LoopBack 4 app

Run the `lb4 app` command, and specify all the values provided below.

```
$ lb4 app

? Project name: lb4-simple-web-app

? Project description: lb4-simple-web-app

? Project root directory: lb4-simple-web-app

? Application class name: Lb4SimpleWebAppApplication

? Select features to enable in the project (Press <space> to select, <a> to toggle
all, <i> to invert selection)
  ☉ Enable eslint: add a linter with pre-configured lint rules

  ☉ Enable prettier: install prettier to format code conforming to rules

  ☉ Enable mocha: install mocha to run tests
  ☉ Enable loopbackBuild: use @loopback/build helpers (e.g. lb-eslint)

  ☉ Enable vscode: add VSCode config files
  ☉ Enable docker: include Dockerfile and .dockerignore

  ☉ Enable repositories: include repository imports and RepositoryMixin

  ☉ Enable services: include service-proxy imports and ServiceMixin

(Move up and down to reveal more choices)
```

The lb4-simple-web-app project is created.

Navigate to the main directory of the project

Step 2: Run the application locally

In a command window in the main directory of your project, type:

The application will build, and then the server should start up successfully and display

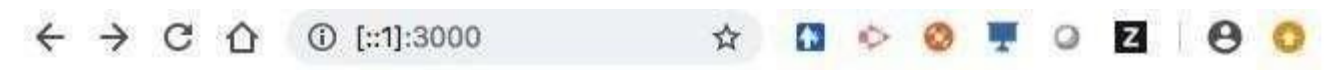
```
Server is running at http://[::1]:3000
```

Open your browser and attempt to access all these url

[http://\[::1\]:3000/](http://[::1]:3000/) [http://\[::1\]:3000/ping](http://[::1]:3000/ping)

[http://\[::1\]:3000/explorer](http://[::1]:3000/explorer)

[http://\[::1\]:3000/openapi.json](http://[::1]:3000/openapi.json)



lb4-simple-web-app

Version 1.0.0

OpenAPI spec: </openapi.json>

API Explorer: </explorer>



Make sure that the application runs well before continuing to the next step.

In the command window, stop the application with

Step 3: Build a Docker image

Review the two Docker-related files that have been conveniently provided, `.dockerignore` and `Dockerfile`, but leave them unchanged for this tutorial.

Notice the `HOST` and `PORT` environment variable values:

In the `package.json` file, a `docker:build` command has been provided.

Run the command:

When it completes, you will see :

```
Successfully built 7d26df6c1561
Successfully tagged lb4-simple-web-app:latest
```

You can find your image by typing:

```
docker images | grep lb4-simple-web-app
```

It will display something like this :

```
lb4-simple-web-app   latest 7d26df6c1561
```

Step 4: Run the application in Docker

In the `package.json` file, a `docker:run` command has been provided.

```
"docker:run": "docker run -p 3000:3000 -d lb4-simple-web-app"
```

Run the command:

```
npm run docker:run
```

Afterwards, type:

```
docker ps
```

You should see something like this:

CONTAINER ID	PORTS	IMAGE	COMMAND	CREATED	STATUS
a9962339e863	0.0.0.0:3000->3000/tcp	lb4-simple-web-app	nds "node ."	8 seconds ago	Up 7 seco

To see the log output of your container, you can type:

```
docker logs <container id>   For example : a9962339e863
```

You should see something like:

```
Server is running at http://127.0.0.1:3000
```

```
Try http://127.0.0.1:3000/ping
```

Open your browser and attempt to access all these urls

<http://127.0.0.1:3000/> <http://127.0.0.1:3000/ping>

<http://127.0.0.1:3000/explorer>

<http://127.0.0.1:3000/openapi.json>

Step 5: Stop the application running in Docker

Find the container id

```
docker ps | grep lb4
```

You should see something like this:

```
a9962339e863      lb4-simple-web-app      "node ."
```

The leftmost value is the container id.

Type:

```
docker stop <container id>      For example : a9962339e863
```

Step 6: Log into IBM Cloud using ibmcloud login command

Use `ibmcloud login` command to login.

After you've been successfully logged in, you'll see something like:

```
API endpoint:      https://api.ng.bluemix.net
Region:           us-south
User:             dremond@ca.ibm.com
Account:          Dominique Emond's Account
Resource group:   default
CF API endpoint:
Org:
Space:
```

Step 7: Log into IBM Cloud Container Registry

You should see:

```
Logging in to 'registry.ng.bluemix.net'...
Logged in to 'registry.ng.bluemix.net'.
OK
```

Step 8: Upload a docker image to the Container Registry

This requires several steps, let's quickly go through them.

Create a namespace

List your current namespace by typing:

If you want to create a new namespace for yourself, you can do so with this command:

Tag your local docker image with the IBM Cloud container registry

Here is the command:

```
docker tag <source_image>:<tag> registry.<region>.bluemix.net/<my_namespace>/<new_image_repo>:<new_tag>
```

`<source_image>:<tag>` is what you have on your machine that you created earlier.

For example : `lb4-simple-web-app:latest`

`registry.<region>.bluemix.net` is the container registry region you logged into before.

For example : `registry.ng.bluemix.net`

`<my_namespace>` is the namespace you created for yourself

For example : `dremond`

`<new_image_repo>:<new_tag>` can be whatever you want it to be; they don't have to exist yet

For example : `loopback4_webapp_repo:1`

So, putting these values together, my command will look like this:

```
docker tag lb4-simple-web-app:latest registry.ng.bluemix.net/dremond/loopback4_webapp_repo:1
```

Push the local image to the container registry

You will see a progress bar like this:

```
The push refers to repository [registry.ng.bluemix.net/dremond/loopback4_webapp_repo]
```

```
478b1e842aa3: Pushed
```

```
6fd2223ea65e: Pushed
```

```
a90c4aba186a: Pushing [=====>] 51.4
MB/207.9MB bb288a38c607: Pushed

53981d6ec3d2: Mounted from dremond/loopback4_repo b727cac390f6:
Mounted fro
```

Wait until it is completed.

```
The push refers to repository [registry.ng.bluemix.net/dremond/loopback4_webapp_re
po]

478b1e842aa3: Pushed
6fd2223ea65e: Pushed
a90c4aba186a: Pushed
bb288a38c607: Pushed

53981d6ec3d2: Mounted from dremond/loopback4_repo
b727cac390f6: Mounted from dremond/loopback4_repo
df64d3292fd6: Mounted from dremond/loopback4_repo

1: digest: sha256:939ada9d1b7f6a7483aed69dff5ccc28d1931ed249b38d51d34b854b32139177
size: 1787
```

Verify the image is in the container registry

Type the command :

```
Listing images...

REPOSITORY                                TAG                                DIGEST                                NAMESPACE
registry.ng.bluemix.net/dremond/loopback4_webapp_repo  1                                939ada9d1b7f                                dremond
OK
```

You should see your image listed.

Perform a build for the container registry

Perform a build for the container registry.

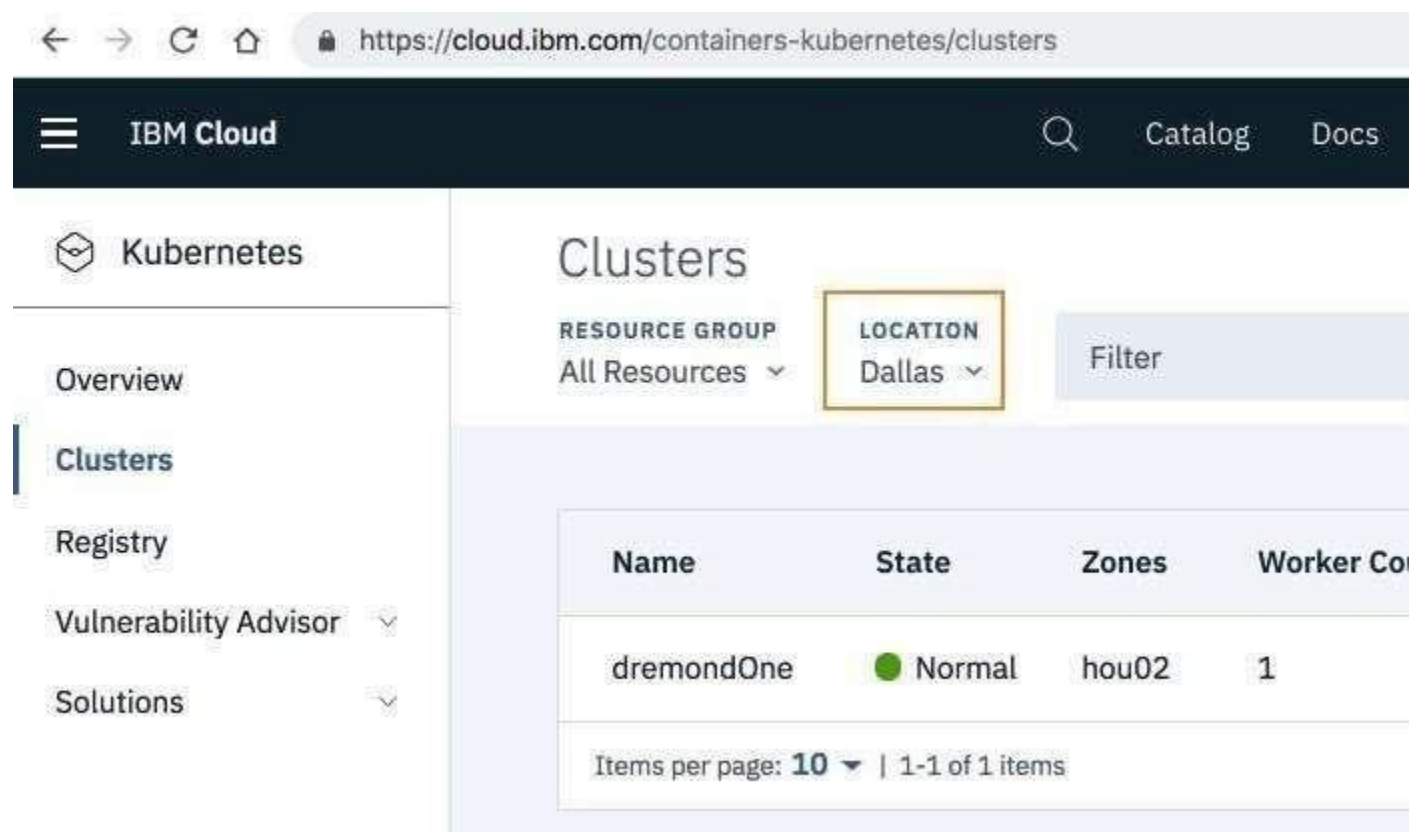
This step may fail if you have exceeded the QUOTA for images in your account. In that case clear up some room and try again.

Wait until it completes.

In your IBM Cloud account, you can view your images here

Step 9: Point to your Kubernetes Cluster

In a browser, log into your IBM Cloud account, and navigate to **Kubernetes > Clusters**.



The screenshot shows the IBM Cloud web interface. The browser address bar displays `https://cloud.ibm.com/containers-kubernetes/clusters`. The top navigation bar includes the IBM Cloud logo, a search icon, and links to 'Catalog' and 'Docs'. On the left, a sidebar menu lists 'Kubernetes' (selected), 'Overview', 'Clusters' (highlighted with a blue bar), 'Registry', 'Vulnerability Advisor', and 'Solutions'. The main content area is titled 'Clusters' and features two dropdown filters: 'RESOURCE GROUP' set to 'All Resources' and 'LOCATION' set to 'Dallas'. A 'Filter' button is also present. Below the filters is a table with the following data:

Name	State	Zones	Worker Co
dremondOne	● Normal	hou02	1

At the bottom of the table area, it says 'Items per page: 10 | 1-1 of 1 items'.

I am choosing my cluster `dremondOne` in Dallas .



Clusters / dremondOne



dremondOne

● Normal**Access**

Overview

Worker Nodes

Worker Pools

Gain access to your cluster

Prerequisites

Download and install a few CLI tools and the IBM Kubernetes Service plug-in.

```
curl -sL https://ibm.biz/ibt-installer | bash
```

Gain access to your cluster

1. Log in to your IBM Cloud account.

```
ibmcloud login -a https://api.ng.bluemix.net
```

If you have a federated ID, use `ibmcloud login --sso` to log in to the IBM Cloud CLI.

We already logged into the IBM Cloud in an earlier step, so we only need to point to the cluster.

My cluster name is '**dremondOne**' so I see this output:

```
OK

The configuration for dremondOne was downloaded successfully. Export environment variables to start using Kubernetes.

export KUBECONFIG=/Users/dremond/.bluemix/plugins/container-service/clusters/dremondOne/kube-config-hou02-dremondOne.yml
```

Take the entire '**export**' line above, and paste it into your command window.

Now you should be able to perform Kubernetes commands like:

```
kubectl get nodes
```

You will see output like this:

NAME	STATUS	ROLES	AGE	VERSION
10.76.193.58	Ready	<none>	13d	v1.10.8+IKS

Ok, so now we are ready to deploy our Loopback4 application to Kubernetes!

Step 10: Deploy your Loopback4 application to Kubernetes

Create a deployment

Create a deployment named : lb4-simple-web-app-deployment ; using the image we placed in the container registry.

```
kubectl run lb4-simple-web-app-deployment --image=registry.ng.bluemix.net/dremond/loopback4_webapp_repo:1
```

Verify that the pods are running

```
kubectl get pods
```

You should see

NAME	READY	STATUS	REST
ARTS AGE			
lb4-simple-web-app-deployment-5bfc546d8-r7cs4 7m	1/1	Running	0

A status of **Running** is a good sign. If you have anything other than this, then there may be something wrong with your docker image , or it may have vulnerability issues you need to address.

To see the logs of your pod, type:

```
kubectl logs lb4-simple-web-app-deployment-5bfc546d8-r7cs4
```

and you will see something like this:

```
Server is running at http://127.0.0.1:3000
```

```
Try http://127.0.0.1:3000/ping
```

Create a service

Expose your deployment with a service named : lb4-simple-web-app-service

```
kubectl expose deployment/lb4-simple-web-app-deployment --type=NodePort --port=3000
```

Obtain the NodePort of

your service

Let's determine the NodePort of your service.

```
kubectl describe service lb4-simple-web-app-service
```

You will see output like this:

```
Name: lb4-simple-web-app-service
Namespace: default
Labels: run=lb4-simple-web-app-deployment
Annotations: <none>
Selector: run=lb4-simple-web-app-deployment
Type: NodePort
IP: 172.21.103.26
Port: <unset> 3000/TCP
TargetPort: 3000/TCP
NodePort: <unset> 31701/TCP
```

```
Endpoints:          172.30.78.136:3000
Session Affinity:    None
External Traffic Policy: Cluster
Events:              <none>
```

In this case, the NodePort is 31701 .

Obtain the public IP address of the cluster

Let's determine the public IP address of the cluster

```
ibmcloud ks workers dremond0ne
```

You should see something like this

```
OK
ID      tatus      Public IP      Private IP      Machine Type      State      S
kube-hou02-pa45e...6-w1  184.173.5.187  10.76.193.58      free      normal      R
eady
```

In my case, the public IP is: 184.173.5.187

So now we can formulate the url of our loopback4 application using those two pieces
:

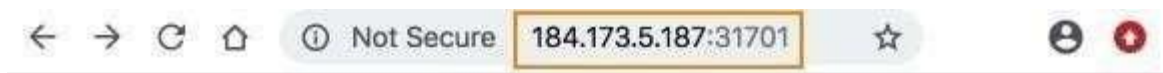
Open your browser and attempt to access all these urls

```
http://184.173.5.187:31701/

http://184.173.5.187:31701/ping

http://184.173.5.187:31701/explorer

http://184.173.5.187:31701/openapi.json
```



lb4-simple-web-app

Version 1.0.0

OpenAPI spec: </openapi.json>

API Explorer: </explorer>



https://v4.loopback.io

Step 11: View your app in the Kubernetes Dashboard

Let's go take a look at your application in the Kubernetes dashboard.

Click the '**Kubernetes Dashboard**' button next to your cluster's name.

Under '**Workloads**', select '**Pods**'

Clusters / dremondOne



dremondOne

 Normal

Kubernetes

Access

Overview

Worker Nodes

Worker Pools



kubernetes



Workloads > Pods

Namespace

default

Overview

Workloads

Cron Jobs

Daemon Sets

Deployments

Jobs

Pods

Locate your application, and click on its name

Pods

Name	Node	Status	Restarts	Age	CPU
 lb4-simple-web-app-de	10.76.193.58	Running	0	44 minutes	

If you want to open a shell into the container in the pod, click on the [EXEC](#) button.
If you want to view the logs of the container in the pod, click on the [LOGS](#) button.



Persistent Volumes

Roles

Storage Classes

Namespace

default

Overview

Workloads

Cron Jobs

Daemon Sets

Deployments

Jobs

Pods

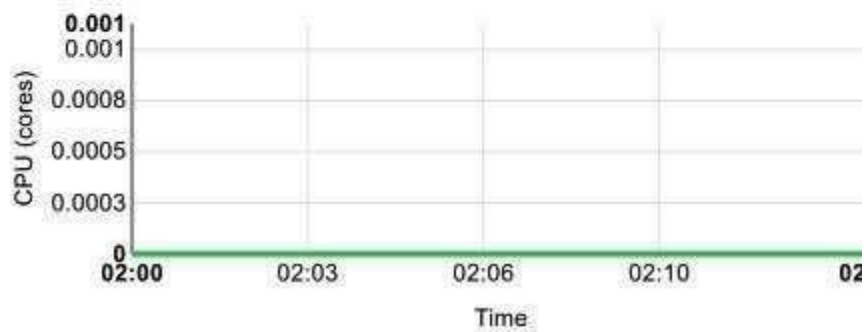
Replica Sets

Replication Controllers

Stateful Sets

Discovery and Load Balancing

CPU usage



Details

Name: lb4-simple-web-app-deployment-5bfc546d8-r7cs4

Namespace: default

Labels: pod-template-hash: 1697610284 run: lb4-simple-web-a

Annotations: kubernetes.io/psp: ibm-privileged-psp

Creation Time: 2018-12-14T06:25 UTC

Status: Running

QoS Class: BestEffort

So there you have it! You have successfully deployed a Loopback4 application to Kubernetes on the IBM Cloud.