Deploying Main Application

Skills Network

Estimated time: 90 minutes

Welcome to the lab **Deploying Main Application**. You should have all the code working from the previous modules in this capstone. The lab focuses on deploying the **Django** application on IBM Kubernetes Services.

Learning Objectives:

After completing this lab you will be able to:

1. Create a `Dockerfile` to containerize Django applications
2. Use the `kubectl` CLI
3. Work with Kubernetes deployment `yaml` file
4. Create a Kubernetes `Deployment` on IKS

> **Note:** Kindly complete the lab in a single session without any break because the lab may go on offline mode and may cause errors. If you face any issues/errors during the lab process, please log out from the lab environment. Then clear your system cache and cookies and try to complete the lab.

Verify the environment and command line tools

1. If a terminal is not already open, open a terminal window by using the menu in the editor: `Terminal > New Terminal`.

   > **Note:** Please skip this step if the terminal already appears.

2. Verify that `kubectl` CLI is installed.

```
kubectl version
```

Copied! Executed!

3. Change to your project folder.

```
cd /home/project
```

Copied! Executed!

Exercise 1: Django - Clone the Github Repository and Set Up Environment

You created a new repository for the Django application from the provided template in a previous lab. If not, go back to the `Create Band Website with Django` lab and ensure you complete it before coming back to this lab.

1. Open a terminal with `Terminal` > `New Terminal` if one is not open already.
2. Next, use the export GITHUB_ACCOUNT command to export an environment variable that contains the name of your GitHub account.

   > **Note:** Substitute your real GitHub account for the {your_github_account} placeholder below:

```
export GITHUB_ACCOUNT={your_github_account}
```

Copied!

3. Then use the following commands to clone your repository.

```
git clone https://github.com/$GITHUB_ACCOUNT/Back-end-Development-Capstone.git
```

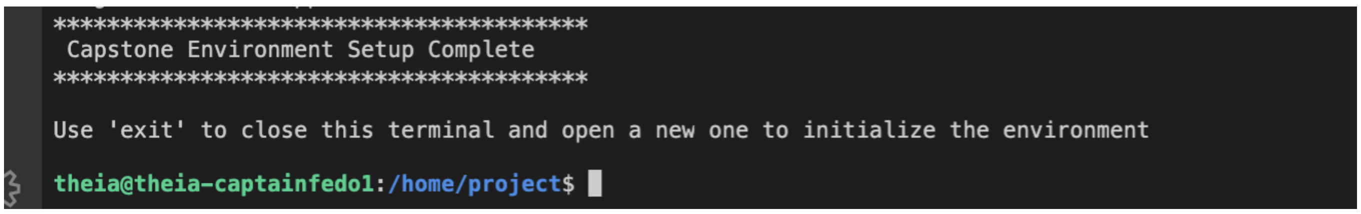
Copied! Executed!

4. Change to the Back-end-Development-Capstone directory, and execute the `./bin/setup.sh` command.

```
cd Back-end-Development-Capstone
bash ./bin/setup.sh
```

Copied! Executed!

5. You should see the follow at the end of the setup execution:



```
******************************************
 Capstone Environment Setup Complete
******************************************

Use 'exit' to close this terminal and open a new one to initialize the environment

theia@theia-captainfedo1:/home/project$
```

6. Finally, use the `exit` command to close the current terminal. The environment will not be fully active until you open a new terminal in the next step.

Exercise 2: Django - Connect Services and Run Locally

You need to have the `pictures` and the `songs` microservices running from the previous lab in order to complete this part. If you don't have them running please ensure you walk through the previous labs and take note of the service URLs to fill in here. Also ensure you are able to perform all the curl operations in the previous lab before continuing here.

Change to the server directory.

```
cd Back-end-Development-Capstone
```

Copied! Executed!

Open `views.py` in the editor.

Open **views.py** in IDE

1. The `def songs(request):` method currently returns an array of songs. Change the code as follows and replace the `SONG_URL` with the songs microservice deployed in the previous lab.

```
def songs(request):
    songs = req.get("SONGS_URL/song").json()
    return render(request, "songs.html", {"songs": songs["songs"]})
```

Copied!

2. The `def photos(request):` method currently returns an array of songs. Change the code as follows and replace the `PHOTO_URL` with the songs microservice deployed in the previous lab.

```
def photos(request):
    photos = req.get("PHOTO_URL/picture").json()
    return render(request, "photos.html", {"photos": photos})
```

Copied!

3. Perform migrations to create necessary tables.

```
python3 manage.py makemigrations
```

Copied! Executed!

4. Run migration to activate models for the app.

```
python3 manage.py migrate
```

Copied! Executed!

Take a screenshot of the terminal after executing the `migrate` command and save as `django-songs-photos-migrate.jpg` (or .png).

5. Start the local development server.

```
python3 manage.py runserver
```

Copied! Executed!

If the application does not run locally, you should return to module 3 and ensure you have finished the final lab. The application should connect to the **songs** and **photos** services that are running on IBM Code Engine and RedHat OpenShift.

Exercise 3: Django - Finish the Dockerfile

Your Tasks

Unlike the other services, there is no option to deploy the main Django application using the `source-to-image` method to IBM Kubernetes Service.You will have to write a Dockerfile to build the image. Your task in this exercise is to fill out the incomplete Dockerfile.

Open the `Back-end-Development-Capstone/Dockerfile` file in the editor.

Open **Dockerfile** in IDE

1. Insert code to use a python base image.
Remember the way to specify a base image for your image is with the `FROM` statement in the Dockerfile. Use the `FROM` statement to specify `FROM python:3.9.16-slim` as the base image.

   ▶ Click here for a hint.

2. Insert code to change the working directory.
Recall that `WORKDIR` is used in Dockerfile to set the working directory for any subsequent files.

   ▶ Click here for a hint.

3. Insert code to copy the requirements.txt file to $APP
Recall that the `requirements.txt` text file lists all the Python dependencies required by a Django project to run. You need to copy it to the container.

   ▶ Click here for a hint.

4. Next, you need to tell the container to install all the dependencies from the `requirements.txt` file using the `pip` tool using the `RUN` command syntax.

   ▶ Click here for a hint.

5. Once the requirements have been installed, you can copy the rest of the source code to the image using the `COPY` command again.

   ▶ Click here for a hint.

6. The next step is to expose port 8000 using the `EXPOSE` command. This command informs Docker that the container will listen on the specified network ports at runtime. It does not actually publish the port to the host machine but rather provides metadata to help users understand how to interact with the container.

   ▶ Click here for a hint.

7. Great! You are almost done. The last line in the Dockerfile should tell Docker how to run the container. We want to run the `python manage.py runserver 0.0.0.0:8000` command when the container starts. Note the `0.0.0.0:8000` at the end. Without the 0.0.0.0:8000 argument, the server would only listen on the loopback interface (127.0.0.1) and would not be accessible from outside the container.

   ▶ Click here for a hint.

Final Solution

Ensure your code looks like the this:

▶ Click here for a hint.

Exercise 4: Django - Build and Upload Image to Registry

The next step is build the Docker image and then push it to the lab IBM Container Registry.

Your Tasks

1. Build the Docker image using the `docker build` command.

   ▶ Click here for a hint.

   Take a screenshot of the output of `docker build` command in the terminal and save as `deploy-getdjango-1.jpg` (or .png).

2. Export the `MY_NAMESPACE` variable. This is your namespace in the lab and the container registry. We will push the image to this namespace in the next step.

   ```
   export MY_NAMESPACE=sn-labs-$USERNAME
   ```
   Copied! Executed!

   You can echo the MY_NAMESPACE variable in the terminal to see the value. In my case, the variable is `sn-labs-captainfedo1`. It would be something different for you:

   ```
   echo $MY_NAMESPACE
   ```
   Copied! Executed!

3. Tag the image with the correct path for your IBM Container Registry. Your container registry in the lab environment has the format `us.icr.io/$MY_NAMESPACE`.

   ▶ Click here for a hint.

4. Push the docker image to the ICR regisry:

   ```
   docker push us.icr.io/$MY_NAMESPACE/djangoserver:1
   ```
   Copied! Executed!

   This command may take a couple of minutes to complete. You should see progress in the terminal as follows:

   ```
   The push refers to repository [us.icr.io/sn-labs-captainfedo1/djangoserver]
   f82006359bac: Pushed
   ca49210f87e2: Pushed
   7db8dc861f85: Pushing [===================>                              ]  26.84MB/69.14MB
   6308aca94bbb: Pushed
   855c8cc5561a: Pushed
   730529d9e57d: Pushed
   550beda58888: Pushed
   43b1c6b4f686: Pushed
   7ca0a8cd8bdd: Pushed
   36e5ac463d7d: Pushed
   4695cdfb426a: Pushing [===================>                              ]  31.98MB/80.51MB
   ```
   Copied!

5. You can check that the image got pushed to your registry namespace with this command:

   ```
   ibmcloud cr images --restrict $MY_NAMESPACE
   ```
   Copied! Executed!

   You should see an output similar to the following. You might have images here from other labs as well.

   ```
   Listing images...

   Repository                                 Tag   Digest             Namespace             Created      Size     Security status
   us.icr.io/sn-labs-captainfedo1/djangoserver   1     41932716f7d5       sn-labs-captainfedo1   1 week ago   153 MB   -
   ```
   Copied!

Evidence

1. Take a screenshot of the `docker build` command running in the lab terminal. Save the screenshot as `deploy-getdjango-1.jpg` (or .png).

Exercise 5: Django - Complete the Deployment File

The lab template contains an incomplete deployment.yaml file. You will complete the file in this step.

Open the `Back-end-Development-Capstone/deployment.yml` file in the editor.

Open **deployment.yml** in IDE

1. Insert kind of `Deployment` in the code below:

   ```
   kind: # {insert kind here}
   ```
   Copied!

2. Insert image name in the code below:

   ```
   image: # {insert image here}
   ```
   Copied!

3. Insert port for the Django application in the code below:

   ```
   containerPort: # {insert port here}
   ```
   Copied!

Final Solution

Ensure your code looks like the following:

▶ Click here for a hint.

Exercise 6: Django - Deploy Django application to IKS

1. In order to deploy the application to IBM Kubernetes Service, you can simply apply the deployment file:

   ```
   kubectl apply -f ./deployment.yml
   ```
   Copied! Executed!

2. You can see the pods running by using the command:

```
kubectl get pods -w
```

Copied! Executed!

The `-w` flag will watch the output. You should see the `djangoserver` pod in running status after going through other states:

```
$ kubectl get pods -w
NAME                             READY   STATUS    RESTARTS   AGE
djangoserver-7d77df49f8-2g7kc   0/1     Pending   0          0s
djangoserver-7d77df49f8-2g7kc   0/1     Pending   0          1s
djangoserver-7d77df49f8-2g7kc   0/1     ContainerCreating   0          1s
djangoserver-7d77df49f8-2g7kc   0/1     ContainerCreating   0          2s
djangoserver-7d77df49f8-2g7kc   1/1     Running             0          9s
```

Copied!

The watch flag will keep the `kubectl get` command open. You can use `ctr+c` keys to close the command so the terminal is available for other commands.

3. Next, in order to access the deployment from outside the cluster, you need to use the `kubectl port-forward` command to forward the ports from the lab environment into the running pod. Replace the pod name with your pod name in the command below:

```
kubectl port-forward po/djangoserver-688dc44d47-bs5x7 8000:8000
```

Copied! Executed!

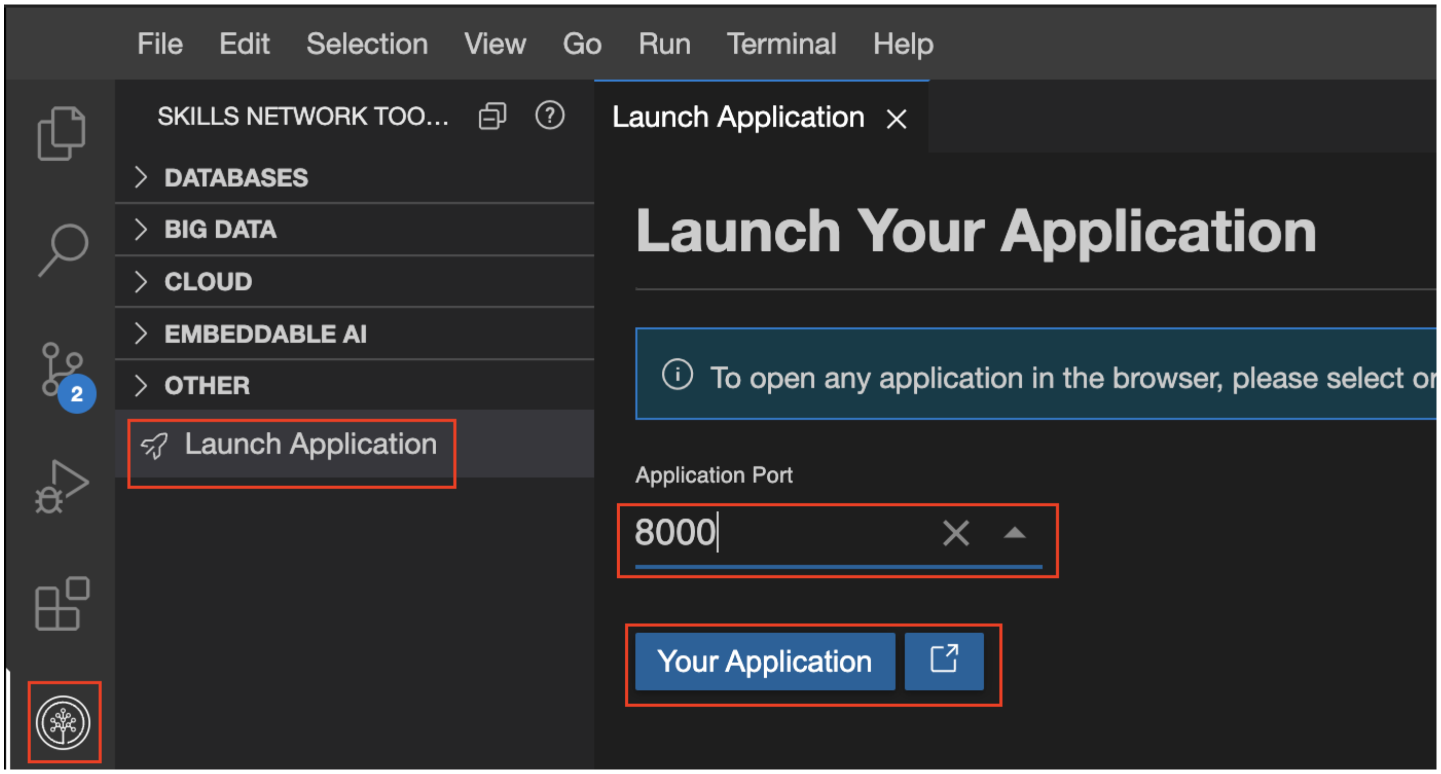
You should see an output similar to this:

```
$ kubectl port-forward po/djangoserver-7d77df49f8-2g7kc 8000:8000

Forwarding from 127.0.0.1:8000 -> 8000
Forwarding from [::1]:8000 -> 8000
```

Copied!

4. You can proceed to launch the application in a new tab by clicking `Launch Applciation` icon on the left bar. Once the tab opens, you can enter port as `8000` and click the `Your Application` button.



To open any application in the browser, please select or

Evidence

1. Take a screenshot of the `kubectl apply -f` command running in the lab terminal. Save the screenshot as `deploy-getdjango-3.jpg` (or .png).

Evidence Checklist

Now that you have the application running in the lab environment, you need to take a few more screenshots to submit for peer review.

1. Take a screenshot named `deploy-getdjango-4.jpg` (or a png) showing the main Django application running in the browser.
2. Take a screenshot named `deploy-getdjango-5.jpg` (or a png) showing you are able to see the songs page.
3. Take a screenshot named `deploy-getdjango-6.jpg` (or a png) showing you are able to see the pictures page.
4. Take a screenshot named `deploy-getdjango-7.jpg` (or a png) showing you are able to log in as the admin user.
5. Take a screenshot named `deploy-getdjango-8.jpg` (or a png) showing you are able see concerts on the concert page. You will have to create one or more concerts as the admin user first.

Congratulations! You have completed the capstone project. You can proceed to submit your evidence for peer review and also review one of your peer's submission.

Author(s)

CF

Changelog

Date	Version	Changed by	Change Description
2023-02-10	1.0	Lavanya	Created initial version
2023-02-20	1.0	CF	Added more content
2023-02-22	2.0	Steve Hord	QA pass with edits