DELL Technologies

Pied Piper Technical Workshop

Part 2: Containers and Kubernetes

Abstract

This document is provided to assist attendees with completing the appropriate labs to apply the concepts and knowledge learnt throughout the technical workshop program. It is not intended to be used or distributed in isolation and may not contain all required information.

May 2020

Student Lab Guide

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Lab 1: Docker

Module Objectives:

- ❑ Learn about Docker and Docker Desktop
- ❑ Build a Docker image
- ❑ Run a Docker container
- ❑ Test its functionality

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Tutorial- Docker

- The link below offers a quick start to docker container
  - https://hub.docker.com/?overlay=onboarding&step=clone

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Lab Exercise: Build a docker image and run as a docker container

Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

1. Clone the following repository (if not already);

   https://github.com/chotiwitj/Piper-TH-Workshop/tree/master/Part%202/Lab%2001%20-%20Docker

2. Review the files contained in the “Part 2 - Lab 01 – Docker” directory

   - app.py
   - DockerFile
   - requirements.txt

3. Open a command prompt and cd into the local directory containing your files

   > cd “{Your project path}\Part 2\Lab 01 – Docker”

4. Type the following command and observe the output {NOTE- don’t miss the dot (.) at the end of the command below}

   > docker build -t helloworld .

5. Type this command to check that the container image was built successfully

   > docker image ls

6. Type this command to start the container and run the Python application

   > docker run -p 6000:6000 helloworld

7. Open a web browser and go to the following URL: http://localhost:6000

8. Press CTRL +C on command prompt to quit

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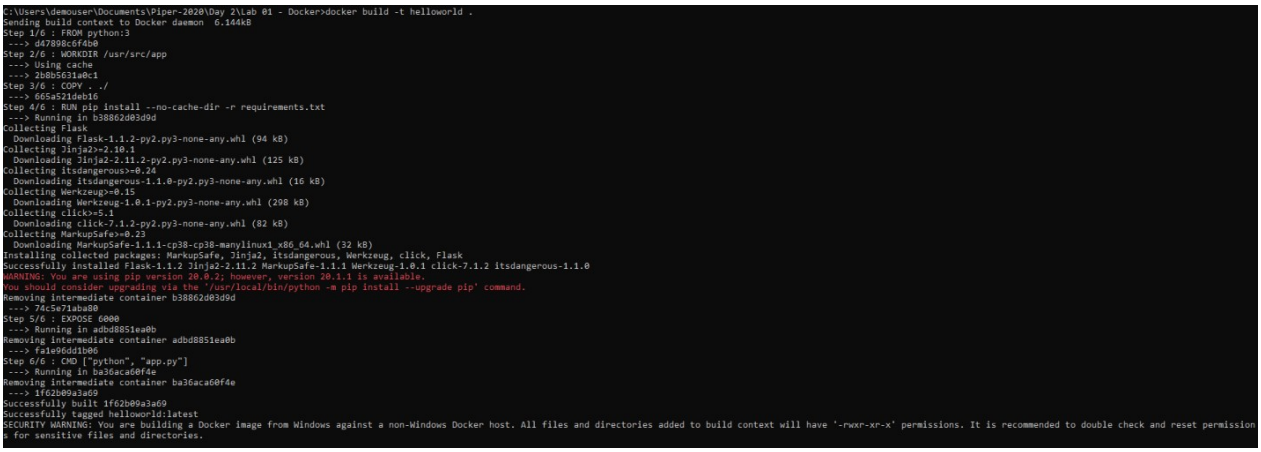
Retrospective: The results

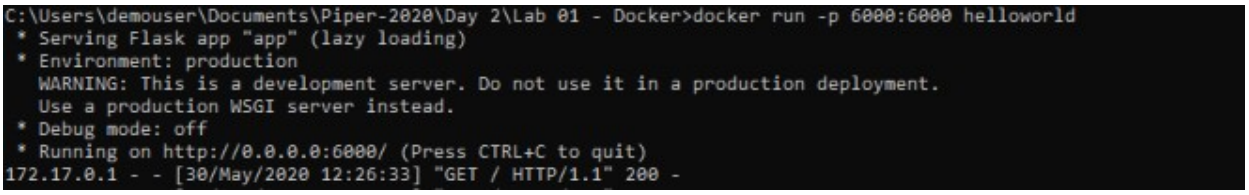
- ❑ Built a Docker image

If you successfully built a docker image, you should see the below result in the command prompt



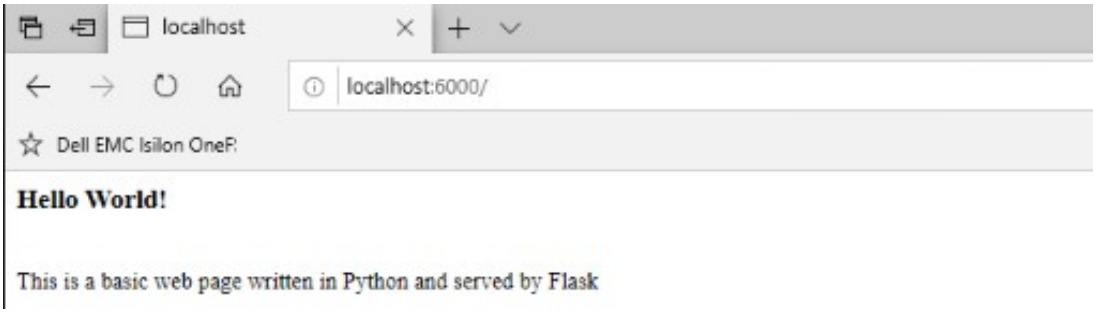
- ❑ Ran a container instance from a Docker image

If you successfully ran the docker container, you should see the below results on the command prompt

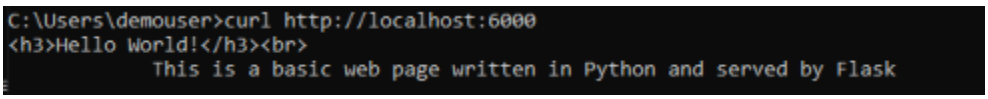


- ❑ Tested the web app

If you successfully ran the docker container, you should see the below results on the web browser or CLI



Or,



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Lab 2: Kubernetes

Module Objectives:

- ❑ Learn about Kubernetes and Docker Desktop Kubernetes
- ❑ Create a Kubernetes deployment from a Docker image
- ❑ Create a service to expose the port
- ❑ Test its functionality

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Tutorial- Standalone Kubernetes with Docker for Windows

- The link below offers a quick start to standalone Kubernetes server that runs on Windows host running Docker Desktop
  - https://docs.docker.com/docker-for-windows/#kubernetes

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Lab Exercise: Create a Kubernetes deployment from a Docker image and expose a service

Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

1. Clone the following repository (if not already); https://github.com/chotiwitj/Piper-TH-Workshop/tree/master/Part%202/Lab%2002%20-%20Kubernetes

2. Review the files contained in the Docker directory

   - app.py
   - DockerFile
   - requirements.txt

   Note: This version has changed port to 6001 in app.py and DockerFile

3. Open a command prompt and cd into the local directory containing your files (note that it's changed to "Lab 02 – Kubernetes" folder)

   > cd "{Your project path}\Part 2\Lab 02 - Kubernetes

1. Check that the Kubernetes cluster is running and available

   > kubectl get deployment

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl get deployments
No resources found.
```

2. Login to docker with your DockerHub credentials

   > docker login

3. Build docker container with your DockerHub credentials {NOTE- don't miss the dot (.) at the end of the command below}

   > docker build -t "YourDockerHubID"/helloworld .

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>docker build -t cloudgeek007/helloworld .
Sending build context to Docker daemon  6.144kB
Step 1/6 : FROM python:3
 ---> d47898c6f4b0
Step 2/6 : WORKDIR /usr/src/app
 ---> Using cache
 ---> 2b8b5631a0c1
Step 3/6 : COPY . ./
 ---> 06295&cbe5cf
Step 4/6 : RUN pip install --no-cache-dir -r requirements.txt
 ---> Running in 9ab5ce367e44
Collecting Flask
  Downloading Flask-1.1.2-py2.py3-none-any.whl (94 kB)
Collecting Jinja2>=2.10.1
  Downloading Jinja2-2.11.2-py2.py3-none-any.whl (125 kB)
Collecting Werkzeug>=0.15
  Downloading Werkzeug-1.0.1-py2.py3-none-any.whl (298 kB)
Collecting itsdangerous>=0.24
  Downloading itsdangerous-1.1.0-py2.py3-none-any.whl (16 kB)
Collecting click>=5.1
  Downloading click-7.1.2-py2.py3-none-any.whl (82 kB)
Collecting MarkupSafe>=0.23
  Downloading MarkupSafe-1.1.1-cp38-cp38-manylinux1_x86_64.whl (32 kB)
Installing collected packages: MarkupSafe, Jinja2, Werkzeug, itsdangerous, click, Flask
Successfully installed Flask-1.1.2 Jinja2-2.11.2 MarkupSafe-1.1.1 Werkzeug-1.0.1 click-7.1.2 itsdangerous-1.1.0
WARNING: You are using pip version 20.0.2; however, version 20.1.1 is available.
You should consider upgrading via the '/usr/local/bin/python -m pip install --upgrade pip' command.
Removing intermediate container 9ab5ce367e44
 ---> 9b1486df5626
Step 5/6 : EXPOSE 6001
 ---> Running in 100e1d7addc5
Removing intermediate container 100e1d7addc5
 ---> 087b023c89ff
Step 6/6 : CMD ["python", "app.py"]
 ---> Running in c1efb4f3a15d
Removing intermediate container c1efb4f3a15d
 ---> 0a10741af4c7
Successfully built 0a10741af4c7
Successfully tagged cloudgeek007/helloworld:latest
SECURITY WARNING: You are building a Docker image from Windows against a non-Windows Docker host. All files and directories added to build context will have '-rwxr-xr-x' permissions. It is recommended to double check and reset permission
s for sensitive files and directories.
```

Note: we are using the same image we built in Lab 01, except this version has changed port to 6001 and has to be pushed to a repository on Docker Hub. i.e. https://hub.docker.com/repository/docker/"YourDockerhubID"/helloworld

4. Push the docker image to repository on Docker Hub

   > docker push YourDockerHubID"/helloworld

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>docker push cloudgeek007/helloworld
The push refers to repository [docker.io/cloudgeek007/helloworld]
61b1e0d7bcf0: Pushed
311d2bff73c3: Pushed
36e9ea9db7ae: Layer already exists
9867e295092a: Layer already exists
4a2b3a37baa3: Layer already exists
64f465a5c456: Layer already exists
912ca77102af: Layer already exists
5900cd753a41: Layer already exists
afae6f50abb9: Layer already exists
136a15f81f25: Layer already exists
185574602537: Layer already exists
24efcd549ab5: Layer already exists
latest: digest: sha256:f2a21e5fdfda5d4283988101fccb37927685979b79e0464d9854bc467d7df03f size: 2843
```

5. Type the following command and observe the output

   > kubectl create deployment helloworld --image="YourDockerHubID"/helloworld

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl create deployment helloworld --image=cloudgeek007/helloworld
deployment.apps/helloworld created
```

6. Type this command to check that the container was deployed to the Kubernetes cluster

   > kubectl get deployment

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
helloworld   1/1     1            1           10s
```

7. Type this command to check that a pod was built and is running successfully

   > kubectl get pods

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl get pods
NAME                          READY   STATUS    RESTARTS   AGE
helloworld-db78d56c8-f5th7    1/1     Running   0          16s
```

8. Type this command to expose port 6001 and allow external access into the Kubernetes cluster

   > kubectl expose deployment helloworld --type=LoadBalancer --port=6001

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl expose deployment helloworld --type=LoadBalancer --port=6001
service/helloworld exposed
```

9. Open a web browser and go to the following URL: http://localhost:6001

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Retrospective: The results

- ❑ Created a Kubernetes deployment from a Docker hub image

If you successfully created a deployment, you should see the below result in the command prompt

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
helloworld   1/1     1            1           10s
```

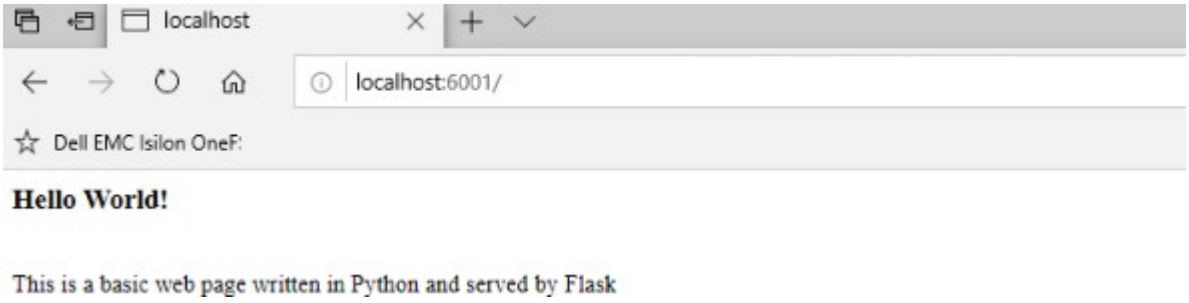
- ❑ Created a service to expose port 6001

If you successfully created a service and exposed to port, you should see the below results on the command prompt

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>kubectl expose deployment helloworld --type=LoadBalancer --port=6001
service/helloworld exposed
```

- ❑ Tested the web app

If you created deployment and exposed service to port successfully, you should see the below results on the web browser or CLI



Or,

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 01 - Docker>curl http://localhost:6001/
<h3>Hello World!</h3><br>
            This is a basic web page written in Python and served by Flask
```

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Lab 3: Containerising an App

Module Objectives:

- ❑ Apply knowledge we learnt in previous labs
- ❑ Deploy a 2-tier app to Docker
- ❑ Forward port to allow local testing
- ❑ Deploy a 2-tier app to a Kubernetes cluster
- ❑ Expose the service port
- ❑ Test its functionality

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Lab Exercise Part 1: Create a 2-tier docker app and forward port for local testing

Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

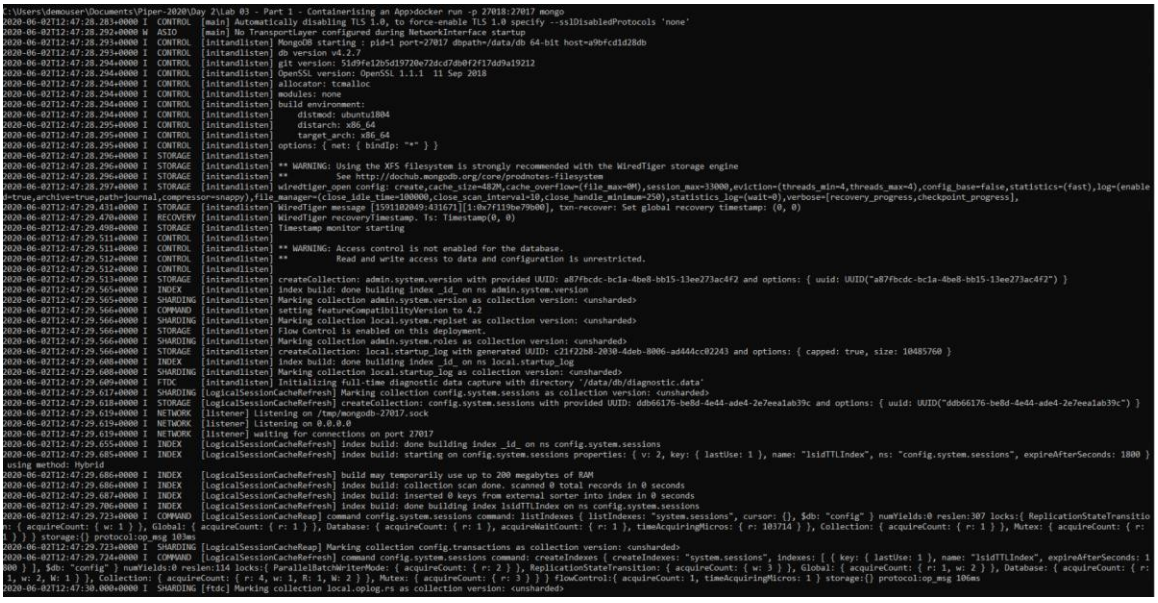
1. Get the mongodb image from Docker Hub

   > docker pull mongo

```
C:\Users\demouser>docker pull mongo
Using default tag: latest
latest: Pulling from library/mongo
23884877105a: Pull complete
bc38caa0f5b9: Pull complete
2910811b6c42: Pull complete
36505266dcc6: Pull complete
a4d269900d94: Pull complete
5e2526abb80a: Pull complete
d3eece1f39ec: Pull complete
358ed78d3204: Pull complete
1a878b8604ae: Pull complete
978c572f0440: Pull complete
35a600ffcf6a: Pull complete
fa9f812cdfe6: Pull complete
7a8109e27110: Pull complete
Digest: sha256:be8d903a68997dd63f64479004a7eeb4f0674dde7ab3cbd1145e5658da3a817b
Status: Downloaded newer image for mongo:latest
docker.io/library/mongo:latest
```

2. Type this command to start the mongo DB container

   > docker run -p 27018:27017 mongo

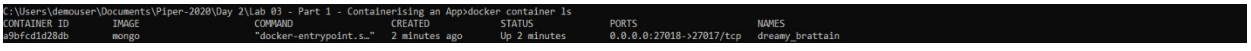


   > Ctrl + C to break from command and run in the background

   Note: The change in exposed port to 27018. This is to avoid conflicts with the existing MongoDB server running locally at 27017

3. Type these commands to check that the container was deployed to Docker

   > docker container ls



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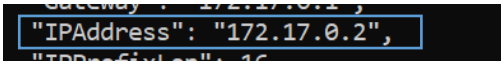
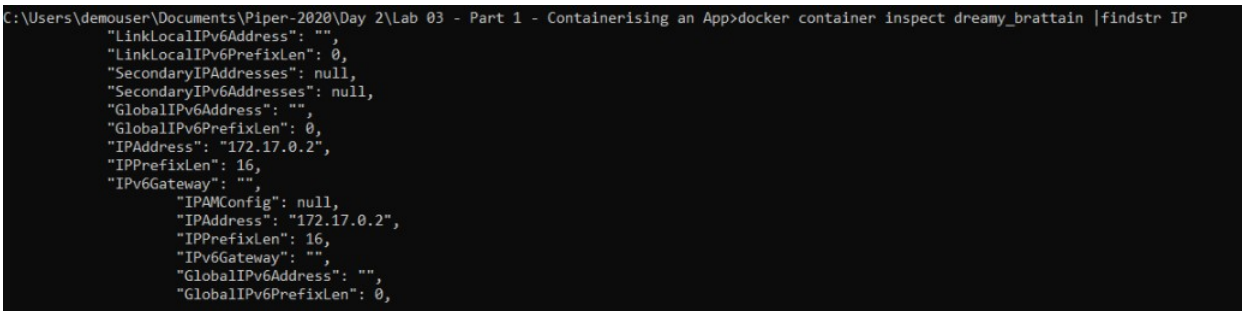
4. Type this command to get the IP address of the docker container running mongodb

   > docker container inspect {container name}

   NOTE- Take note of this IP address, we will use it later in our code to create a database connection

5. Clone the following repository (if not already); https://github.com/chotiwitj/Piper-TH-Workshop/tree/master/Part%202/Lab%2003%20-%20Part%201%20-%20Containerising%20an%20App

6. Check that the config file contains your ECS credentials

   - config.py
   - Rename config-example.py to config.py and replace with your ECS account credentials if required

   ```
   ecs_test_drive = {
       'ecs_endpoint_url' : 'https://object.ecstestdrive.com',
       'ecs_access_key_id' : '1234-your-unique-number-5678@ecstestdrive.emc.com',
       'ecs_secret_key' : 'your-long-secret-key-from-ECS-testdrive-portal',
       'ecs_bucket_name' : 'photo-album'
   }
   ```

7. Edit the models.py file on line 29 to reflect the IP address of your mongodb container

   ```
   29        client = MongoClient('172.17.0.2:27017')
   ```

   Note: We use port 27017 as the internal accessible port within the Docker network.

8. Open a command prompt and cd into the local directory containing your files

   > cd {user project folder}\Part 2\Lab 03 – Part 1 - Containerising an App\

9. Type the following commands and observe the outputs {NOTE- don't miss the dot (.) at the end of the command below}

   > docker build -t photo-album .

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```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 03 - Part 1 - Containerising an App>docker build -t photo-album .
Sending build context to Docker daemon  25.09kB
Step 1/6 : FROM python:3
 ---> d47898c6f4b0
Step 2/6 : WORKDIR /usr/src/app
 ---> Using cache
 ---> 2b8b5631a0c1
Step 3/6 : COPY . ./
 ---> bc10042d1260
Step 4/6 : RUN pip install --no-cache-dir -r requirements.txt
 ---> Running in 115abeeae488
Requirement already satisfied: pip==20.0.2 in /usr/local/lib/python3.8/site-packages (from -r requirements.txt (line 1)) (20.0.2)
Collecting Flask==1.1.1
  Downloading Flask-1.1.1-py2.py3-none-any.whl (94 kB)
Collecting boto3==1.11.12
  Downloading boto3-1.11.12-py2.py3-none-any.whl (128 kB)
Collecting Pillow==7.0.0
  Downloading Pillow-7.0.0-cp38-cp38-manylinux1_x86_64.whl (2.1 MB)
Collecting pymongo==3.10.1
  Downloading pymongo-3.10.1-cp38-cp38-manylinux2014_x86_64.whl (480 kB)
Collecting Werkzeug==0.16.1
  Downloading Werkzeug-0.16.1-py2.py3-none-any.whl (327 kB)
Collecting itsdangerous>=0.24
  Downloading itsdangerous-1.1.0-py2.py3-none-any.whl (16 kB)
Collecting click>=5.1
  Downloading click-7.1.2-py2.py3-none-any.whl (82 kB)
Collecting Jinja2>=2.10.1
  Downloading Jinja2-2.11.2-py2.py3-none-any.whl (125 kB)
Collecting jmespath<1.0.0,>=0.7.1
  Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Collecting botocore<1.15.0,>=1.14.12
  Downloading botocore-1.14.17-py2.py3-none-any.whl (5.9 MB)
Collecting s3transfer<0.4.0,>=0.3.0
  Downloading s3transfer-0.3.3-py2.py3-none-any.whl (69 kB)
Collecting MarkupSafe>=0.23
  Downloading MarkupSafe-1.1.1-cp38-cp38-manylinux1_x86_64.whl (32 kB)
Collecting docutils<0.16,>=0.10
  Downloading docutils-0.15.2-py3-none-any.whl (547 kB)
Collecting urllib3<1.26,>=1.20; python_version != "3.4"
  Downloading urllib3-1.25.9-py2.py3-none-any.whl (126 kB)
Collecting python-dateutil<3.0.0,>=2.1
  Downloading python_dateutil-2.8.1-py2.py3-none-any.whl (227 kB)
Collecting six>1.5
  Downloading six-1.15.0-py2.py3-none-any.whl (10 kB)
Installing collected packages: itsdangerous, click, MarkupSafe, Jinja2, Werkzeug, Flask, jmespath, docutils, urllib3, six, python-dateutil, botocore, s3transfer, boto3, Pillow, pymongo
Successfully installed Flask-1.1.1 Jinja2-2.11.2 MarkupSafe-1.1.1 Pillow-7.0.0 Werkzeug-0.16.1 boto3-1.11.12 botocore-1.14.17 click-7.1.2 docutils-0.15.2 itsdangerous-1.1.0 jmespath-0.10.0 pymongo-3.10.1 python-dateutil-2.8.1 s3transfer-
0.3.3 six-1.15.0 urllib3-1.25.9
WARNING: You are using pip version 20.0.2; however, version 20.1.1 is available.
You should consider upgrading via the '/usr/local/bin/python -m pip install --upgrade pip' command.
Removing intermediate container 115abeeae488
 ---> ad1e04a21ee7
Step 5/6 : EXPOSE 6002
 ---> Running in fb49006b152b
Removing intermediate container fb49006b152b
 ---> d91b8b1f34b6
Step 6/6 : CMD ["python", "app.py"]
 ---> Running in 9782075c0982
Removing intermediate container 9782075c0982
 ---> 229b071d61c3
Successfully built 229b071d61c3
Successfully tagged photo-album:latest
SECURITY WARNING: You are building a Docker image from Windows against a non-Windows Docker host. All files and directories added to build context will have '-rwxr-xr-x' permissions. It is recommended to double check and reset permission
s for sensitive files and directories.
```

10. Type this command to check that the container image photo-album was built and mongo was downloaded from docker hub

    > docker image ls

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 03 - Part 1 - Containerising an App>docker image ls
REPOSITORY                          TAG                 IMAGE ID            CREATED             SIZE
photo-album                         latest              229b071d61c3        54 seconds ago      1GB
```

11. Type this command to start the mongo DB container

    > docker run -p 6002:6002 photo-album

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 03 - Part 1 - Containerising an App>docker run -p 6002:6002 photo-album
 * Serving Flask app "app" (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://0.0.0.0:6002/ (Press CTRL+C to quit)
172.17.0.1 - - [02/Jun/2020 14:36:21] "GET / HTTP/1.1" 200 -
```

12. Open a web browser and go to the following URL: http://localhost:6002

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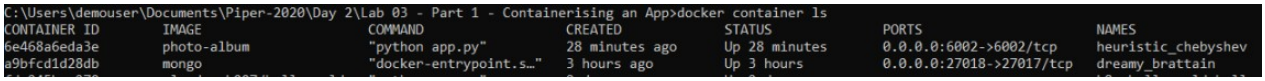
Retrospective: The results

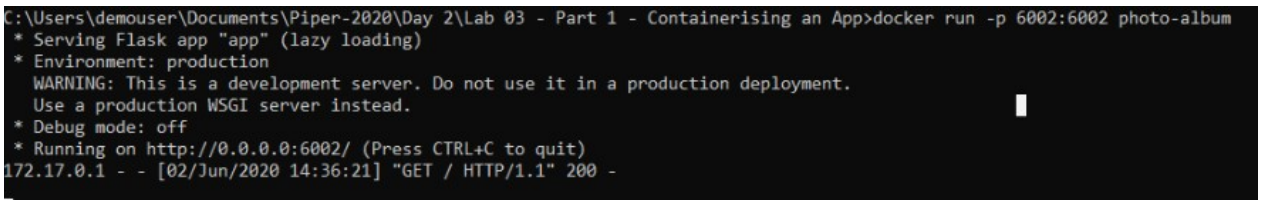
- ❑ Deployed a 2-tier app to both Docker

If you successfully ran docker containers for mongodb and photo-album, you should see the below result in the command prompt



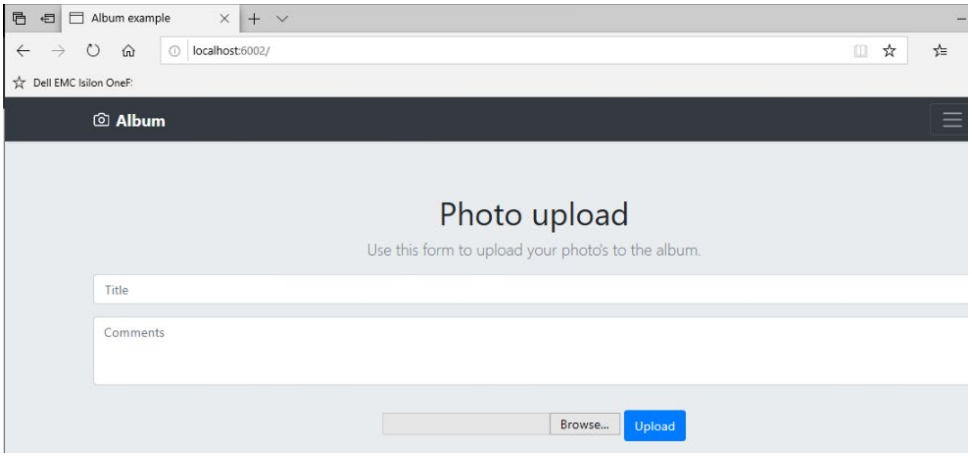
- ❑ Forward port to allow local testing

If you successfully ran docker for photo-album on stated port, you should see the below result in the command prompt

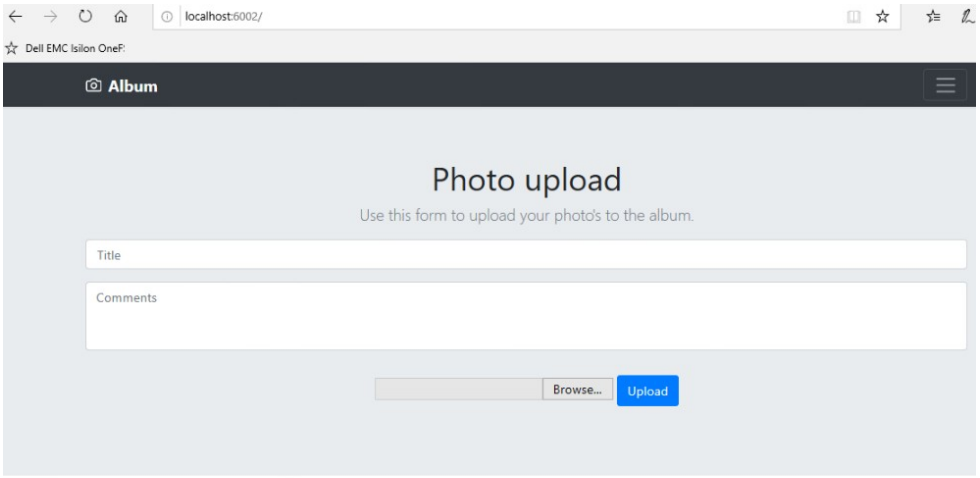


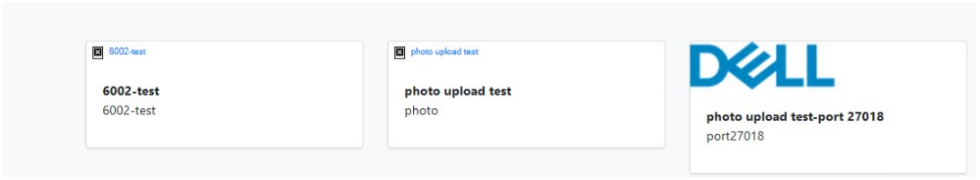
- ❑ Tested the web app

If you are running photo-album container on stated port successfully, you should see the below results on the web browser or CLI

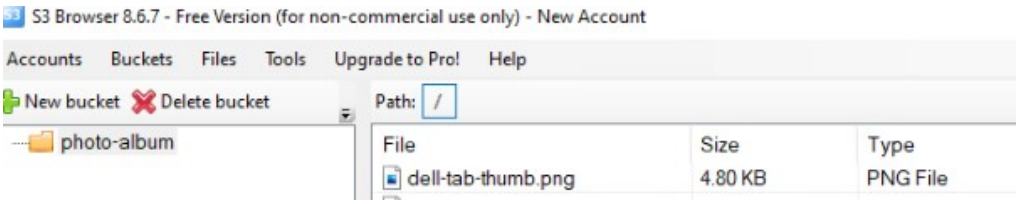


If you upload a photo, you should see similar results as below on the web browser or CLI





The photo image being uploaded can be verified using S3 browser



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Lab Exercise Part-2: Create a 2-tier docker app for local testing and deploy the 2-tier app to kubernetes cluster

Clean up and delete any Docker container instances you deployed in the previous labs

Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

1. Check that the Kubernetes cluster is running and if there are any existing deployments

   > kubectl cluster-info

   > kubectl get deployment

2. Type the following command and observe the output

   > kubectl create deployment mongo --image=mongo

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl create deployment mongo --image=mongo
deployment.extensions "mongo" created
```

3. Type these commands to check that the container was deployed to the Kubernetes cluster

   > kubectl get deployment

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl get deployment
NAME         DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
helloworld   1         1         1            1           92d
mongo        1         1         1            1           49s
```

   > kubectl get pods

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl get pods
NAME                          READY     STATUS    RESTARTS   AGE
helloworld-688d6bcfd6-qjjtf   1/1       Running   7          29d
mongo-7cdd4fbf69-n8qck        1/1       Running   0          54s
```

4. Type this command to expose port 27017 to allow our application to connect to the database port

   > kubectl expose deployment mongo --port=27017

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl expose deployment mongo --type=NodePort --port=27017
service "mongo" exposed
```

5. Type this command to retrieve the cluster IP address of the mongo deployment

   > kubectl get svc

```
D:\MyProject>kubectl get svc
NAME         TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)     AGE
kubernetes   ClusterIP   10.96.0.1       <none>        443/TCP     49d
mongo        ClusterIP   10.104.88.185   <none>        27017/TCP   7s
```

7. Clone the following repository (if not already); https://github.com/chotiwitj/Piper-TH-Workshop/tree/master/Part%202/Lab%2003%20-%20Part%202%20-%20Deploying%20to%20Kubernetes

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8. Edit the models.py file on line 29 and add the IP address you obtained from the mongo svc

```
29        client = MongoClient('10.104.88.185:27017')
```

9. Build the docker image and push it to Docker Hub {NOTE- don't miss the dot (.) at the end of the command below}

   > docker build -t {dockerhubID}/photo-album-k8s .

```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>docker build -t cloudgeek007/photo-album-k8s .
Sending build context to Docker daemon  23.55kB
Step 1/6 : FROM python:3
 ---> d47898c6f4b0
Step 2/6 : WORKDIR /usr/src/app
 ---> Using cache
 ---> 2b8b5631a0c1
Step 3/6 : COPY . ./
 ---> b1581f98d046
Step 4/6 : RUN pip install --no-cache-dir -r requirements.txt
 ---> Running in 7e21901b2b74
Requirement already satisfied: pip==20.0.2 in /usr/local/lib/python3.8/site-packages (from -r requirements.txt (line 1)) (20.0.2)
Collecting Flask==1.1.1
  Downloading Flask-1.1.1-py2.py3-none-any.whl (94 kB)
Collecting boto3==1.11.12
  Downloading boto3-1.11.12-py2.py3-none-any.whl (128 kB)
Collecting Pillow==7.0.0
  Downloading Pillow-7.0.0-cp38-cp38-manylinux1_x86_64.whl (2.1 MB)
Collecting pymongo==3.10.1
  Downloading pymongo-3.10.1-cp38-cp38-manylinux2014_x86_64.whl (480 kB)
Collecting Werkzeug==0.16.1
  Downloading Werkzeug-0.16.1-py2.py3-none-any.whl (327 kB)
Collecting click>=5.1
  Downloading click-7.1.2-py2.py3-none-any.whl (82 kB)
Collecting itsdangerous>=0.24
  Downloading itsdangerous-1.1.0-py2.py3-none-any.whl (16 kB)
Collecting Jinja2>=2.10.1
  Downloading Jinja2-2.11.2-py2.py3-none-any.whl (125 kB)
Collecting s3transfer<0.4.0,>=0.3.0
  Downloading s3transfer-0.3.3-py2.py3-none-any.whl (69 kB)
Collecting botocore<1.15.0,>=1.14.12
  Downloading botocore-1.14.17-py2.py3-none-any.whl (5.9 MB)
Collecting jmespath<1.0.0,>=0.7.1
  Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Collecting MarkupSafe>=0.23
  Downloading MarkupSafe-1.1.1-cp38-cp38-manylinux1_x86_64.whl (32 kB)
Collecting docutils<0.16,>=0.10
  Downloading docutils-0.15.2-py3-none-any.whl (547 kB)
Collecting python-dateutil<3.0.0,>=2.1
  Downloading python_dateutil-2.8.1-py2.py3-none-any.whl (227 kB)
Collecting urllib3<1.26,>=1.20; python_version != "3.4"
  Downloading urllib3-1.25.9-py2.py3-none-any.whl (126 kB)
Collecting six>=1.5
  Downloading six-1.15.0-py2.py3-none-any.whl (10 kB)
Installing collected packages: click, itsdangerous, Werkzeug, MarkupSafe, Jinja2, Flask, docutils, six, python-dateutil, jmespath, urllib3, botocore, s3transfer, boto3, Pillow, pymongo
Successfully installed Flask-1.1.1 Jinja2-2.11.2 MarkupSafe-1.1.1 Pillow-7.0.0 Werkzeug-0.16.1 boto3-1.11.12 botocore-1.14.17 click-7.1.2 docutils-0.15.2 itsdangerous-1.1.0 jmespath-0.10.0 pymongo-3.10.1 python-dateutil-2.8.1 s3transfer-0.3.3 six-1.15.0 urllib3-1.25.9
WARNING: You are using pip version 20.0.2; however, version 20.1.1 is available.
You should consider upgrading via the '/usr/local/bin/python -m pip install --upgrade pip' command.
Removing intermediate container 7e21901b2b74
 ---> e880c4ea49ea
Step 5/6 : EXPOSE 6003
 ---> Running in 379fd87259e6
Removing intermediate container 379fd87259e6
 ---> 953d63748ead
Step 6/6 : CMD ["python", "app.py"]
 ---> Running in bcf4bd99eab5
Removing intermediate container bcf4bd99eab5
 ---> 2f4322879e51
Successfully built 2f4322879e51
Successfully tagged cloudgeek007/photo-album-k8s:latest
SECURITY WARNING: You are building a Docker image from Windows against a non-Windows Docker host. All files and directories added to build context will have '-rwxr-xr-x' permissions. It is recommended to double check and reset permissions for sensitive files and directories.
```

   > docker images

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>docker images
REPOSITORY                          TAG                 IMAGE ID            CREATED             SIZE
cloudgeek007/photo-album-k8s        latest              ef21766cb3cb        About an hour ago   1GB
```

   > docker push {dockerhubID}/photo-album-k8s

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>docker push cloudgeek007/photo-album-k8s
The push refers to repository [docker.io/cloudgeek007/photo-album-k8s]
2e085a5841cf: Layer already exists
b9bca98cc134: Layer already exists
3f64199536a3: Layer already exists
fbefc7d9db96: Layer already exists
bd436d37b328: Layer already exists
8b6dde37c5c4: Layer already exists
3dffd131f01f: Layer already exists
271910c4c150: Layer already exists
6670e930ed33: Layer already exists
c7f27a4eb870: Layer already exists
e70dfb4c3a48: Layer already exists
1c76bd0dc325: Layer already exists
latest: digest: sha256:3a7cd5a6ccded420b8dbed85201ab61e6a1f325515df4d6ea489a4a00e3df001 size: 2844
```

10. Deploy your image to the Kubernetes cluster and expose port 6003 for local access

    > kubectl create deployment photo-album-k8s --image={dockerhub username}/photo-album-k8s

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```
C:\Users\demouser\Documents\Piper-2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl create deployment photo-album-k8s --image=cloudgeek007/photo-album-k8s
deployment.apps/photo-album-k8s created
```

>kubectl get deployment

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl get deployments
NAME             DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
helloworld       1         1         1            1           92d
mongo            1         1         1            1           1h
photo-album-k8s  1         1         1            1           1h
```

> kubectl expose deployment photo-album-k8s --type=LoadBalancer --port=6003

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl expose deployment photo-album-k8s --type=LoadBalancer --port=6003
service "photo-album-k8s" exposed
```

> kubectl get service

```
D:\MyProject>kubectl get svc
NAME             TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
kubernetes       ClusterIP      10.96.0.1       <none>        443/TCP          49d
mongo            ClusterIP      10.104.88.185   <none>        27017/TCP        12m
photo-album-k8s  LoadBalancer   10.105.118.2    localhost     6003:30764/TCP   8s
```

11. Open a web browser and go to the following URL: http://localhost:6003

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Retrospective: The results

- ❑ Deployed a 2-tier app to Kubernetes

If you successfully deployed mongodb and photo-album deployments, you should see the below result in the command prompt

```
C:\Users\negij\Documents\GitHub Repos\Piper2020\Day 2\Lab 03 - Part 2 - Deploying to Kubernetes>kubectl get deployments
NAME             DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
helloworld       1         1         1            1           92d
mongo            1         1         1            1           1h
photo-album-k8s  1         1         1            1           1h
```

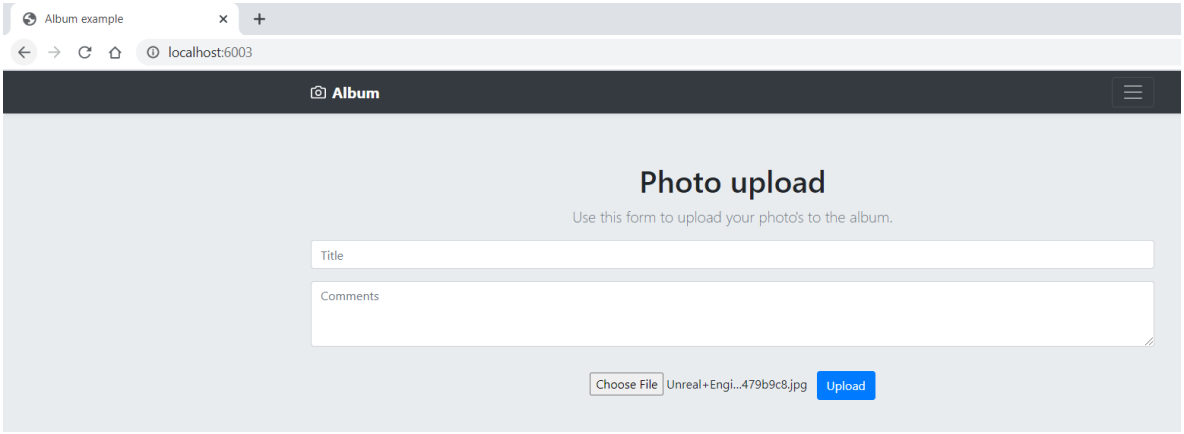
- ❑ Exposed the service port to access application

If you successfully exposed the service port to access application photo-album-k8s on stated port, you should see the similar result in the command prompt

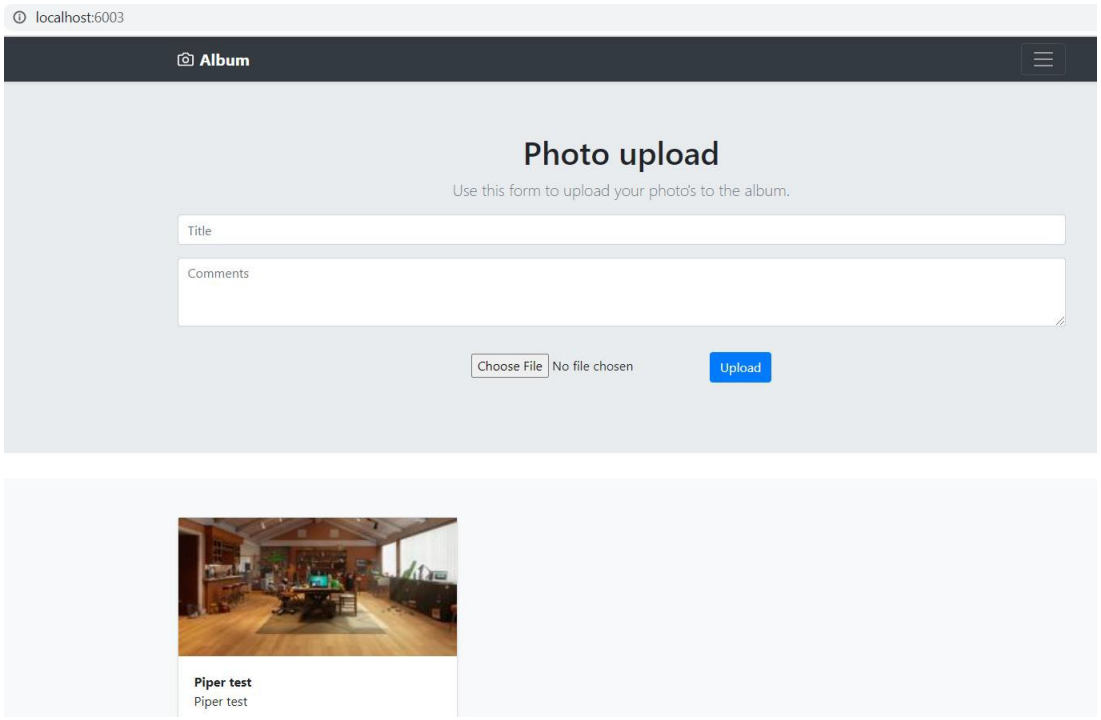
```
D:\MyProject>kubectl get svc
NAME             TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
kubernetes       ClusterIP      10.96.0.1       <none>        443/TCP          49d
mongo            ClusterIP      10.104.88.185   <none>        27017/TCP        12m
photo-album-k8s  LoadBalancer   10.105.118.2    localhost     6003:30764/TCP   8s
```

- ❑ Tested the web app

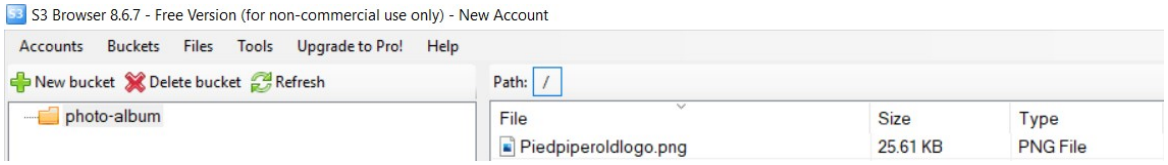
If you are running photo-album-k8s deployment on stated port successfully, you should see the below results on the web browser or CLI



If you upload any photo, you should see similar results as below on the web browser



The photo image being uploaded can be verified using S3 browser



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Lab 4: CI/CD with Jenkins

Module Objectives:

- ❑ Learn about Jenkins as CI/CD tool
- ❑ Configure Pipeline as a Code
- ❑ Build (Trigger) Pipeline job
- ❑ Review stages- Checkout, Build, Publish and Clean-up

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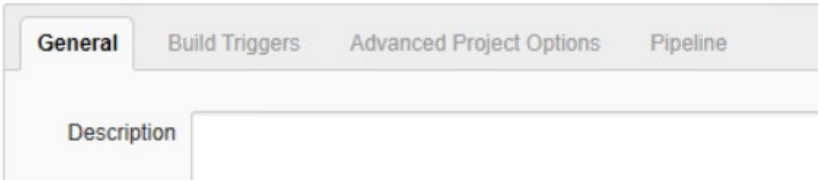
Lab Exercise: Create a build pipeline with Jenkins

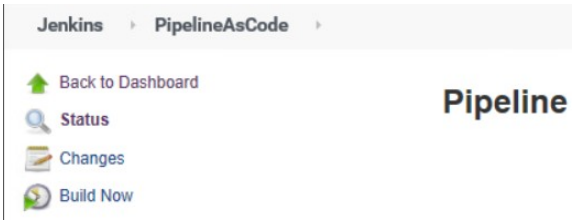
Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

(Require Github & Docker hub accounts)

1. Run commands from RunDIND & RunJenkins file on Windows command prompt
2. Run to check Jenkins BlueOcean and DIND containers are running
   - docker ps
3. Login to http://localhost:8080 with Credentials (admin/Password123!)
4. Create new job & configure as below



   - Jobname- PipelineAsCode
   - Type- Pipeline
   - Build Trigers- Check “github hook trigger for GITScm polling”
   - Pipeline Definition- Pipeline Script from SCM
   - SCM- Git
   - Repository URL- https://github.com/YOURGITHUBID/Piper-2020.git
   - Credentials- github (your credentials) & Dockerhub ((your credentials)
   - Replace Jenkins file in your github repo with dockerhub login id-
     - registry = " YourDockerHubID/YourRepoName“
   - Script Path- (relative path to Jenkins file in repo) e.g. Day 03/Lab 06 – Jenkins/Jenkinsfile
5. Click on Pipeline & Click Build Now



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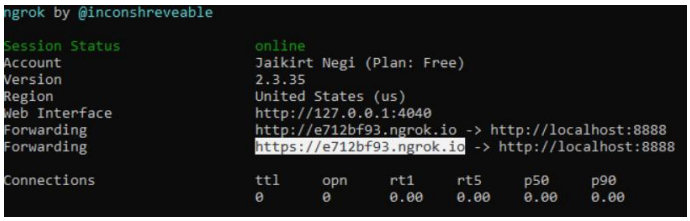
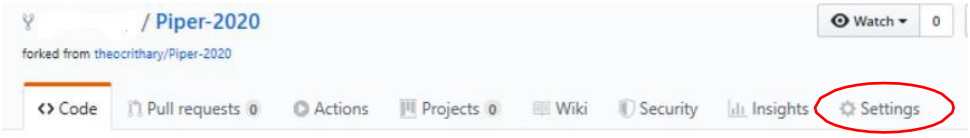
Lab Exercise: Automatically invoke the pipeline when new code is committed to Github

Complete the below steps to demonstrate your understanding of the tools and concepts required for the remaining lab exercises;

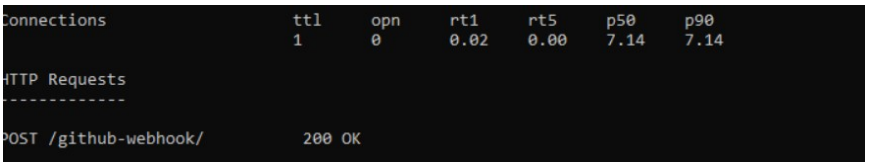
1. Run following commands from command prompt
    a. ngrok http 8888



2. Copy URL as shaded from the command prompt
3. Go to github.com and your workshop repo
4. Click settings



5. Click Webhooks> paste the URL from above
6. https://XXXXXX.ngrok.io/github-webhook/ & content type as application/json
7. Save the settings
8. Create a new file in your workshop repo & save it to trigger Pipeline by SCM polling
9. Verify SCM poll request on ngrok command prompt



10. Got to Jenkins URL http://localhost:8888 & click pipeline to verify new job initiated via GitSCM polling
15. Console output for pipeline job shows started by github

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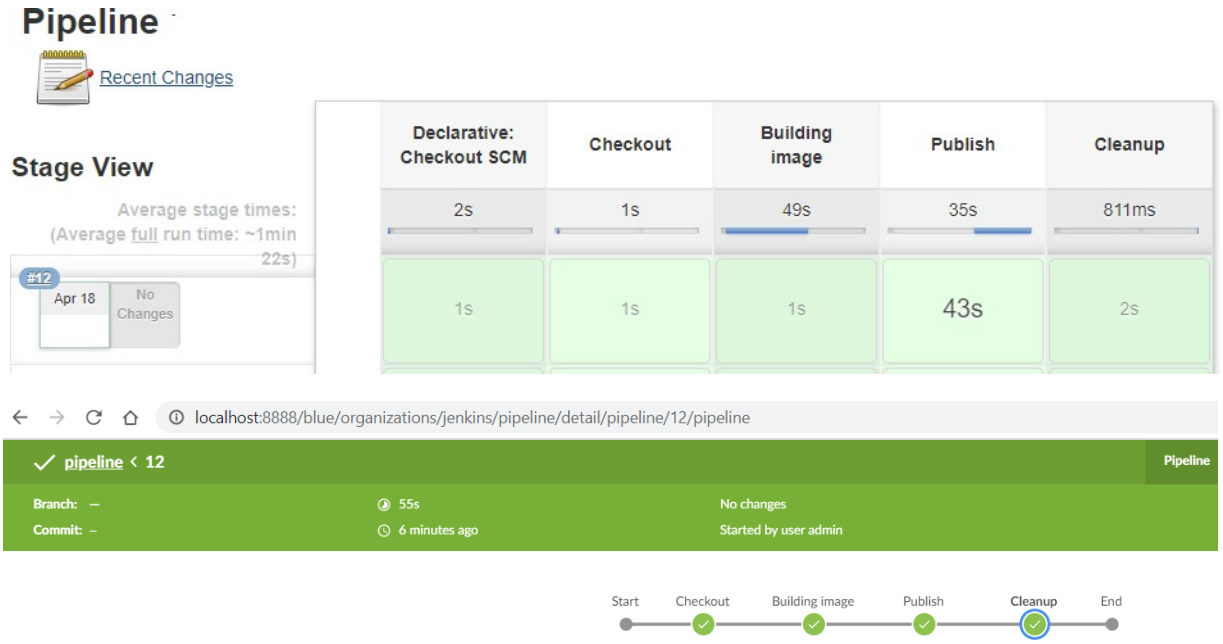
Retrospective: Built a CI/CD pipeline with an automated trigger using Github & Jenkins

- ❑ Learnt about Jenkins as CI/CD tool
- ❑ Configured Pipeline as a Code
- ❑ Triggered Pipeline job
- ❑ Reviewed the pipeline stages



Now that our container is being built using the latest code whenever a Github commit is performed, we can extend this pipeline to include deployment and testing stages.

Stay tuned for additional enhancements to this lab, or feel free to iterate on this lab example and add your own deployment / testing workflows.