**Hello Docker!!**

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# Deploying to IBM Container Service

This lab is a primer on how to use, build, deploy and run Liberty in a IBM Bluemix Container Service. resources inside the container, add an application then test it.

Please refer to the following table for file and resource location references on different operating systems.

|  |  |  |
| --- | --- | --- |
| Location Ref. | OS | Absolute Path |
| *{LAB\_HOME}* | Windows | C:\WLP\_<version> |
| Linux | ~\WLP\_<version> |
| Mac OSX |  |

## Prerequisites

The following preparation must be completed prior to beginning this lab:

1. Access to the internet and more specifically Docker Hub.
2. Download and install Docker to your machine. Go to <https://www.docker.com/> to get the version for the OS being used.
   1. If you are on Windows, Docker requires you to have Windows 10 installed
3. Setup up Access to IBM Bluemix
   1. Complete the sections marked “Labs Accessing Bluemix” in ${LAB\_HOME}/labs/getttingStarted/0\_setup\_<timestamp>/setup.pdf

## Log into the Bluemix environment using the CLI

Docker has a set of infrastructure that is used to run and manage the Docker containers. When you install the Docker software it creates a daemon, command line tools and a quick start terminal.

1. If you're not already logged in to Bluemix, run these Cloud Foundry commands from your OS command prompt to log in:

bx api <https://api.ng.bluemix.net/>

For other regions of the world:

bx api https://api.eu-gb.bluemix.net/

bx api <https://api.eu-de.bluemix.net/>

bx api <https://api.au-syd.bluemix.net/>

bx login –u <Your Bluemix username> --apikey @{LAB\_HOME}/Liberty-APIKey.json

API endpoint: **https://api.ng.bluemix.net**

Authenticating...

**OK**

Targeted account **<your account> Account (eeee7d19b6701916e21bf02f116813a9)**

Targeted org **<Your org (email if non subscribed account)>**

Targeted space **LAB\_SPACE**

**API endpoint:**   **https://api.ng.bluemix.net** (API version: **2.75.0**)

**Region:**         **us-south**

**User:**           **<your user email>**

**Account:**        **<your account> Account (eeee7d19b6701916e21bf02f116813a9)**

**Org:**            **<Your org (email if non subscribed account)>**

**Space:**          **LAB\_SPACE**

## install the container service and container registry plugins

1. Install the Bluemix Container Service plugin by issuing

bx plugin install container-service -r Bluemix

Looking up '**container-service**' from repository '**Bluemix**'...

Plug-in '**container-service** **0.1.328**' found in repository '**Bluemix**'

Attempting to download the binary file...

 19.65 MiB / 19.65 MiB [===========================================================================================================] 100.00% 12s

20607456 bytes downloaded

Installing binary...

**OK**

Plug-in '**container-service 0.1.328**' was successfully installed into /Users/<usrname>/.bluemix/plugins/container-service. Use '**bx plugin show container-service**' to show its details.

1. Install the container registry plugin by issuing the following command:

bx plugin install container-registry -r Bluemix

Looking up '**container-registry**' from repository '**Bluemix**'...

Plug-in '**container-registry** **0.1.215**' found in repository '**Bluemix**'

Attempting to download the binary file...

 21.74 MiB / 21.74 MiB [===========================================================================================================] 100.00% 15s

22795616 bytes downloaded

Installing binary...

**OK**

Plug-in '**container-registry 0.1.215**' was successfully installed into /Users/tjmcmanus/.bluemix/plugins/container-registry. Use '**bx plugin show container-registry**' to show its details.

1. Issue the following command to initialize the IBM Container plugin which allows you access to the IBM Container environment:  
     
   **bx cs init**

bx cs init

Using default API endpoint: **https://us-south.containers.bluemix.net**

**OK**

1. Download the private registry pluing
2. bx plugin list
3. Listing installed plug-ins...
4. **Plugin Name**   **Version**
5. bx plugin install container-service -r Bluemix
6. Looking up '**container-service**' from repository '**Bluemix**'...
7. Plug-in '**container-service** **0.1.328**' found in repository '**Bluemix**'
8. Attempting to download the binary file...
9. 19.65 MiB / 19.65 MiB [===========================================================================================================] 100.00% 12s
10. 20607456 bytes downloaded
11. Installing binary...
12. **OK**
13. Plug-in '**container-service 0.1.328**' was successfully installed into /Users/tjmcmanus/.bluemix/plugins/container-service. Use '**bx plugin show container-service**' to show its details.
14. Toms-MBP:buildpot tjmcmanus$ bx plugin list
15. Listing installed plug-ins...
16. **Plugin Name**         **Version**
17. **container-service**   0.1.328
18. Toms-MBP:buildpot tjmcmanus$ bx plugin show container-service
20. **Plugin**                         container-service
21. **Version**                        0.1.328
22. **Minimal CLI version required**   0.4.9
24. Toms-MBP:buildpot tjmcmanus$ bx cs locations
25. **OK**
26. **Location**
27. **dal10**
28. **dal12**
29. Toms-MBP:buildpot tjmcmanus$ bx plugin install container-registry -r Bluemix
30. Looking up '**container-registry**' from repository '**Bluemix**'...
31. Plug-in '**container-registry** **0.1.215**' found in repository '**Bluemix**'
32. Attempting to download the binary file...
33. 21.74 MiB / 21.74 MiB [===========================================================================================================] 100.00% 15s
34. 22795616 bytes downloaded
35. Installing binary...
36. **OK**
37. Plug-in '**container-registry 0.1.215**' was successfully installed into /Users/tjmcmanus/.bluemix/plugins/container-registry. Use '**bx plugin show container-registry**' to show its details.
38. Let’s run a Liberty image Docker container. Docker will check if there is an image in the repository. If not it will download the latest image, then run it.

The parameters are:

--name: the name you wish to assign to the container

-p: *publish* a container port to a host port. In this case port 9080 on the container will be available to the host using port **9080**

-d: *detach* the container to run in the background and print the container id the name of the container image (in this case websphere-liberty)

* 1. docker run -d -p 9080:9080 --name wlp websphere-liberty

Unable to find image 'websphere-liberty:latest' locally

latest: Pulling from library/websphere-liberty

952132ac251a: Pull complete

cf88eb2790ed: Pull complete

b79bc15ccdb3: Pull complete

26eea697f093: Pull complete

f0772594b736: Pull complete

6d864bbed0dc: Pull complete

7c38edab1e5c: Pull complete

e58a7f9f5b7a: Pull complete

c0b1caf382fe: Pull complete

d43e1f127400: Pull complete

fa192947348f: Pull complete

2830387e6f06: Pull complete

969c2a1fc525: Pull complete

b2de9651a96a: Pull complete

d4d79c7cc2b4: Pull complete

f68a11cc2013: Pull complete

Digest: sha256:ac770677ec1f46f5ebd173d7abfc2b7dd6f431cd4f64d715cce3b328ee6dfdce

Status: Downloaded newer image for websphere-liberty:latest

5e8cf88eb88b747ea69323f0e0197950028f4a74a62e96633e4538cb7c7e2c4d

* 1. Review the Container’s process information:
     1. docker ps

CONTAINER ID IMAGE COMMAND CREATED STATUS

3f5066240ef7 websphere-liberty "/opt/ibm/docker/dock" 9 seconds ago Up 8 seconds

PORTS NAMES

0.0.0.0:9080->9080/tcp, 9443/tcp wlp

* + 1. docker stats

CONTAINER CPU % MEM USAGE / LIMIT MEM %

3f5066240ef7 1.57% 130.1MiB / 1.952GiB 7.95%

NET I/O BLOCK I/O PIDS

648 B / 648 B 0 B / 20.61 MB 111

* + 1. Ctrl + C to stop stats
  1. Open a browser and access <http://localhost:9080>



* 1. Look at the logs for the Liberty server running inside the Docker container.
     1. docker logs --tail=all -f wlp

Launching defaultServer (WebSphere Application Server 17.0.0.3/wlp-1.0.18.cl160320160831-1555) on IBM J9 VM, version pxa6480sr3fp11-20160817\_02 (SR3 FP11) (en\_US)

[AUDIT ] CWWKE0001I: The server defaultServer has been launched.

….

[AUDIT ] CWWKF0012I: The server installed the following features: [servlet-3.1, beanValidation-1.1, ssl-1.0, jndi-1.0, jca-1.7, ejbPersistentTimer-3.2, appSecurity-2.0, j2eeManagement-1.1, jdbc-4.1, wasJmsServer-1.0, jaxrs-2.0, javaMail-1.5, cdi-1.2, webProfile-7.0, jcaInboundSecurity-1.0, jpa-2.1, jsp-2.3, ejbLite-3.2, managedBeans-1.0, jsf-2.2, ejbHome-3.2, jaxws-2.2, jsonp-1.0, el-3.0, jaxrsClient-2.0, concurrent-1.0, appClientSupport-1.0, ejbRemote-3.2, javaee-7.0, jaxb-2.2, mdb-3.2, jacc-1.5, batch-1.0, ejb-3.2, json-1.0, jaspic-1.1, distributedMap-1.0, websocket-1.1, wasJmsSecurity-1.0, wasJmsClient-2.0].

**[AUDIT ] CWWKF0011I: The server defaultServer is ready to run a smarter planet.**

* 1. Ctrl+C to stop the tail
  2. Run the command below to access the wlp-xxx container shell console (again, replace wlp-xxx with the name of your docker container)
     1. docker exec -it wlp bash
  3. You will now be in a bash command shell inside the docker container as the root user.
     1. root@48a98833d101:/#
  4. In the container shell console, run the Liberty productInfo command to check version of the server

root@48a98833d101:/# /opt/ibm/wlp/bin/productInfo version

Product name: WebSphere Application Server

Product version: 17.0.0.3

Product edition: BASE\_ILAN

In the similar way, you can perform other task related to Liberty e.g. install some additional features.

* 1. Type **exit** to close the container console

1. Clean up the environment:
   1. First stop the container
      1. docker stop wlp

wlp

* 1. Second remove the container instance
     1. docker rm wlp

wlp

## Creating a Build file

To make the build process repeatable, create a Dockerfile which is the ordering of the layers of the runnable container.

1. Changed directories to {LAB\_HOME}/labs/cloud/4\_HelloDocker\_<timestamp>
2. Investigate the Dockerfile

FROM websphere-liberty

COPY ServletApp.war /config/dropins/app.war

* 1. The first line FROM is the virtual machine image that is to be used. If this is not in the local repository, this will be pulled from Docker Hub.
  2. The second line COPY is a straight copy from the directory that you are running the build into the container at the designated directory.

1. From the 4\_HelloDocker directory execute. This will build a template named app from the Dockerfile and place it in the local repository.

docker build -t app .

Sending build context to Docker daemon 12.03 MB

Step 1 : FROM websphere-liberty

---> a33cec241317

Step 2 : COPY ServletApp.war /config/dropins/app.war

---> ea7cb8b12dc2

Removing intermediate container 770d6a93e2cd

Successfully built ea7cb8b12dc2

1. Run the Docker container. Note you are running this with both HTTP and HTTPS ports.

docker run -d -p 9080:9080 -p 9443:9443 --name=app-instance app

73b1eed3d39c662c1acc231463499330d27ecb9636c5842f10aa87895a2fae5e

1. Open up a browser and enter <http://localhost:9080/app/>



1. Open up a browser and enter <https://localhost:9443/app/>. Notice you get that this is a secured connection, so this is SSL.
2. Create a second instance of the same container, but this time make it listen on 9081 and 9444. Note the changes in red

docker run -d -p 9081:9080 -p 9444:9443 --name=app-instance1 app

1. Open a browser and enter <https://localhost:9444/app>. Note they are both running, yet the application server inside the container is using the same port 9080 and 9443



1. List the running containers

docker ps

CONTAINER ID IMAGE COMMAND CREATED STATUS

32c2db743837 app "/opt/ibm/docker/dock" 7 minutes ago Up 6 minutes

73b1eed3d39c app "/opt/ibm/docker/dock" 14 minutes ago Up 5 minutes

PORTS NAMES

0.0.0.0:9081->9080/tcp, 0.0.0.0:9444->9443/tcp app-instance1

0.0.0.0:9080->9080/tcp, 0.0.0.0:9443->9443/tcp app-instance

1. List the images to see that the same images were used for each instance

docker images

REPOSITORY TAG IMAGE ID CREATED SIZE

app latest ea7cb8b12dc2 27 minutes ago 442.8 MB

websphere-liberty latest a33cec241317 2 hours ago 442.8 MB

hello-world latest c54a2cc56cbb 11 weeks ago 1.848 kB

1. Stop the running containers

docker stop app-instance

app-instance

docker stop app-instance1

app-instance1

1. Remove the instances

docker rm app-instance

app-instance

docker rm app-instance1

app-instance1

1. Congratulations you have completed running Liberty in Docker!

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