

Final Project



Objectives

In this lab, you will:

- Build and deploy a simple Guestbook application
- Autoscale the Guestbook application using Horizontal Pod Autoscaler
- Perform Rolling Updates and Rollbacks

Project Overview

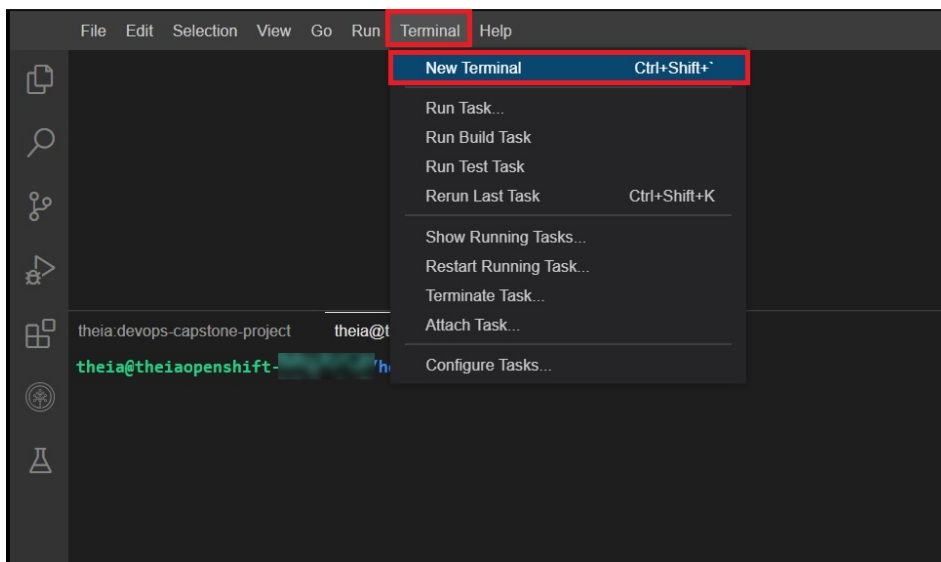
Guestbook application

Guestbook is a simple web application that we will build and deploy with Docker and Kubernetes. The application consists of a web front end which will have a text input where you can enter any text and submit. For all of these we will create Kubernetes Deployments and Pods. Then we will apply Horizontal Pod Scaling to the Guestbook application and finally work on Rolling Updates and Rollbacks.

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 wait for some time for the terminal prompt to appear.



2. Change to your project folder.

Note: If you are already on the `/home/project` folder, please skip this step.

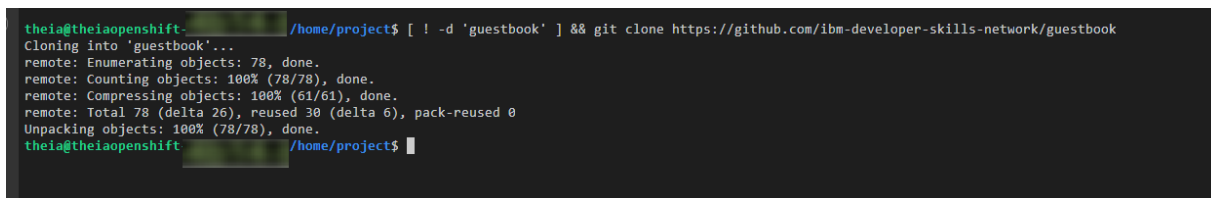
1. 1
1. `cd /home/project`

Copied!

3. Clone the git repository that contains the artifacts needed for this lab.

1. 1
1. `[! -d 'guestbook'] && git clone https://github.com/ibm-developer-skills-network/guestbook`

Copied!



4. Change to the directory for this lab.

1. 1
1. `cd guestbook`

Copied!

5. List the contents of this directory to see the artifacts for this lab.

1. 1
1. `ls`

Copied!

Build the guestbook app

To begin, we will build and deploy the web front end for the guestbook app.

- 1. Change to the v1/guestbook directory.

```
1. 1
1. cd v1/guestbook
```

Copied!

- 2. Dockerfile incorporates a more advanced strategy called multi-stage builds, so feel free to read more about that [here](#).

Complete the Dockerfile with the necessary Docker commands to build and push your image. The path to this file is guestbook/v1/guestbook/Dockerfile.

► Hint!

Copy the code of the completed dockerfile with you. You will be prompted to submit it in the text box in the Peer Assignment.

- 3. Export your namespace as an environment variable so that it can be used in subsequent commands.

```
1. 1
1. export MY_NAMESPACE=sn-labs-$USERNAME
```

Copied!

```
theia@theiaopenshift- /home/project/guestbook/v1/guestbook$ export MY_NAMESPACE=sn-labs-$USERNAME
theia@theiaopenshift- /home/project/guestbook/v1/guestbook$
```

- 4. Build the guestbook app using the Docker Build command.

► Hint!

- 5. Push the image to IBM Cloud Container Registry.

► Hint!

Note: If you have tried this lab earlier, there might be a possibility that the previous session is still persistent. In such a case, you will see a **‘Layer already Exists’** message instead of the **‘Pushed’** message in the above output. We recommend you to proceed with the next steps of the lab.

- 6. Verify that the image was pushed successfully.

```
1. 1
1. ibmcloud cr images
```

Copied!

```
theia@theiaopenshift-lavanyar: /home/project/guestbook/v1/guestbook  x
theia@theiaopenshift- /home/project/guestbook/v1/guestbook$ ibmcloud cr images
Listing images...

Repository                                     Tag      Digest                                Namespace                Created      Size      Security status
us.icr.io/sn-labs- /guestbook          v1       61e06d36213c                       sn-labs-                 21 minutes ago  32 MB     -
us.icr.io/sn-labsassets/instructions-splitter latest   2af122cfe4ee                       sn-labsassets            2 years ago   21 MB     -
us.icr.io/sn-labsassets/pgadmin-theia        latest   0adf67ad81a3                       sn-labsassets            2 years ago   101 MB    -
us.icr.io/sn-labsassets/phpmyadmin           latest   b66c30786353                       sn-labsassets            2 years ago   163 MB    -
us.icr.io/sn-labsassets/tts-standalone       latest   56ce85280714                       sn-labsassets            1 week ago    3.7 GB    -

OK
theia@theiaopenshift- /home/project/guestbook/v1/guestbook$
```

📸 Take a screenshot of the output of Step 6 and save it as a .jpg or .png with the filename `crimages.png`. You will be prompted to upload the screenshot in the Peer Assignment.

- 7. Open the deployment.yml file in the v1/guestbook directory & view the code for the deployment of the application:

```
1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
16. 16
17. 17
18. 18
19. 19
20. 20
21. 21
22. 22
23. 23
24. 24
25. 25
26. 26
27. 27
28. 28
29. 29
30. 30
31. 31
32. 32
33. 33

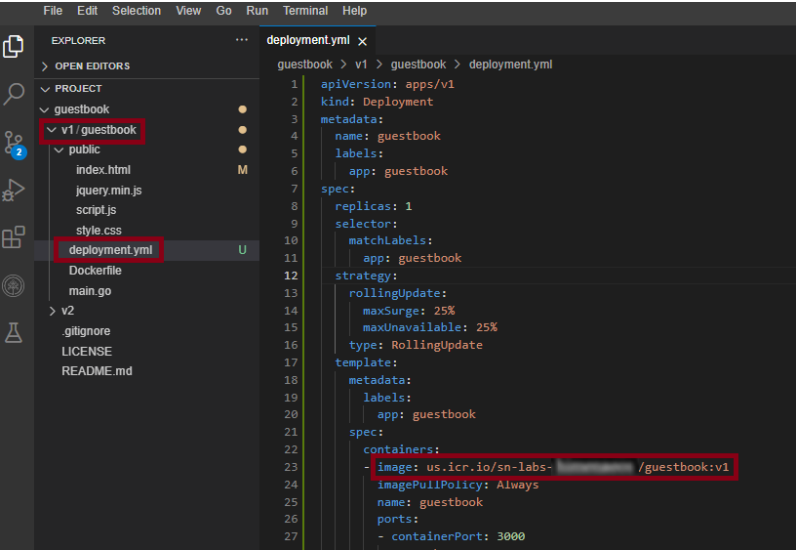
1. apiVersion: apps/v1
2. kind: Deployment
3. metadata:
4.   name: guestbook
5.   labels:
6.     app: guestbook
7. spec:
8.   replicas: 1
9.   selector:
10.    matchLabels:
11.      app: guestbook
12.   strategy:
13.     rollingUpdate:
14.       maxSurge: 25%
15.       maxUnavailable: 25%
16.   type: RollingUpdate
17. template:
18.   metadata:
19.     labels:
20.       app: guestbook
21.   spec:
```

```
22.     containers:
23.     - image: us.icr.io/<your sn labs namespace>/guestbook:v1
24.       imagePullPolicy: Always
25.       name: guestbook
26.       ports:
27.       - containerPort: 3000
28.       name: http
29.     resources:
30.       limits:
31.         cpu: 50m
32.       requests:
33.         cpu: 20m
```

Copied!

Note: Replace <your sn labs namespace> with your SN labs namespace. To check your SN labs namespace, please run the command `ibmcloud cr namespaces`

- It should look as below:



8. Apply the deployment using:

```
1. 1
1. kubectl apply -f deployment.yml
```

Copied!

```
theia@theiaopenshift: /home/project/guestbook/v1/guestbook$ kubectl apply -f deployment.yml
deployment.apps/guestbook configured
```

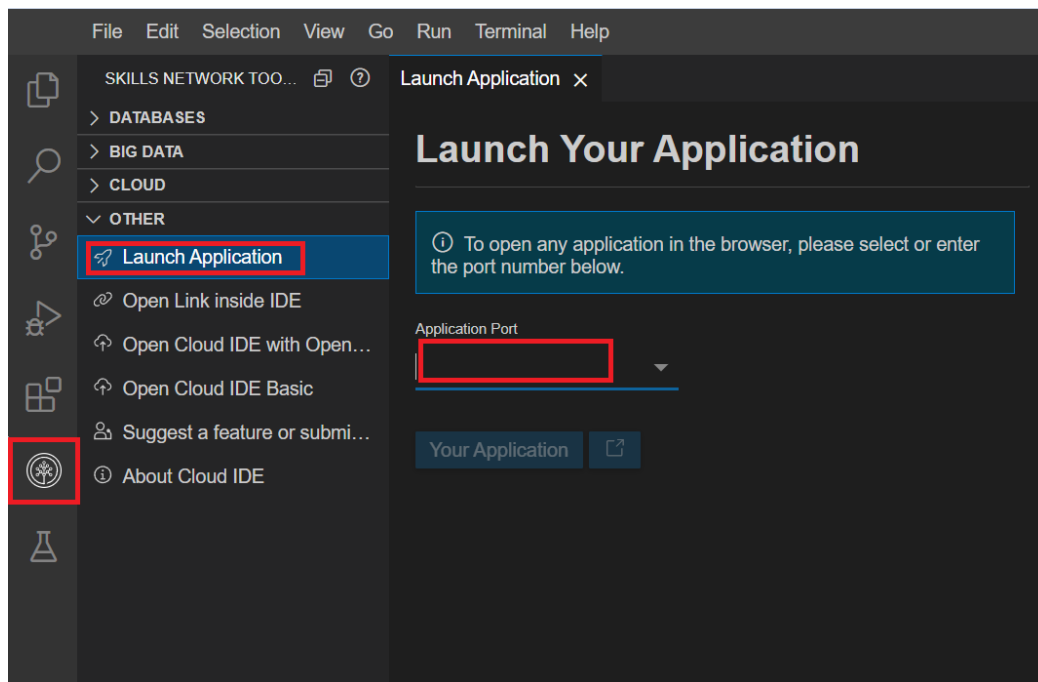
9. Open a New Terminal and enter the below command to view your application:

```
1. 1
1. kubectl port-forward deployment.apps/guestbook 3000:3000
```

Copied!

```
theia@theiaopenshift: /home/project/guestbook/v1/guestbook$ kubectl port-forward deployment.apps/guestbook 3000:3000
Forwarding from 127.0.0.1:3000 -> 3000
Forwarding from [::1]:3000 -> 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
Handling connection for 3000
```

10. Launch your application on port 3000. Click on the Skills Network button on the right, it will open the “Skills Network Toolbox”. Then click the **Other** then **Launch Application**. From there you should be able to enter the port and launch.



11. Now you should be able to see your running application. Please copy the app URL which will be given as below:

Guestbook - v1

SUBMIT

https://-3000.theiaopenshift-0-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai/
/env /info

Take a screenshot of your deployed application and save it as a .jpg or .png with the filename app.png. You will be prompted to upload the screenshot in the Peer Assignment.

12. Try out the guestbook by putting in a few entries. You should see them appear above the input box after you hit **Submit**.

Autoscale the Guestbook application using Horizontal Pod Autoscaler

1. Autoscale the Guestbook deployment using `kubectl autoscale deployment`

► Hint!

2. You can check the current status of the newly-made HorizontalPodAutoscaler, by running:

1. 1

1. `kubectl get hpa guestbook`

Copied!

The current replicas is 0 as there is no load on the server.

Take a screenshot of your Horizontal Pod Autoscaler and save it as a .jpg or .png with the filename hpa.png. You will be prompted to upload the screenshot in the Peer Assignment.

2. Open another new terminal and enter the below command to generate load on the app to observe the autoscaling (Please ensure your port-forward command is running. In case you have stopped your application, please run the port-forward command to re-run the application at port 3000.)

1. 1

1. `kubectl run -i --tty load-generator --rm --image=busybox:1.36.0 --restart=Never -- /bin/sh -c "while sleep 0.01; do wget -q -O- <your app URL>; done"`

Copied!

• Please replace your app URL in the `<your app URL>` part of the above command.

Note: Use the same copied URL which you obtained in step 11 of the previous task.

The command will be as below:

```
theia@theiaopenshift: /home/project$ kubectl run -i --tty load-generator-7 --rm --image=busybox:1.28 --restart=Never -- /bin/sh -c "while sleep 0.01; do wget -q -O- https://0.theiaopenshift-2-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai/; done"
```

Note: In case you get a Load generator already exists error, please suffix a number after load-generator eg. load-generator-1, load-generator-2.

- You will keep getting an output similar as below which will indicate the increasing load on the app:

```
</div>

<div id="guestbook-entries">
  <link href="https://afeld.github.io/emoji-css/emoji.css" rel="stylesheet">
  <p>Waiting for database connection... <i class='em em-boat'></i></p>

</div>

<div>
  <form id="guestbook-form">
    <input autocomplete="off" id="guestbook-entry-content" type="text">
    <a href="#" id="guestbook-submit">Submit</a>
  </form>
</div>

<div>
  <p><h2 id="guestbook-host-address"></h2></p>
  <p><a href="env">env</a>
  <a href="info">info</a></p>
</div>
<script src="jquery.min.js"></script>
<script src="script.js"></script>
</body>
</html>
```

Note: Continue further commands in the 1st terminal

- Run the below command to observe the replicas increase in accordance with the autoscaling:

- 1
1. kubectl get hpa guestbook --watch

Copied!

```
theia@theiaopenshift: /home/project$ kubectl get hpa guestbook --watch
NAME      REFERENCE          TARGETS      MINPODS  MAXPODS  REPLICAS  AGE
guestbook Deployment/guestbook <unknown>/5% 1         10       0         51s
```

- Run the above command again after 5-10 minutes and you will see an increase in the number of replicas which shows that your application has been autoscaled.

```
^Ctheia@theiaopenshift: /home/project$ kubectl get hpa guestbook --watch
NAME      REFERENCE          TARGETS      MINPODS  MAXPODS  REPLICAS  AGE
guestbook Deployment/guestbook <unknown>/5% 1         10       0         2m54s
guestbook Deployment/guestbook <unknown>/5% 1         10       1         3m31s
```

Take a screenshot of your Autoscaler details and save it as a .jpg or .png with the filename hpa2.png. You will be prompted to upload the screenshot in the Peer Assignment.

- Run the below command to observe the details of the horizontal pod autoscaler:

- 1
1. kubectl get hpa guestbook

Copied!

```
theia@theiaopenshift: /home/project$ kubectl get hpa guestbook
NAME      REFERENCE          TARGETS      MINPODS  MAXPODS  REPLICAS  AGE
guestbook Deployment/guestbook <unknown>/5% 1         10       1         8m2s
```

- Please close the other terminals where load generator and port-forward commands are running.

Perform Rolling Updates and Rollbacks on the Guestbook application

Note: Please run all the commands in the 1st terminal unless mentioned to use a new terminal.

- Please update the title and header in index.html to any other suitable title and header like <Your name> Guestbook - v2 & Guestbook - v2.

Hint!

- Run the below command to build and push your updated app image:

Hint!

Take a screenshot of your updated image and save it as a .jpg or .png with the filename upguestbook.png. You will be prompted to upload the screenshot in the Peer Assignment.

- Update the values of the CPU in the deployment.yml to **cpu: 5m** and **cpu: 2m** as below:

Hint!

- Apply the changes to the deployment.yml file.

Hint!

Take a screenshot of the details of the output of Step 4 and save it as a .jpg or .png with the filename deployment.png. You will be prompted to upload the screenshot in the Peer Assignment.

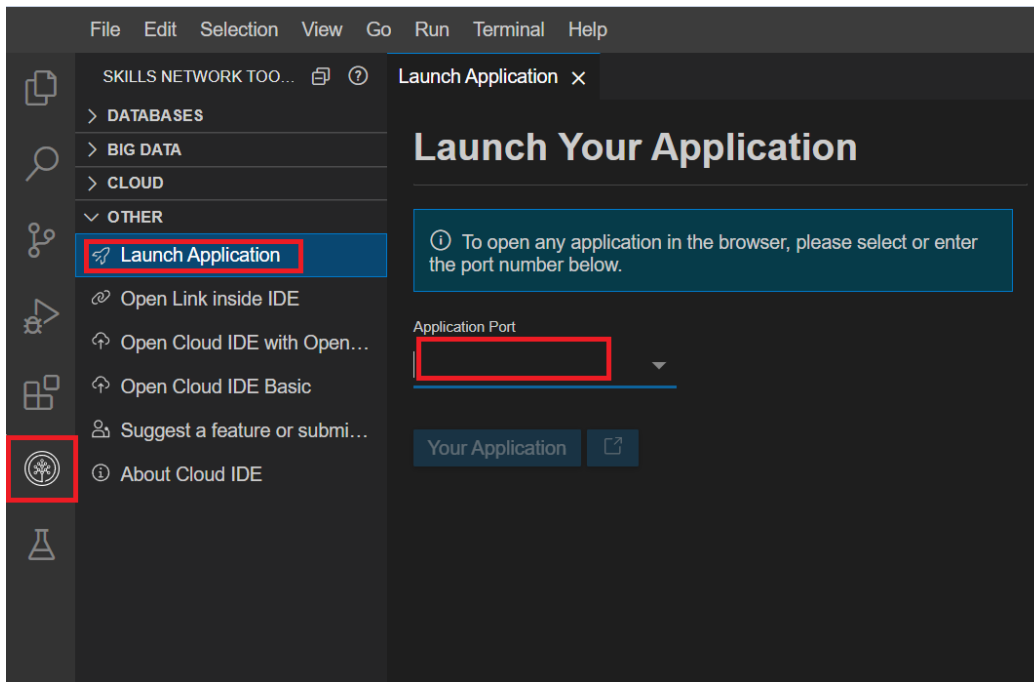
- Open a new terminal and run the port-forward command again to start the app:

- 1
1. kubectl port-forward deployment.apps/guestbook 3000:3000

Copied!

```
theia@theiaopenshift: /home/project/guestbook/v1/guestbook$ kubectl get rs
NAME                                DESIRED  CURRENT  READY  AGE
guestbook-5997448ccb                1        1        1      19m
guestbook-bbdb/c/4cb                0        0        0      3m40s
```

- Launch your application on port 3000. Click on the Skills Network button on the right, it will open the "Skills Network Toolbox". Then click the **Other** then **Launch Application**. From there you should be able to enter the port and launch.



7. You will notice the updated app content as below:

Guestbook - v2

SUBMIT

[https://\[redacted\]3000.theiaopenshift-2-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai/](https://[redacted]3000.theiaopenshift-2-labs-prod-theiaopenshift-4-tor01.proxy.cognitiveclass.ai/)
[/env](#) [/info](#)

Take a screenshot of your updated application and save it as a .jpg or .png with the filename up-app.png. You will be prompted to upload the screenshot in the Peer Assignment.

Note: Please stop the application before running the next steps.

8. Run the below command to see the history of deployment rollouts:

1. 1
1. `kubectl rollout history deployment/guestbook`

Copied!

```
theia@theiaopenshift: /home/project/guestbook/v1/guestbook$ kubectl rollout history deployment/guestbook
deployment.apps/guestbook
REVISION  CHANGE-CAUSE
1          <none>
2          <none>
```

6. Run the below command to see the details of Revision of the deployment rollout:

1. 1
1. `kubectl rollout history deployments guestbook --revision=2`

Copied!

```
theia@theiaopenshift: /home/project/guestbook/v1/guestbook$ kubectl rollout history deployments guestbook --revision=2
deployment.apps/guestbook with revision #2
Pod Template:
  Labels:  app=guestbook
           pod-template-hash=6bdb7c74c6
Containers:
  guestbook:
    Image:  us.icr.io/sn-labs-[redacted]/guestbook:v1
    Port:  3000/TCP
    Host Port:  0/TCP
    Limits:
      cpu:  5m
    Requests:
      cpu:  2m
    Environment:  <none>
    Mounts:  <none>
    Volumes:  <none>
```

Take a screenshot of the details of the correct Revision and save it as a .jpg or .png with the filename rev.png. You will be prompted to upload the screenshot in the Peer Assignment.

7. Run the below command to get the replica sets and observe the deployment which is being used now:

- 1. 1
- 1. kubectl get rs

Copied!

```
theia@theiaopenshift- /home/project/guestbook/v1/guestbook$ kubectl get rs
NAME                                DESIRED   CURRENT   READY   AGE
guestbook-5997448ccb                0         0         0       17m
guestbook-6bdb7c74c6                1         1         1       105s
```

8. Run the below command to undo the deployment and set it to Revision 1:

- 1. 1
- 1. kubectl rollout undo deployment/guestbook --to-revision=1

Copied!

```
theia@theiaopenshift /home/project/guestbook/v1/guestbook$ kubectl rollout undo deployment/guestbook --to-revision=1
deployment.apps/guestbook rolled back
```

9. Run the below command to get the replica sets after the Rollout has been undone. The deployment being used would have changed as below:

- 1. 1
- 1. kubectl get rs

Copied!

```
theia@theiaopenshift /home/project/guestbook/v1/guestbook$ kubectl get rs
NAME                                DESIRED   CURRENT   READY   AGE
guestbook-5997448ccb                1         1         1       19m
guestbook-6bdb7c74c6                0         0         0       3m40s
```

Take a screenshot of the output of Step 9 and save it as a .jpg or .png with the filename rs.png. You will be prompted to upload the screenshot in the Peer Assignment.

Congratulations! You have completed the final project for this course. Do not log out of the lab environment (you can close the browser though) or delete any of the artifacts created during the lab, as these will be needed for grading.

Changelog

Date	Version	Changed by	Change Description
2022-07-21	1.0	K Sundararajan	Created Lab instructions
2022-07-25	1.1	K Sundararajan	Updated Lab instructions
2022-08-02	1.2	K Sundararajan	Added new IDSN logo
2022-08-04	1.3	K Sundararajan	Updated Lab instructions
2022-08-12	1.4	K Sundararajan	Updated Lab instructions
2022-09-21	1.5	K Sundararajan	Updated screenshot for Git clone command
2022-11-15	1.6	Lavanya Rajalingam	Updated screenshots
2023-04-04	1.7	Sneha R Baddi	Instructions Updated

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