Step 2 of 6

Introduction to Containers, Docker, and IBM Cloud Container Registry

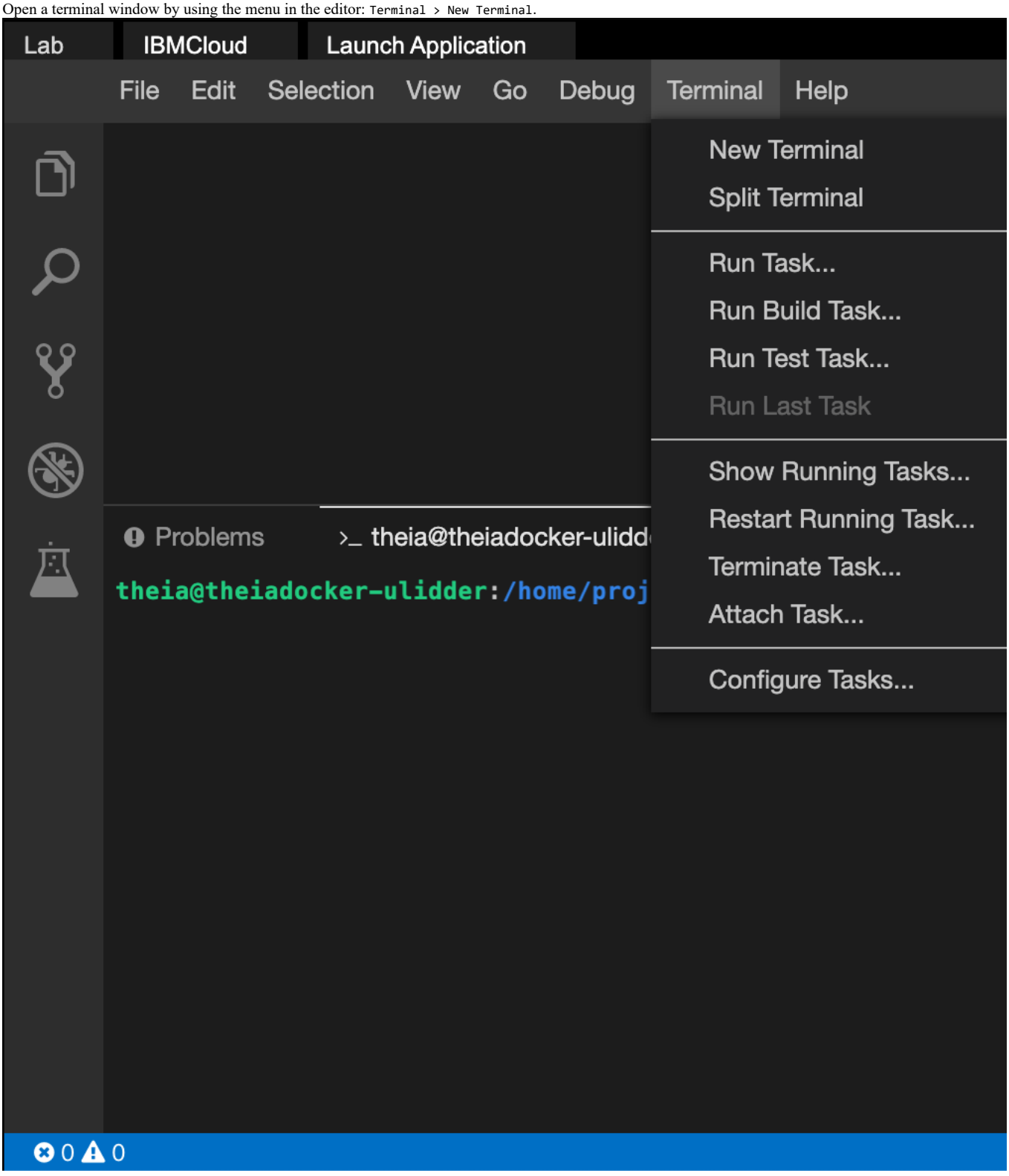
Objectives

In this lab, you will:

- Pull an image from Docker Hub
- Run an image as a container using `docker`
- Build an image using a Dockerfile
- Push an image to IBM Cloud Container Registry

Verify the environment and command line tools

1. Open a terminal window by using the menu in the editor: `Terminal > New Terminal`.



2. Verify that `docker` CLI is installed.

```
docker --version
```

You should see output similar to this, though the version may be different:

```
Docker version 18.09.7, build 2d0083d
```

3. Verify that `ibmcloud` CLI is installed.

```
ibmcloud version
```

You should see output similar to this, though the version may be different:

```
ibmcloud version 1.0.0+908f90a-2020-03-30T06:37:22+00:00
```

3. Change to your project folder.

```
cd /home/project
```

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

```
git clone https://gitlab.com/ibm/skills-network/courses/cc201.git
```

5. Change to the directory for this lab.

```
cd cc201/labs/1_ContainersAndDocker/
```

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

```
ls
```

Pull an image from Docker Hub and run it as a container

1. Use the `docker` CLI to list your images.

```
docker images
```

You should see an empty table since you don't have any images yet.

2. Pull your first image from Docker Hub.

```
docker pull hello-world
```

3. List images again to see this image in the local environment.

```
docker images
```

You should now see the `hello-world` image present in the table.

4. Run the `hello-world` image as a container.

```
docker run hello-world
```

This command prints out a simple hello message and some explanation of what Docker did to generate this message.

5. List the containers to see that your container ran and exited successfully.

```
docker ps -a
```

Among other things, for this container you should see a container ID, the image name (`hello-world`), and a status that indicates that the container exited successfully.

6. Note the container ID from the previous step, and remove the container now that we've run it.

```
docker container rm <container_id>
```

Congratulations on pulling an image and running you first container! Now let's build an image on our own instead of using one pulled from Docker Hub.

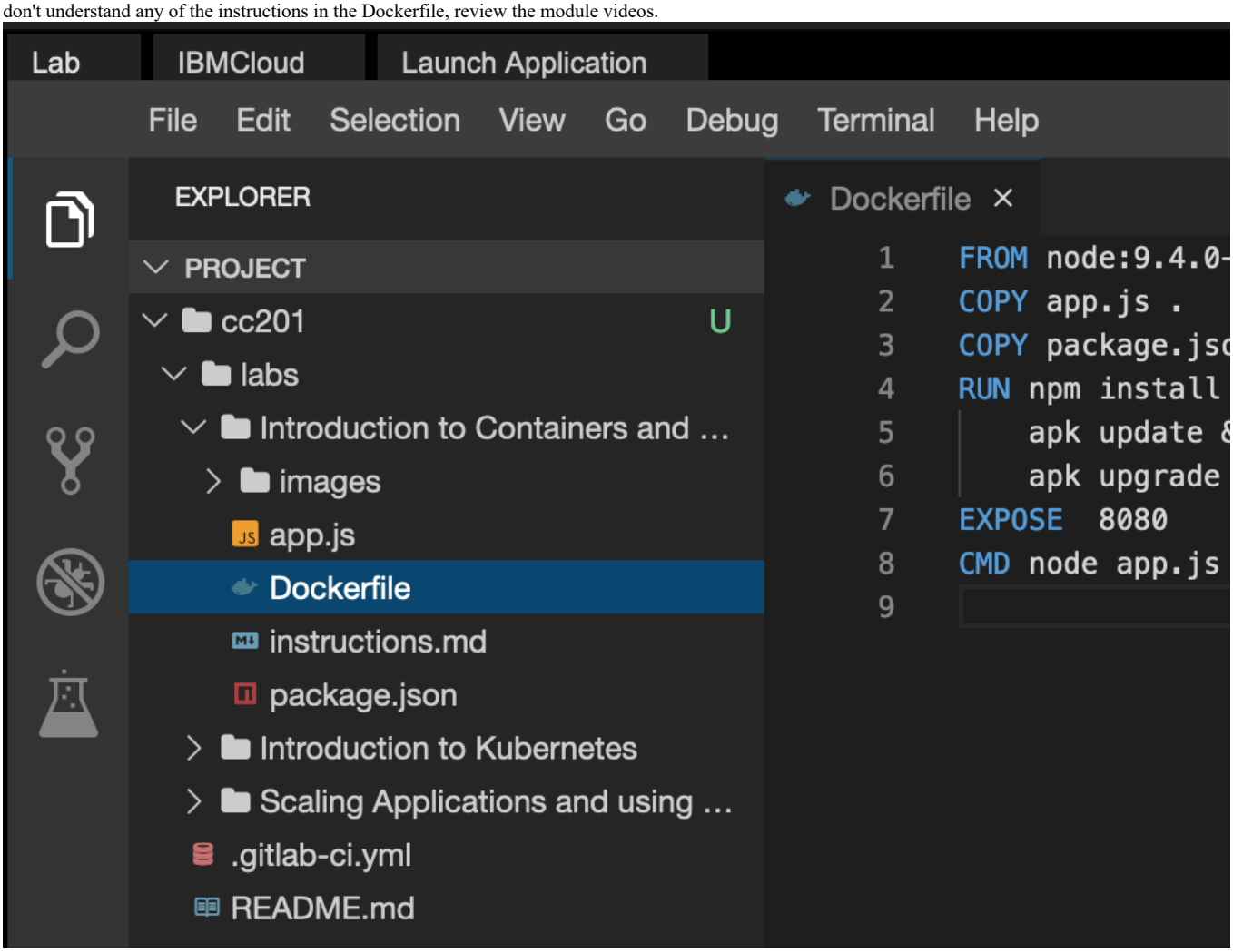
Build an image using a Dockerfile

1. The current working directory contains a simple Node.js application that we will run in a container. The app will print a hello message along with the hostname. The following files are needed to run the app in a container:

- app.js is the main application, which simply replies with a hello world message.
- package.json defines the dependencies of the application.
- Dockerfile defines the instructions Docker uses to build the image.

1. Use the Explorer to view the files needed for this app. Click the Explorer icon (it looks like a sheet of paper) on the left side of the window, and then navigate to the directory for this lab: `cc201 > labs > 1_ContainersAndDocker`. Click `Dockerfile` to view the Dockerfile we'll use to build an image. If you

don't understand any of the instructions in the Dockerfile, review the module videos.



2. Run the following command to build the image:

```
docker build . -t myimage:v1
```

As seen in the module videos, the output should include a step for each instruction in the Dockerfile. Each step creates a new layer in the image.

4. List images to see your image tagged `myimage:v1` in the table.

```
docker images
```

Note that compared to the `hello-world` image, this image has a different image ID. This means that the two images consist of different layers -- in other words, they're not the same image.

You should also see a `node` image in the images output. This is because the `docker build` command pulled `node:9.4.0-alpine` to use it as the base image for the image you built.

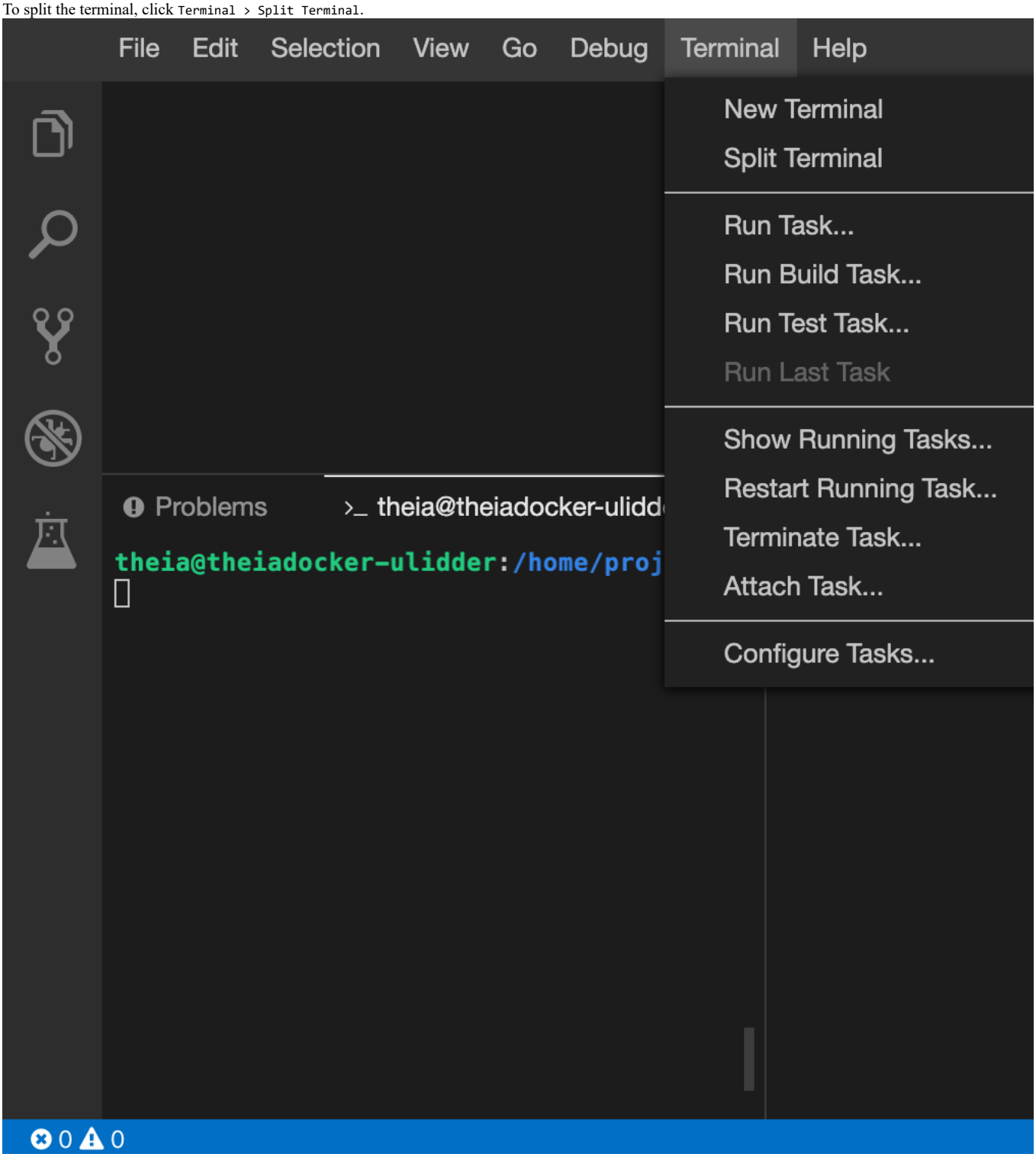
Run the image as a container

1. Now that your image is built, run it as a container with the following command:

```
docker run -p 8080:8080 myimage:v1
```

The output should indicate that your application is listening on port 8080. This command will continue running until it is quit, since the container runs a web app that continually listens for requests. To query the app, we need to open another terminal window.

2. To split the terminal, click `Terminal > Split Terminal`.



3. In the second terminal window, use the `curl` command to ping the application.

```
curl localhost:8080
```

The output should indicate that your app is up and running.

4. In the second terminal window, stop the container. The following command uses `docker ps -q` to pass in the list of all running containers:

```
docker stop $(docker ps -q)
```

5. Close the second terminal window, as it is no longer needed.

```
exit
```

In the original terminal window, the `docker run` command has exited and you are able to type commands in that terminal window again.

Push the image to IBM Cloud Container Registry

1. The environment should have already logged you into an IBM Cloud account. The following command will give you information about the account you're targeting:

```
ibmcloud target
```

2. The environment also created an IBM Cloud Container Registry namespace for you. Since Container Registry is multi-tenant, namespaces are used to divvy up the registry among several users. Use the following command to see your namespace:

```
ibmcloud cr namespaces
```

3. However, since you created your own IBM Cloud Container Registry namespace in the previous lab, we'll use that one for this lab. To do so, login to your IBM Cloud account.

```
ibmcloud login
```

If you have a federated ID, use the `--sso` option. Use the provided URL in your CLI output to retrieve your one-time passcode. You know you have a federated ID when the login fails without the `--sso` and succeeds with the `--sso` option. If you don't have a federated ID, use the `-u` and `-p` options for your username and password.

4. Ensure that you are targeting the `us-south` region where you created your namespace.

```
ibmcloud cr region-set us-south
```

5. Log your local Docker daemon into IBM Cloud Container Registry so that you can push to and pull from the registry.

```
ibmcloud cr login
```

6. Export your namespace as an environment variable so that it can be used in subsequent commands. Make sure to substitute your namespace after the equals sign. If you don't remember your namespace, run `ibmcloud cr namespaces`. Since you're now logged into your personal account, you should see your personal namespace instead of the one in the lab account.

```
export MY_NAMESPACE=<my_namespace>
```

7. Tag your image so that it can be pushed to IBM Cloud Container Registry.

```
docker tag myimage:v1 us.icr.io/$MY_NAMESPACE/hello-world:1
```

8. Push the newly tagged image to IBM Cloud Container Registry.

```
docker push us.icr.io/$MY_NAMESPACE/hello-world:1
```

9. Verify that the image was successfully pushed by listing images in Container Registry.

```
ibmcloud cr images
```

You should see your image name in the output. Recall from the module videos that we discussed Vulnerability Advisor, which scans images in IBM Cloud Container Registry for common vulnerabilities and exposures. In the last column of the output, note that Vulnerability Advisor is either scanning your image or it has provided a security status, depending on how quickly you list the images and how long the scan takes.

10. Since you will use the namespace in the lab account in future labs, log back into the lab account.

```
ibmcloud login --apikey $IBMCLOUD_API_KEY
```

Congratulations! You have completed the second lab for the first module of this course.

PREVIOUS CONTINUE