BCIT, COMP 4912 - LAB #3

Winter 2025

1. Objectives

By the end of this lab, you will have deployed a website on a Kubernetes cluster running on multiple pods in Linode. A service load balancer will distribute users' requests among these pods. To illustrate that requests aren't served by a single pod, each pod's index page will appear in a different color.

2. Tasks

For this lab, you have to complete the following tasks in the given sequence:

2.1. Create a three-node Kubernetes cluster in Linode.
2.2. Setup Kubectl by adding kubconfig.yaml into your computer.
2.3. Define a Config Map and apply it using Kubectl.
2.4. Define three deployment files and apply them.
2.5. Define a service (load balancer) and apply it.
2.6. Verify the website deployment and load balancing requests.
2.7. Scale the number of pods for one of the deployments.
2.8. Cleanup process (delete your deployment/service).

For the first two steps (2.1, 2.2), please follow the process shown in the class by the course instructor. You can refer to the class recording for further details. Before step 2.2, please visit https://kubernetes.io/docs/tasks/tools/install-kubectl-linux/, and download/install Kubectl binary file on your computer as explained in the class.

For step 2.3, download a ConfigMap file from the following link into your computer and then apply it by running '**kubectl apply -f my-configmap.yaml**'.

ConfigMap: https://github.com/5tuxnet/courses/blob/main/comp4912/lab3/my-configmap.yaml

This ConfigMap file stores multiple HTML files with different colors for you. You can check the index filename to find the respective color. Also, you can verify the definition of the ConfigMap by '**kubectl get configmap**' and '**kubectl describe configmap color-pages**'. In the second command, **color-pages** is the name of the defined ConfigMaps.

Then in step 2.4, you need to create three deployment files that can be downloaded from the following links:

Red: https://github.com/5tuxnet/courses/blob/main/comp4912/lab3/deployment-red.yaml
Green: https://github.com/5tuxnet/courses/blob/main/comp4912/lab3/deployment-green.yaml
Yellow: https://github.com/5tuxnet/courses/blob/main/comp4912/lab3/deployment-yellow.yaml
After downloading three files, run the following commands one by one:

```
$ kubectl apply -f deployment-red.yaml
$ kubectl apply -f deployment-green.yaml
$ kubectl apply -f deployment-yellow.yaml
```

After applying three deployments, you should see three running pods by following commands. When you check the content of each deployment, you can see the replica value is set to 1. Therefore, in total three pods will be running.

```
$ kubectl get deployment
$ kubectl get pods -o wide
```

Next, in step 2.5, you have to first download the service (load balancer) YAML file via the following link. Then by running '**kubectl apply -f service-colors.yaml**', you will apply the service. Note that all three deployments use the label **app: color-demo** and you can see in the selector section of the service yaml file that it selects **app: color-demo**, as well.

Service (LB): https://github.com/5tuxnet/courses/blob/main/comp4912/lab3/service-colors.yaml

To verify the service, run '**kubectl get svc color-lb-service**'. In the output of this command, you should see an **External (public) IP address** that is assigned to your load balancer and it can be used to receive users' requests. You can verify the same address by checking the **NodeBalancers** section from your Linode dashboard (as shown in the class).

Now, we have to verify our deployment (step 2.6) by visiting the load balancer external IP you see in the output of the last command. To do this, open your web browser (preferably Google Chrome) and enter **http://<External IP>**. Now, **Refresh** the page multiple times by pressing **Ctrl + F5** keys to do a hard refresh that ignores the cached content. This will route your requests to different deployments; therefore, sometimes the fetched page's background color will be Red, sometimes Green, and sometimes Yellow. This proves your requests are being distributed across different pods behind the single load balancer IP. Besides your computer, you can also try your phone to access the external IP.

Moreover, you may try to increase the number of pods in each deployment using a command similar to the following one (step 2.7).

```
$ kubectl scale deployment red-deployment --replicas=5
```

For instance, the above command increases the number of pods for red deployment to 5, while keeping the number of pods for other deployments to 1. You can verify the number of pods by running ‘**kubectl get pods -o wide**’.

Finally, in step 2.8, you need to clean up your deployment to ensure it will cause no extra cost to you (via your Linode account). To do this, you may run:

```
$ kubectl delete deployment red-deployment
$ kubectl delete green-deployment yellow-deployment
$ kubectl delete svc color-lb-service
$ kubectl delete configmap my-configmap
```

3. Expected Outcome

3.1. **Individual Report Requirement**

Each student must submit an individual report for every lab. Collaboration on reports is not allowed, but you can discuss concepts with classmates.

3.2. **Report Content**

- **Screenshots**: Include screenshots of each step, including the commands you used and the corresponding output.
- **Challenges and Solutions**: If you encounter challenges while following the instructions on your computer, describe it in your report along with the solutions you applied to resolve them.

3.3. **Organization and Quality**

- Divide your report into sections corresponding to each task in the lab.
- At the end of your report, write a summary highlighting the tasks completed and your observations. Ensure your report is well-written & well-organized.

3.4. **Deadline**

Submit your report before the deadline. Late submissions may not be accepted unless prior arrangements are made.

3.5. **Troubleshooting Guidance**

- If you face an issue, start by researching solutions using Google, community forums, or tools like ChatGPT.
- If you cannot resolve the issue, share your question along with a detailed explanation of what you’ve already tried with your classmates and me.
- Remember, it is very important to attempt some independent research before asking for help with any project-related questions.