SOFE 4790U: Distributed Systems

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Lab 1: Introduction to Google Kubernetes Engine (GKE)

Group 14
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Video Report:

Part 1:
https://youtu.be/mBTTFRcY45o

Part 2:
https://www.youtube.com/watch?v=U7B1_CeY6bQ

Learning Objectives:

In this lab we learned how to use Google cloud services to deploy some basic databases and microservices. We deployed a mySQL database and a mongoDB database using commands, YAML files and a configuration wizard.

Discussion

Summarize what you have learned about docker and Kubernetes including the used terminologies and their descriptions. What's the advantages and disadvantages of using docker images against using virtual machines?

Summary of Docker and Kubernetes :

Docker:

Docker is a lightweight tool that does not require guest OS to share projects across different work environments. Docker automates the deployment of applications for use across different working environments. One example of these different environments could be between developers and testers. Docker aims to make this transition seamless. Docker also allows for frameworks to be running on different applications at once freeing up space.

The Docker engine is split up into four main sections. Client and Server, Docker Images, Docker Containers, Docker registry. The client and server are connected through a rest API which facilitates the communication between the two elements. The docker images are within the Docker server and the registry, an image is a template for how to create docker containers and is built using a docker file. The container is instructions for how the environment will look. Which include the applications and their libraries. The registry allows other users to access the Docker images.

Kubernetes:

Kubernetes is an open-source platform for managing containers. Kubernetes was created to combat monoliths and reduce deployment time. This resulted in microservices which split the service into smaller sections. These microservices were independent and could be updated separately instead of updating the whole system. The containers are used to package applications to be delivered as one and take up less space. Kubernetes creates horizontal scalability and less downtime.

Docker Advantages and Disadvantages compared to Virtual Machines:

Docker	**Virtual Machines**
Docker requires less memory space	VM requires more memory space
Shorter startup time	Longer startup time
Much higher efficiency	Lower efficiency
Greater Scalability	Lesser Scalability

Easily portable across different platforms	Compatibility issues when porting between different platforms
Can share data/libraries between containers	Cannot share data/libraries between application instances

Design

MongoDB is another type of database. It's required to deploy it using GKE using a YAML file. If you used any Kubernetes tool in your deployment that is not included in the lab you should describe it and why you used it

For the deployment of the MongoDB database application, we used the setup wizard and configuration wizard. For MongoDB we used the port number 3308, we created 1 replica, with the environment variables username set to 'user' and password set to 'password'. To find an existing public mongoDB image, we used the docker hub registry to find the bitnami/mongoDB image which we used for this lab.

- **Problem:** Deploy a MongoDB application using the Google kubernetes engine (GKE).
- **Solution:** For the deployment of the MongoDB database application, we first created a single YAML file in which we pass the parameters of the deployment and service which includes the port number, number of replicas, environment variables such as username and password, and the MySQL image. For MongoDB we used the port number 3308, we created 1 replica, with the environment variables username set to 'user' and password set to 'password'. To find an existing public mongoDB image, we used the docker hub registry to find the bitnami/mongoDB image which we used for this lab.

Deliverables

MySQL Deployment:

- **Problem:** Deploy a MySQL database application using the Google kubernetes engine (GKE).
- **Solution:** For the deployment of the MySQL database application, we needed to first create a three node cluster on GKE. After this, we had to create a deployment with a public MySQL image. Once this image is deployed, we expose this deployment by creating a load-balancer service. Once the service is running, it can be accessed from any machine by using the provided ip address. We can then connect with the MySQL application and create tables and insert rows into the tables. All of these steps can also be packaged into a single YAML file in which we pass the parameters of the deployment

and service which includes the port number, number of replicas, environment variables such as username and password, and the MySQL image.

MongoDB Deployment:

- **Problem:** The deployment failed numerous times.
- **Solution:** By deleting old projects, scaling down the number of machines and changing locations, we were able to eventually deploy the database.