Deployment of Microservice architecture for Implementing a redirection gateway in cloud using docker and Kubernetes

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Agenda

Introduction

Our project uses microservices in a container within the Docker and deploy it in Kubernetes and google cloud.

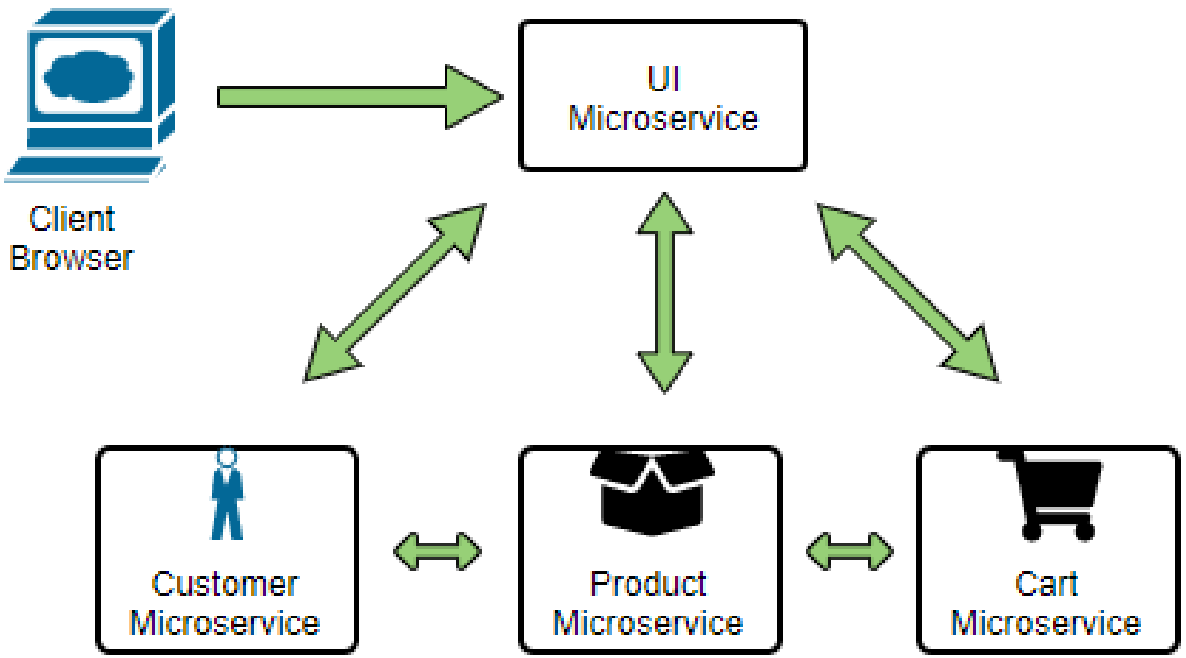
Specific Objectives:

1. To analyze the microservices technology;
2. To design and deploy a Microservice Architecture using Docker and Kubernetes
3. Integrating CI/CD Pipeline with Docker and Kubernetes.
4. Test and validate the deployment

Microservice Technology

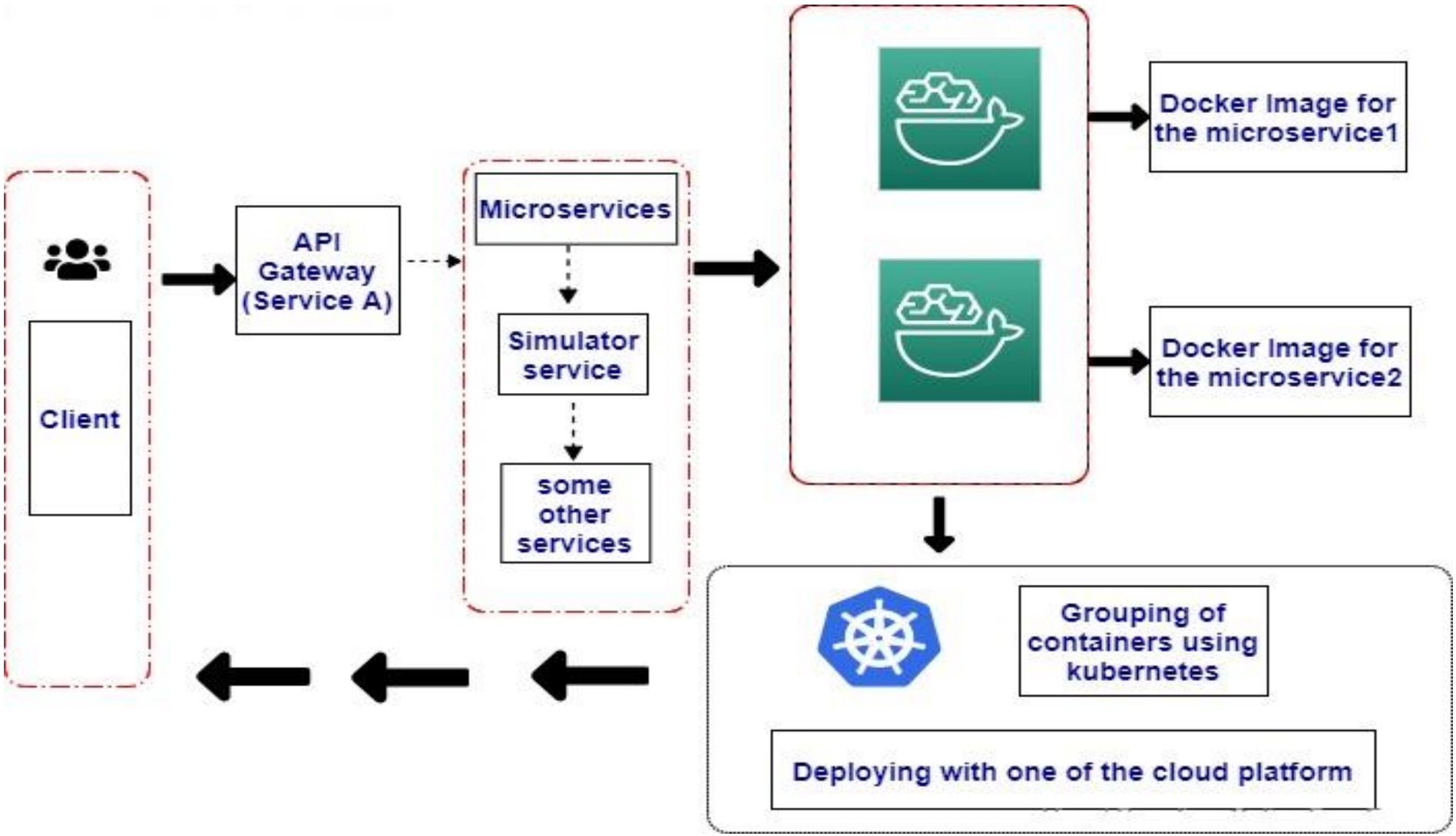
- It is mainly used to solve the problems that comes from Monolithic structures (means tightly coupled)
- We are mainly focused on redirection gateway microservice which forwards the requests to individual services

Example: shopping app



Architecture

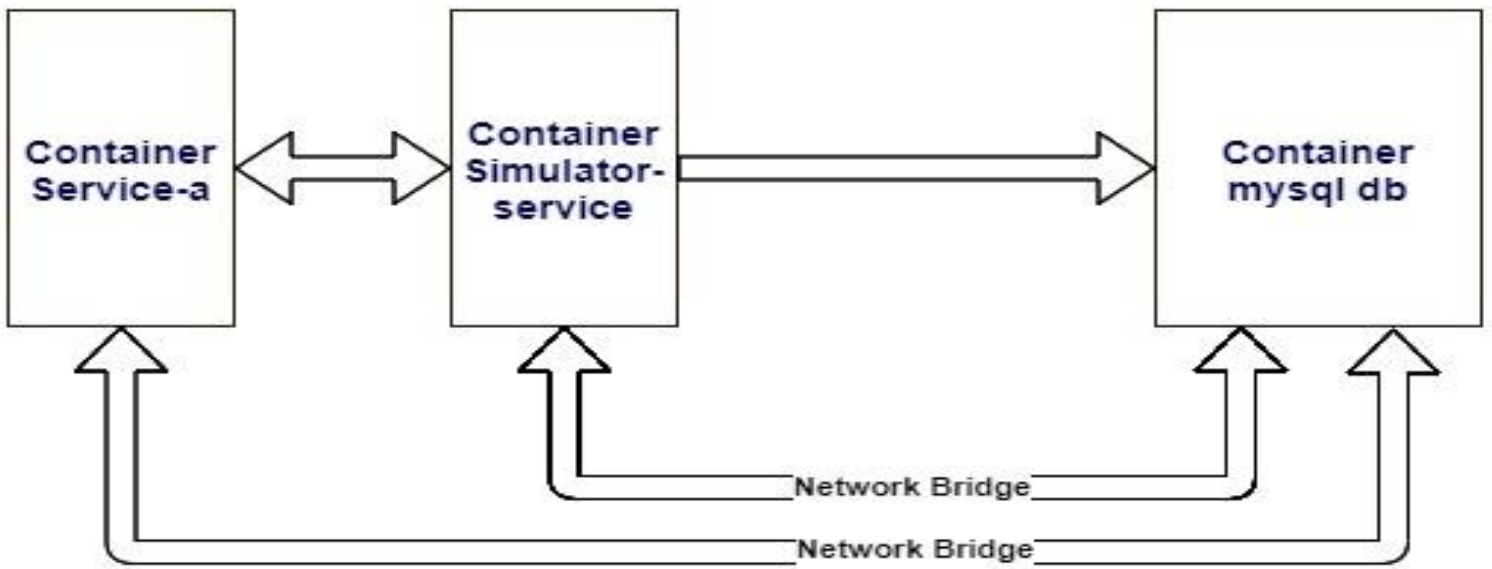
The gateway is a REST API and it auto scales based on user specifications



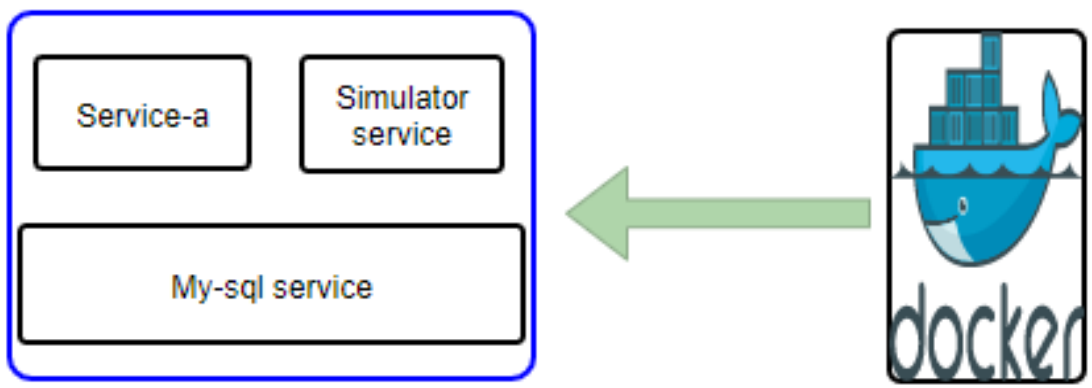
Development of Microservices with Docker and Kubernetes

1. We developed services using spring boot

2. We have my-sql database along with the services. We connect the services with my-sql using a network bridge.

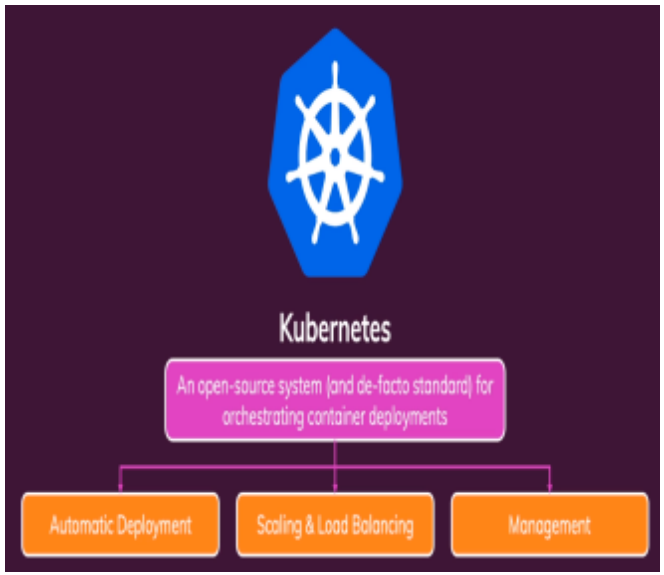


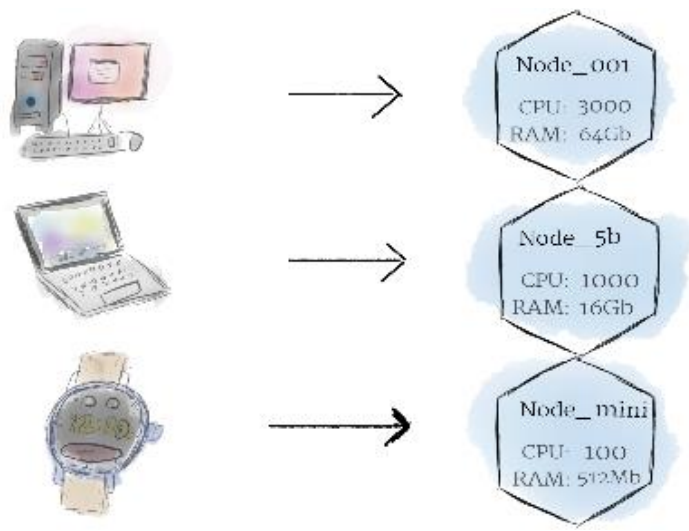
- We used docker hub to create our images. It contains images of 2 microservices along with one my-sql service and all are containerized.
- Created a network for MySQL and configured database credential for making it compatible with our services.
- Before uploading to docker hub we will add a tag and then push it to the docker hub repository.
- The images on docker hub can be exposed to our local machine and are available for pull step.



Kubernetes

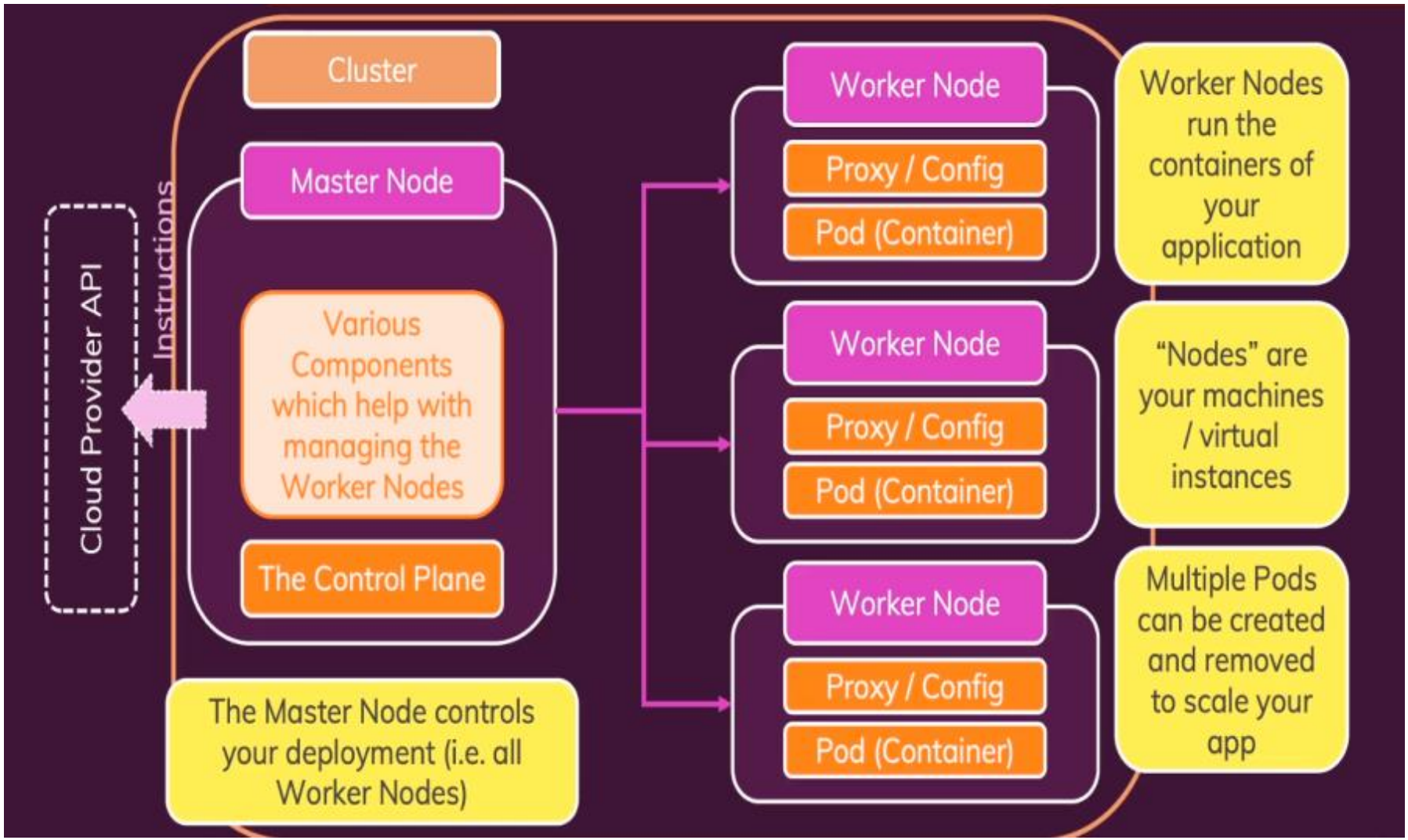
- Next step is to use any platform that provides automated deployment and scaling these docker containers
- Configured the environment for Kubernetes deployment
- Kubernetes contains clusters with multiple nodes. Each node should be linked with one container from docker hub.
- We need a persistent volume like a storage that is provisioned by the admin. we setup MySQL for persisting volume and secret



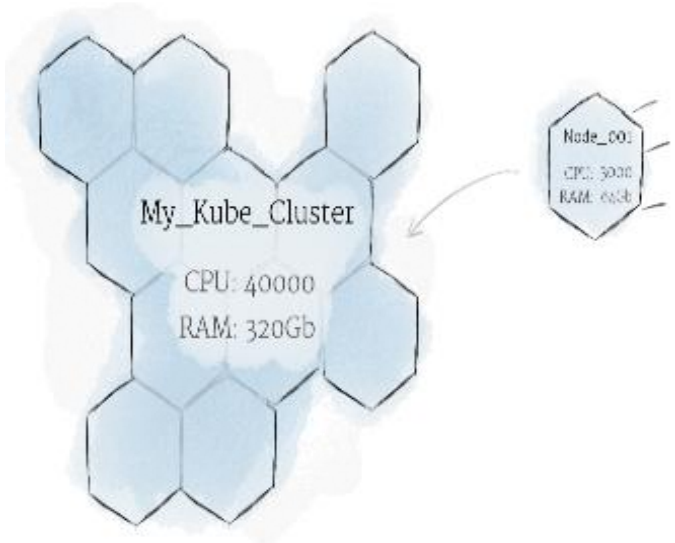


Nodes

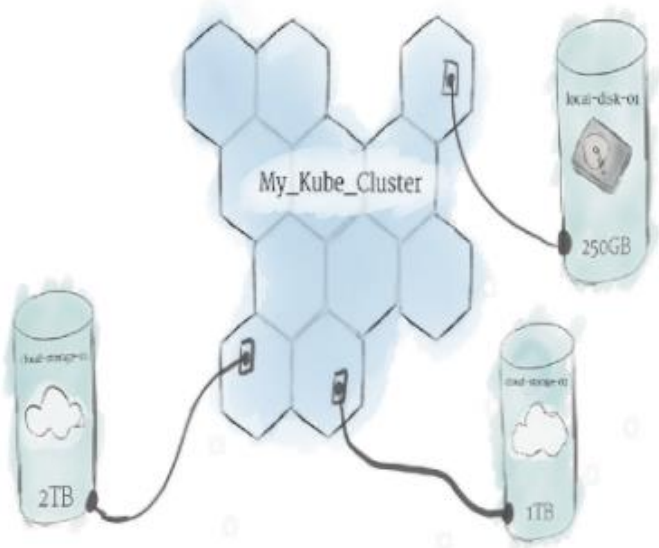
Architecture



- We used minikube to run these deployment commands in Kubernetes
- Written yaml file for deploying everything on Kubernetes cluster
- Autoscaling of pods is possible by increasing the number of replicas for services



Cluster

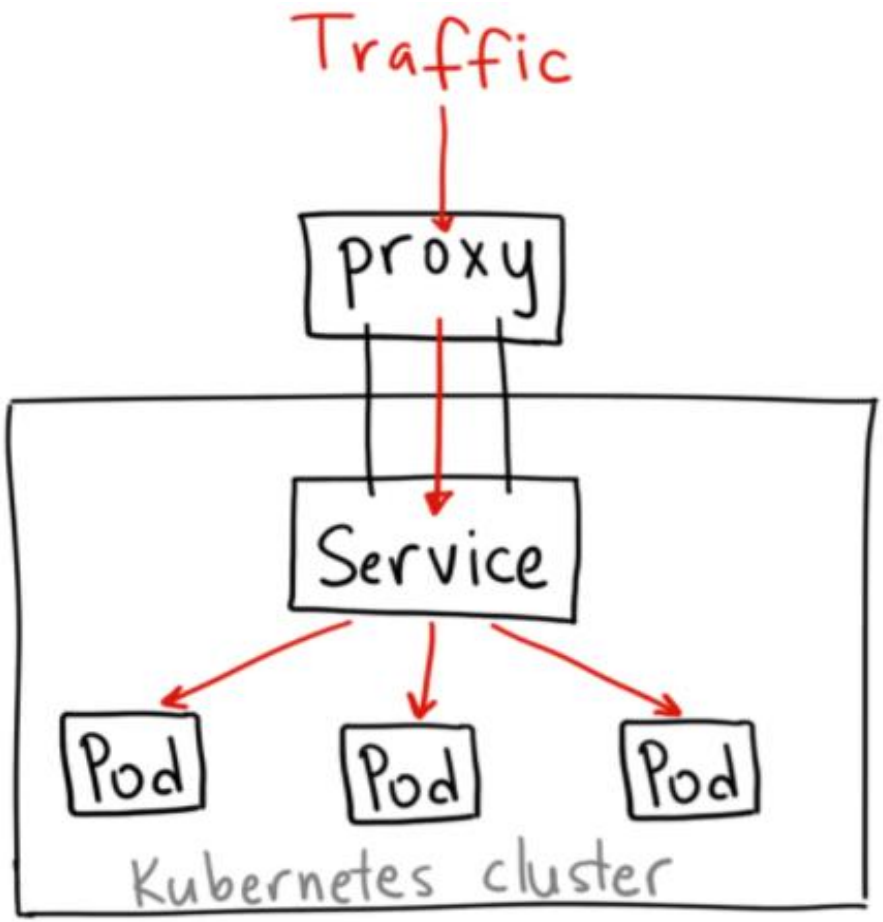


Persistent Volume

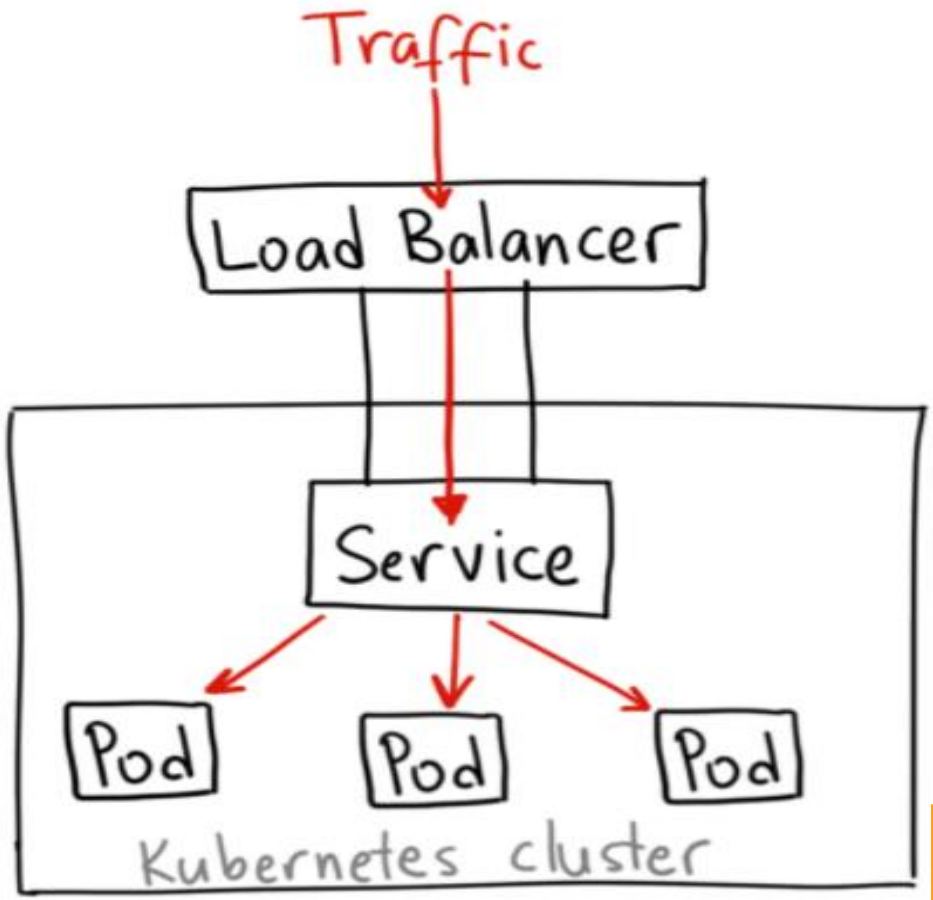
Deployment of microservices using google cloud

- We implemented this deployment step using google cloud. Firstly, setup Environment for google cloud.
- Create cluster using SDK
- Push docker images in google cloud registry from docker hub.
- Then deploying the docker images in Kubernetes engine
- Exposing the images and accessing it virtually
- Demonstration of our steps

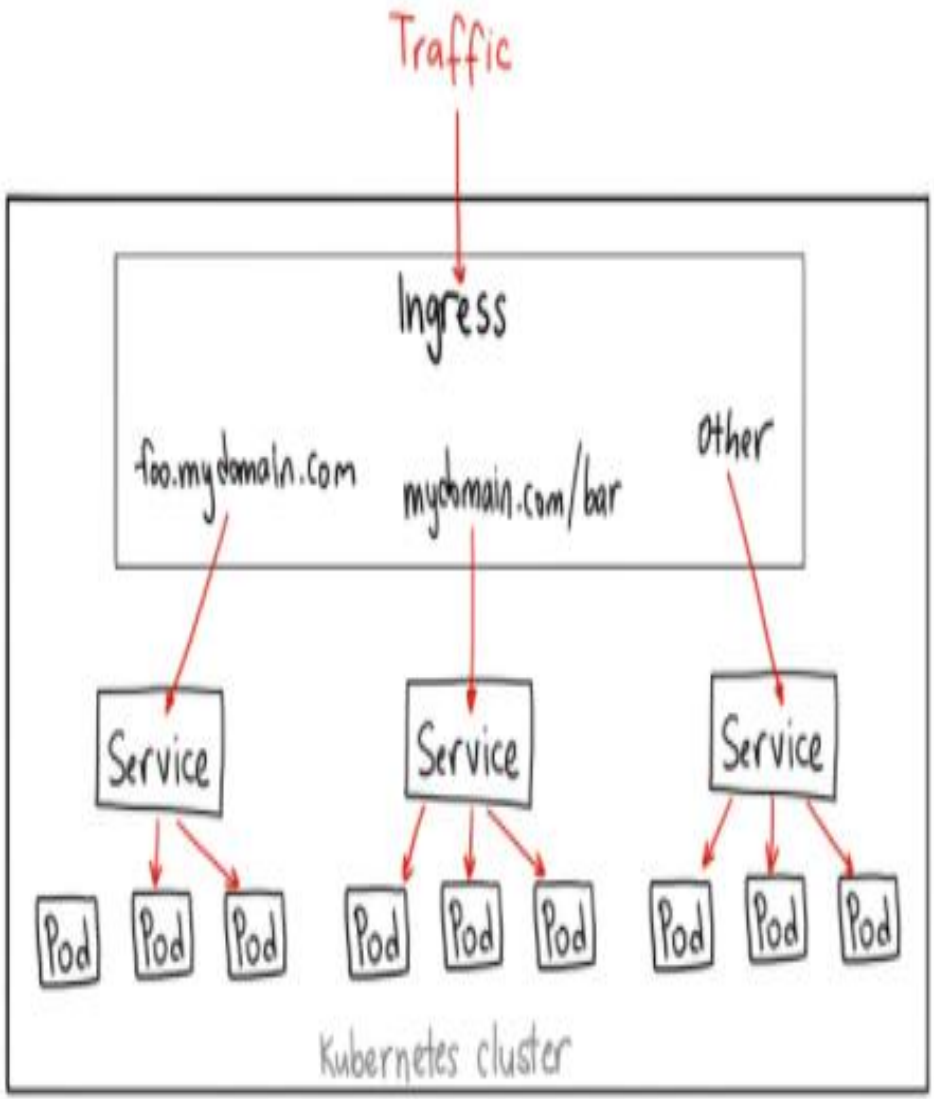
Cluster IP Vs Load balancer



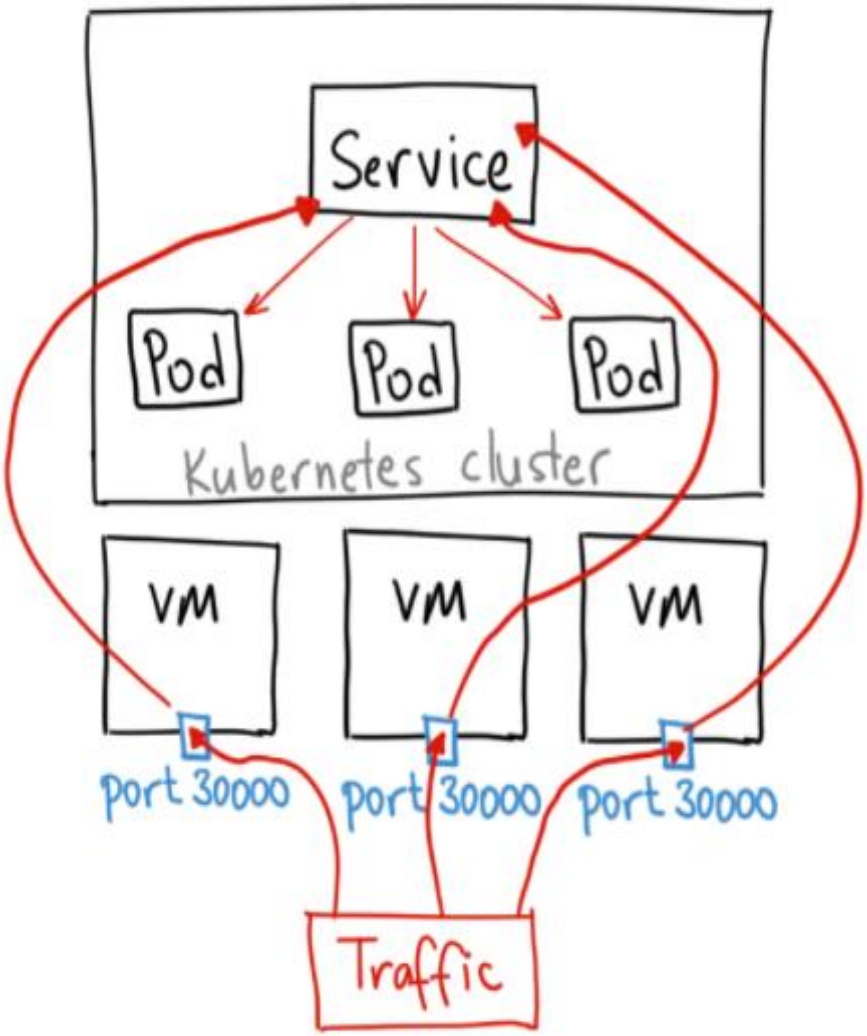
Cluster IP



Load balancer



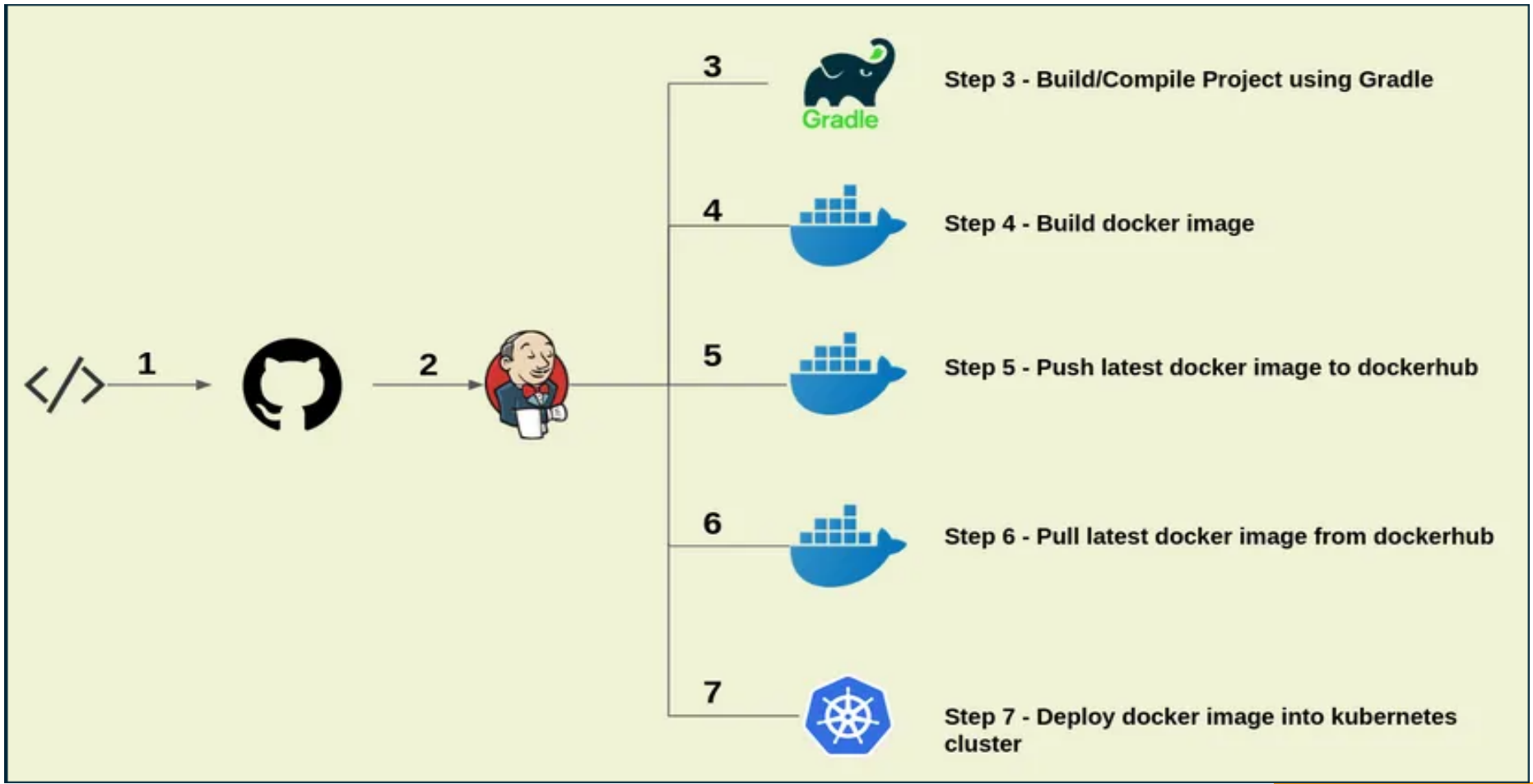
Ingress



Node Port

CI/CD pipeline with Jenkins

- Purpose of CI/CD
- Environment setup
- Create and run pipeline script



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Demo

Results, Conclusion & Further research

Results:

Successfully deployed our services

The Integration of the CI/CD Pipeline with docker and Kubernetes done

Conclusion:

Objectives were achieved

Further research:

Security consideration

Traffic Analysis(Throughput analysis)

Dynamics of data managed by third party

References

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"DEPLOYING A DOCKERIZED APPLICATION WITH KUBERNETES ON GOOGLE CLOUD PLATFORM" by Robert Botez1 , Calin-Marian Iurian1 , Iustin-Alexandru Ivanciu1 and Virgil Dobrota1

Vaibhav Bejgam, Sriniketan Mysari. Continuous integration and continuous deployment pipeline automation using jenkins ansible. 2020.

Appendix:

Full code is available at:

https://github.com/abdullahalnoman8/cloud_deployment