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Catechization-Deployment using Docker and Kubernetes in Local

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ABSTRACT

This catechization is software that allows any industry or institute to arrange, conduct and manage examinations via an online environment. It can be done through the Internet/Intranet and LAN environments. Some of the problems faced during manual examination systems are the delay in result processing, and filing poses a problem; filtering records is difficult. The loss of papers is also high, and record searching is difficult. Develop a MERN stack application and deploy it using Docker and Kubernetes. Docker is a tool for creating an image of an application and the dependencies needed to run it. The image can later be used on a containerization platform such as Kubernetes. The two main components used in this web application are Docker and Kubernetes. Docker is used to producing a Docker image of the operation using a Dockerfile. A Dockerfile has all the instructions on building the final image for deployment and distribution. The photos that are made are reusable perpetually. Kubernetes then use the image for the deployment. Everything is developed and deployed in the local machine.

***Keywords*--**Docker,Kubernetes,Online Examination,Registry,Cloud Computing.

INTRODUCTION

Docker is an open-source software that runs programs and making the task of developing and distributing them simpler.The applications built into the docker are bundled into a standard type called a container, with all the supporting dependencies. Such containers usually run in a sandbox environment over the operating system's kernel. Interms of performance, the additional layer of abstraction can have an effect.

Container technology has been around for over ten years, but Docker, a comparatively recent technology, is hoped to be one of the best innovations right now because it incorporates modern elements that previous technologies have not..

Initially it gives the container formation and control facility. Besides that, the developer can easily loadapplications into lightweight docker containers. This virtualized software can be performed with ease anywhere without alteration. In addition, on the same hardware, the docker can communicate more virtual circumstances than various innovations. Docker can easily communicate with third-party instruments to tie things up, which help to quickly deploy and handle the docker containers. Docker containers can be deployed easily inside the cloud-based environment.

Kubernetes, also known as K8s, is an open-source system for automating deployment, scaling, and management of containerized applications. Kubernetes works with Docker and Container. Many cloud server provides like Amazon, Google, Azure etc offer Kubernetes-based platforms or infrastructures as a service that deploy K8s.

This paper is a study of deployments using Docker and Kubernetes. The whole deployment is made in a single local machine instead of a cloud server or cloud environment. We will discuss more about the deployment methods in this paper.

LITERATURESURVEY

Prof. Rahul Shahane [1] has presentedin his work on online examination system and analysing people's knowledge. His work consists of three levels of authentication for student, teacher or staff and admin. Admin can assign teacher or supervisor role and monitor audios and screenshots. Supervisor can create questions, conduct exams, assignments etc. Students can attend tests.

Pawan Kaur and Nitin Pawar[2] has worked on Docker and it's features. They have mentioned how docker works and advantages of docker.

Babak Basshari Rad and Harrison John Bhatti explored the Analysis of Docker performance over deployment.

DOCKERINSIDE

There are four mains internal docker modules, including Docker Client and Server, Docker Images, Docker Registries and Docker Containers. The following parts should describe certain components in detail.

Docker Client and Server

As shown in Figure 1 Docker can be described as a client and server-based program. The server docker receives the request from the client docker and then processes it accordingly. The full RESTful (Representational State Transfer) API and a binary client command line are shipped via the docker. Docker daemon / server and docker client can run on the same machine or connect a local docker client to a remote server or daemon running on another machine [9].

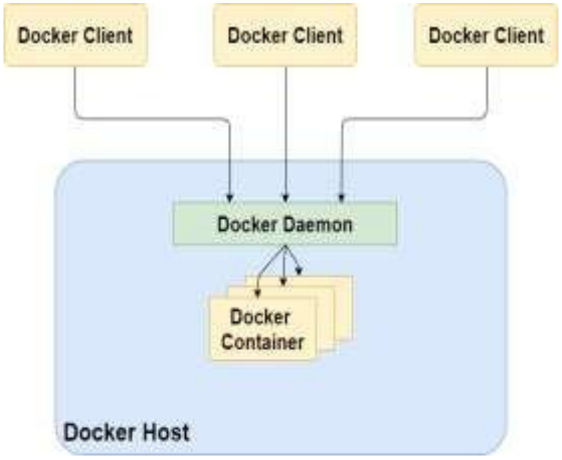

Fig.1 Dockerarchitecture

DOCKER

Docker offers a container management facility for applications when they are deployed. In a container world, where programmes are virtualized and performed, Docker adds an extra layer of development system on top of it.. The docker is developed to provide a convenient and portable environment in which code can be run easily, as well as an extra feature for the proficient work cycle to take the code from the machine for testing before production [9]. Russell (2015) states that the docker helps you to check and deploy the code into the production environment as quickly as possible [6]. Turnbull (2014) ends by saying dockers are surprisingly simple [9].Of course, a docker with a basic configuration system or a binary docker with a linux kernel may be used to get started.

There are two ways of creating a picture. The first is the use of a read-only template to create an image. Each picture is based on a base picture. Basically, operating system images are the foundation files, such as Ubuntu 14.04 LTS, or Fedora 20. Operating system images build a container with the ability to fully run OS. One can also create base image from scratch. Additional applications may be applied by changing it to the base image, but a new image needs to be created. The process of creating a new picture is called "engaging in a transition." The second approach is making a docker script. The docker file contains a list of instructions that obey all the instructions provided in the docker file and generate an image when the "Docker build" command is run from the bash terminal. That is an automated way to construct an image.

Docker Registries

Docker images are put in registries of dockers. This operates correspondingly for collections of source code where images can be pushed or pulled from a single source. There are two types of state and private registries. Docker Hub is also a shared repository where anyone can pull images that are accessible and move their own images without making a scratch image. Using the docker hub feature, images can be distributed to a given area (public or private).

Kubernetes

Today’s industry has gradationally realized the significance of lifting effectiveness and saving costs during the life- cycle of an operation. In particular, we see that utmost of the cloud-based operations and services frequently correspond of hundreds ofmicro-services; still, the traditional monolithic pattern is no longer suitable for moment’s development life- cycle. This is due to the difficulties of conservation, scale, cargo balance, and numerous other factors associated with it. Accordingly, people switch their focus on containerization — a featherlight virtualization technology. The saving grace is that it can use machine coffers more efficiently than the virtual machine(VM). In VM, a guest OS is needed to pretend on the host machine, whereas containerization enables operations to partake a common OS. Likewise, containerization facilitates druggies to produce, cancel, or emplace holders painlessly. In order to manipulate and manage the multiple containers, the leading Cloud providers introduced the containerorchestration platforms, similar as Kubernetes, Docker Swarm, Nomad, and numerous others. Kubernetes defines a set of structure blocks(" savages") that inclusively give mechanisms that emplace, maintain, and scale operations grounded on CPU, memory or custom criteria. Kubernetes is approximately coupled and extensible to meet different workloads. The internal factors as well as extensions and holders that run on Kubernetes calculate on the Kubernetes API. The platform exerts its control over cipher and storehouse coffers by defining coffers as Objects, which can also be managed as similar. Kubernetes is generally used as a way to host a microservice- grounded implementation, because it and its associated ecosystem of tools give all the capabilities demanded to address crucial enterprises of any microservice armature. It's available in three forms open source, marketable, and managed. Open source distributions include the original Kubernetes, Amazon EKS- D, Red Hat Openshift, VMware Tanzu, Mirantis Kubernetes Engine, and D2iQ Kubernetes Platform. Managed immolations include GKE, Oracle Container Engine for Kubernetes, Amazon Elasric Kubernetes Service, IBM Kubernetes Service, and Platform9 Managed Kubernetes.

How Deployment was made?

A private registry was created in a local machine using docker registry. Then the registry is executes and port has been exposed. The Backend and Frontend has been containerized separately using Dockerfile. This file contains the steps how to create the container and which os or softwareshas to used and how to execute the code. Then the images are tagged with the domain of the registry (ex: localhost:5000/image-name). Then the newly tagged image is pushed to the registry. If we delete the image in our local and take a pull, the image will be pulled from the local private registry.

The containerized image has to be deployed using Kubernetes. It is used to scale up the application. Like Dockerfile Kubernetes code file is saved with the extension yaml or yml. Here we mention the name of the pod, number of replicas, image that has to be used and in which port the code has to be executed. This port can be later exposed to the outer local machine to access the application.

To pull image from the registry, first it has to be authenticated. So username and password has to be created. The registry has to be in running statewhile running Kubernetes cluster. In Kubernetes yaml file, the name of the image is mentioned as registry.domain/image-name (localhost:5000/image-name).

First service is created for both server and client. Later, deployment is created. When deployment is created it pulls the mentioned image from the registry and creates a pod from it. Replicas of pods are set as required in the yaml file.

After this step, there will be a pod running in the Kubernetes and a service listening to the requests. But we won’t be able to access the application now. Port-forwarding has to be done to access the application. We are port-forwarding the service so that the requests are listened from outside machine as well.

Now the deployment is ready and can be used and accessed by the users.

SUMMERY

The required deployment is achieved finally. The entire deployment is done locally in a single machine. No public repositories are used. But since everything is in one single machine, the machine’s configuration has to be better. If not we will face difficulties in the long term. To avoid this, either move to a cloud service provider or configure the machine according to the needs.

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