Assignment 3.1: Container Virtualization

UvA - Web Services and Cloud-Based Systems

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1 Strengths

The operation and installation of Docker are incredibly simple. We consider it as a highly developed container engine that makes it simple for novices to comprehend and apply the concepts of Image, Container, and Repository. Then it works out of the box, so no configuration is required after installation to use the application in containers. That means, Docker solves the vital problems of running environment and configuration, which benefits publishing and continuous integration. Additionally, it is very lightweight and efficient since a Docker image is made up of multiple superimposed read-only layers, with each layer containing only the differences from the previous layer. When we make changes on the container, such as creating, editing or deleting a file, all changes are only saved on the layer, and the overall update of image will not be large. Moreover, containers are typically very small, and they start up in seconds, significantly faster than VMs, which take minutes.

In terms of practical applications, docker's portability [2] affords us great convenience. Specifically, we only need to configure and deploy a complex environment once, after which we can use these settings on other systems and machines without restriction. Simply import or pull an Image from the repository, and then all the required deployments are prepared, which is a fantastic experience.

Docker also brings environment standardization, thanks to the design of Dockerfile [1], all the detailed process of software installation in this Image can be easily obtained in Dockerfile.

2 Drawbacks

A disadvantage of Docker is that it cannot store data for an extended period of time. [3] When Docker shuts down, all of its data is deleted. As a result, restarting operations is extremely inconvenient. Second, inadequate Docker monitoring can cause a great deal of trouble. For monitoring, Docker offers only the stats command, which provides only basic information about the container. Docker does not offer more advanced monitoring options.

3 Our Experience

We prefer to use Docker for projects that are mature and require complex deployment. The advantages are obvious: for time-consuming environment configuration and deployment, we only need to configure or compile the code once, and it can then be easily reused on multiple machines. There are no environment conflicts with other machines. For example, after we finishing the 3.1 part, we need to deploy two services to the k8s cluster and we are done by using the docker image to complete all the work in one step without any environment configuration and file transfer.

The issue that must be faced is that docker does not support Windows, so we must use docker on a virtual machine with ubuntu or other linux OS when using a Windows system. Fortunately, one of our team members is working with macOS :)

4 Contribution

Summer Xia: Deploy URL-shortener and User in the containers.
Yiming Xu: Main part of the report.
Tianhao Xu: Literature review and revised the report.

Each team member was extensively involved in the project.

References

1. Dockerfile Reference. [Online] (2019), available: https://docs.docker.com/engine/reference/builder/ [Accessed May.09, 2022]
2. Boettiger, C.: An introduction to docker for reproducible research. ACM SIGOPS Operating Systems Review **49**(1), 71–79 (2015)
3. Harter, T., Salmon, B., Liu, R., Arpaci-Dusseau, A.C., Arpaci-Dusseau, R.H.: Slacker: Fast distribution with lazy docker containers. In: 14th USENIX Conference on File and Storage Technologies (FAST 16). pp. 181–195 (2016)