

Analysis of Docker and its Performance

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Abstract

Docker is a toolkit that provides facility for the developers to build, deploy, run the applications using simple commands. Docker offers a work-saving automation environment by using a single API. It gives flexibility to the users to take and build their own configuration, so that it can be put into the code and further deployed without any consequences. It makes the application development easier, simpler and safer. Docker offers the platform to manage the containers. Applications developed using Docker will be portable as well as lightweight. It takes little time to distributing and gathering images. So performance of Docker containers are generally faster and consumes less resource compare to virtual machines.

Keywords

Docker, Container, API, Kernel, Docker File, Docker Image, Docker Daemon, Docker Registry
Docker Hub, Virtual Machine

Introduction

Docker is an open platform that is used for build, distribute and run the applications in a lightweight portable, runtime and packaging environment called as Docker Engine. It provides Docker Hub, which provides facility for sharing applications. [1] It is a cloud service. Costs can be reduced by using Docker containers which can replace virtual machines. It reduces the cost of re-building application on the cloud platform. Docker provides facilities, which are useful for developers as well as administrators as the management of applications is easier. The boot time is very short. It enables separate applications from infrastructure so delivery of software is fast. Docker does not contain any guest operating system. It takes very less time to distribute and gather images and enables separate applications from infrastructure so delivery of software is fast. Docker reserves certain threshold amount of resources to host operating system and allocates to the running container instances as and when it is required to boost the performance.

Docker uses client-server architecture. Client talks to the Docker daemon where it performs the actions like building, running, and distributing the Docker containers. Docker client and daemon communicate using REST API over a network interface or a UNIX sockets. The Docker client and daemon can run on the same machine and it can also be connected to a Docker client which is present on a remote Docker daemon. Docker is written using Go programming language and uses features of the Linux kernel to deliver its functionalities.

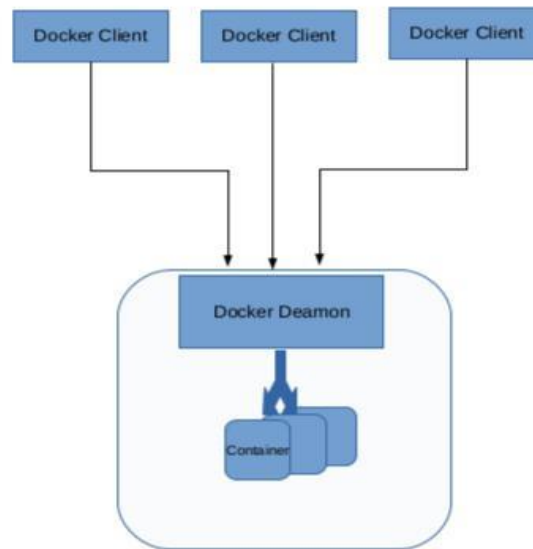


Figure1 : Overview of Docker

The above figure shows an overview of Docker, where it contains multiple clients which will have a service running on a single operating system. Daemon will contain multiple containers and these containers are the live, running instances of Docker images.

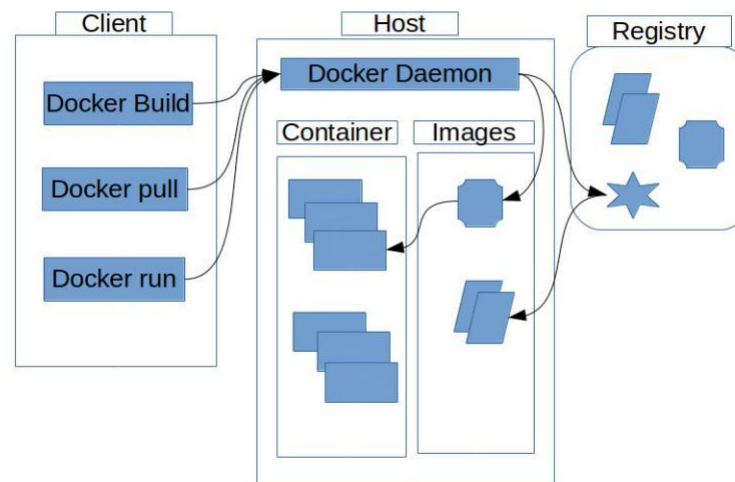


Figure 2 : Architecture diagram of Docker

The above diagram shows the architecture of docker and the operations which can be done on the client's side. The docker host contains the docker containers as well as images. Docker registry is the open-source storage and distribution for docker environment.

Docker Performance

Docker does not contain any guest operating system so it takes very less time to distribute and gather the images. Hence boot time is also very less. These are the main advantages of utilizing Docker Cloud over the VM Cloud. Containers provide better performance, scalability, reliability and usability as compared with traditional virtualization. Therefore containers smartly utilize its resources and reduce the chance of unnecessary consequences. As containers take less start-up time, it performs better than virtual machines thereby it removes dependability.

Virtual Machines vs. Containers

Virtual machines use an extra layer between the host operating system and guest operating system which is known as Hypervisors. But docker adds an extra layer where the applications are virtualized and executed between host operating systems; it is called Docker Engine. As docker does not use any guest operating system it makes a difference in performance between a docker container and a virtual machine.

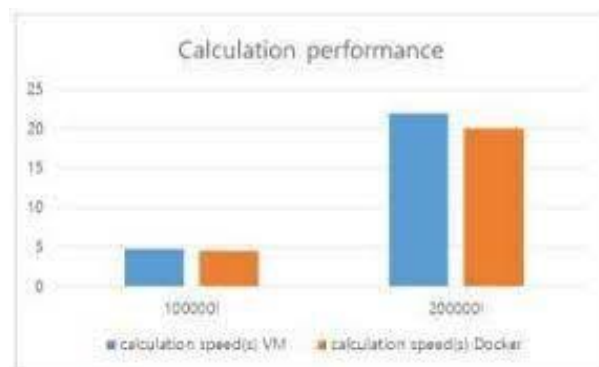


Figure 3 : CPU performance calculation of VM and Docker

The above figure shows CPU performance calculation of VM and Docker, where Docker's performance is high compared to Virtual Machines.

Docker Tools :

DockerFile - It is a simple text file that contains instructions to build the application.

Docker images - Docker images are those which contain executable application source code, tools, libraries, and dependencies which helps in easy development of applications.

Docker containers - Docker containers can contain any number of docker images and containers are live, running instances of Docker images.

Docker Hub - It is the public repository of docker images.

Docker daemon - It is a service running on the operating system, such as Microsoft Windows or Apple MacOS or iOS .

Docker registry - It is a scalable open-source storage and distribution system to store the docker images.

Sustainability

Social - Docker tool is designed for developers and system administrators to build applications without any consequences of versions. So it is an essential part of DevOps so that all can use this application.

Economic - As Docker is an open source platform, it is cost-effective with Fast Deployment.

Environmental - Docker images are open source and these are free of environmental limitations, and that makes any deployment consistent, easier, movable (portable) as well as scalable.

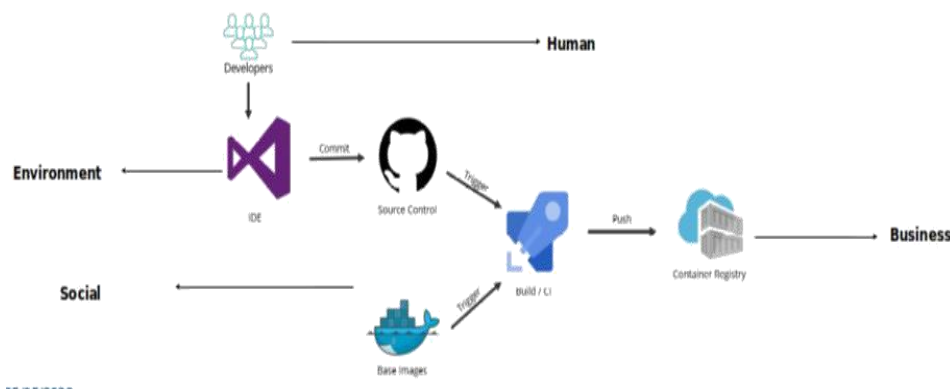


Figure 4 : Sustainability of docker

The above figure shows the sustainability of the docker in terms of human,environmental,social and business.

Conclusion

Docker is an open source platform that automates the applications when they are containerized. Docker engine, which is an extra layer added to the host operating system. So the performance of docker is faster than virtual machines as it has no guest operating system.Docker consumes less resources.

- It provides work-saving automation environment through single API
- Deployment can be done without any limitations
- Docker gives flexibility to the users to take and build their own configuration, that can be put into the code
- Dockers makes the application simpler,easier and safer
- Performance of docker is faster than virtual machines

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