CONTAINER AND ORCHESTRATION TOOLS IN CLOUD COMPUTING

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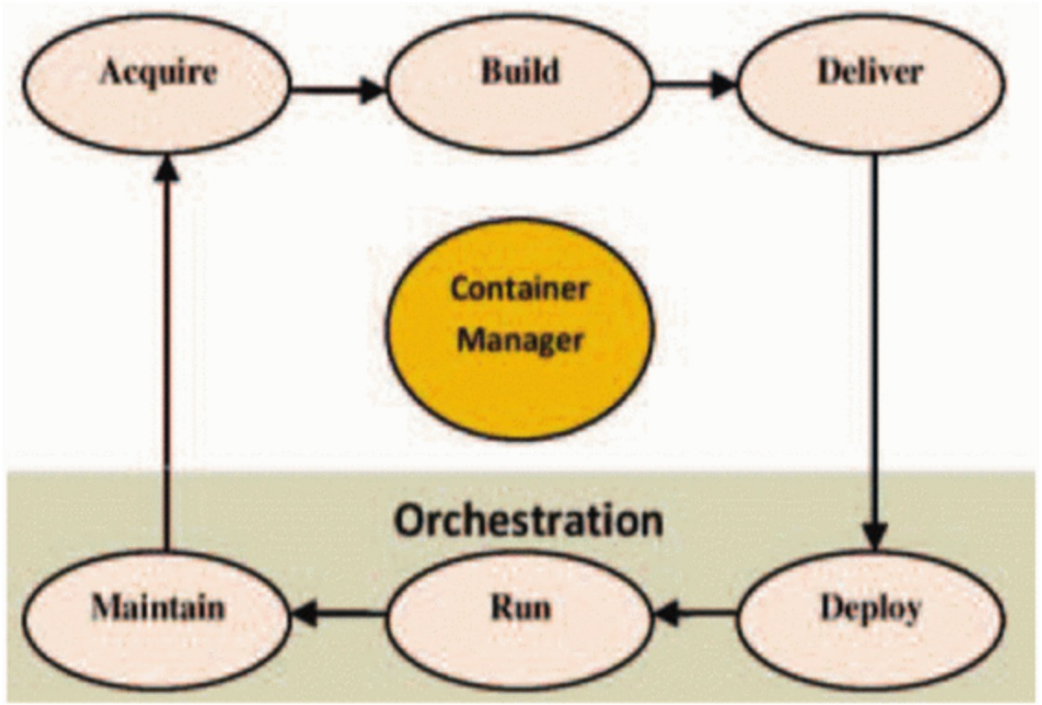
WHAT IS CONTAINERS ?

Containers

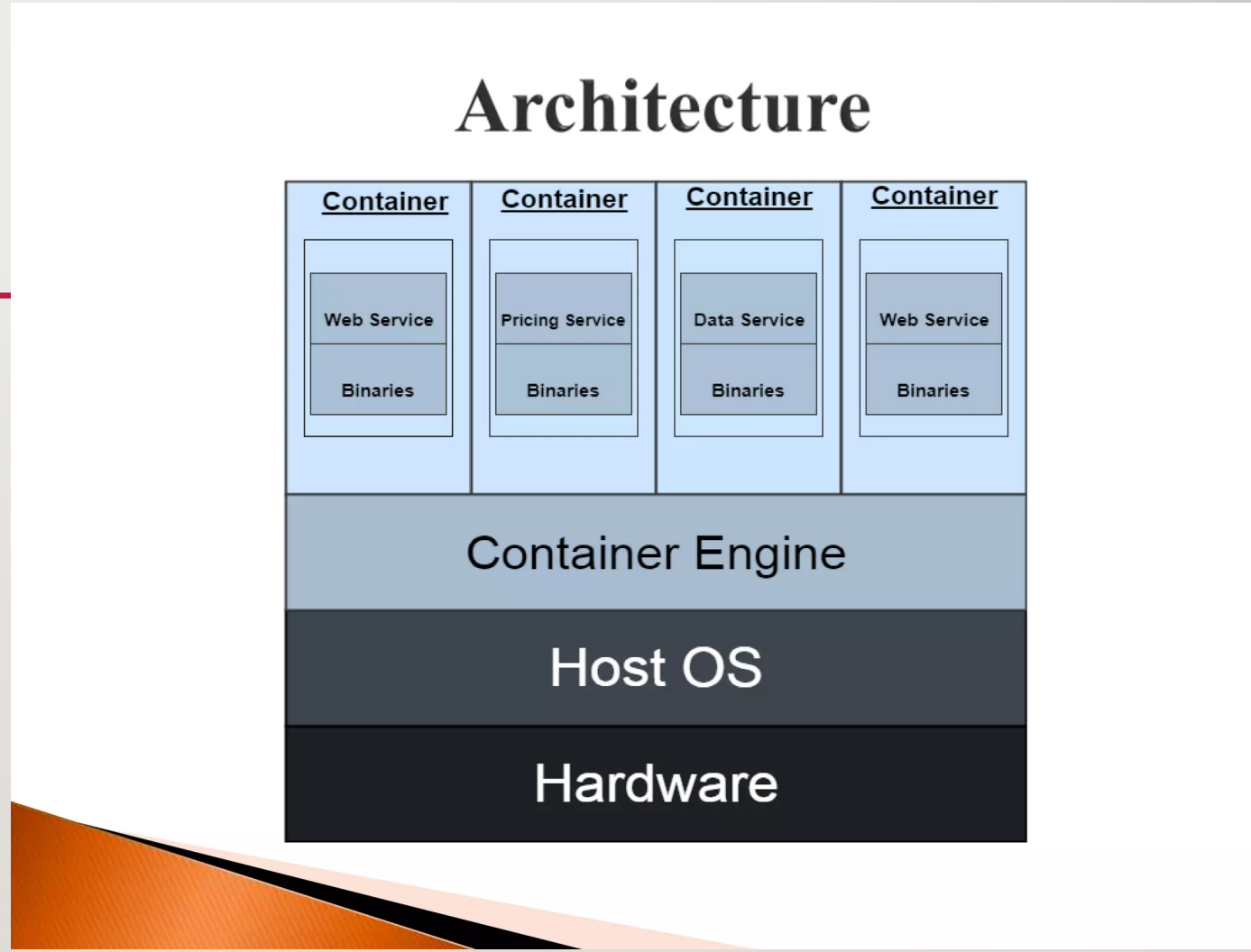
- Containers are packages of software that contain all of the necessary elements to run in any environment. In this way, containers virtualize the operating system and run anywhere from a private data center to the public cloud or even on a developer's personal laptop.

Lifecycle of container



HOW CONTAINERS WORK?

- Each container is an package of software, running on top of a host OS. A hosts) may support many containers (tens, hundreds or even thousands).
- At the bottom, there is the hardware including its CPU, disk storage and network interfaces.
- Above that, there is the host OS and its kernel - the latter serves as a bridge between the software of the OS and the hardware.
- At the very top are the binaries and libraries (bins/libs) for each application and the apps themselves, running in their isolated user spaces (containers).



Benefits

- Applications can consist of tens, hundreds, or even thousands of containers with cloud contains, you can distribute and manage these containers across many different cloud servers.

- Simplified application deployment
- Flexibility
- Separation of responsibility
- Scalability
- Resiliency
- workload portability

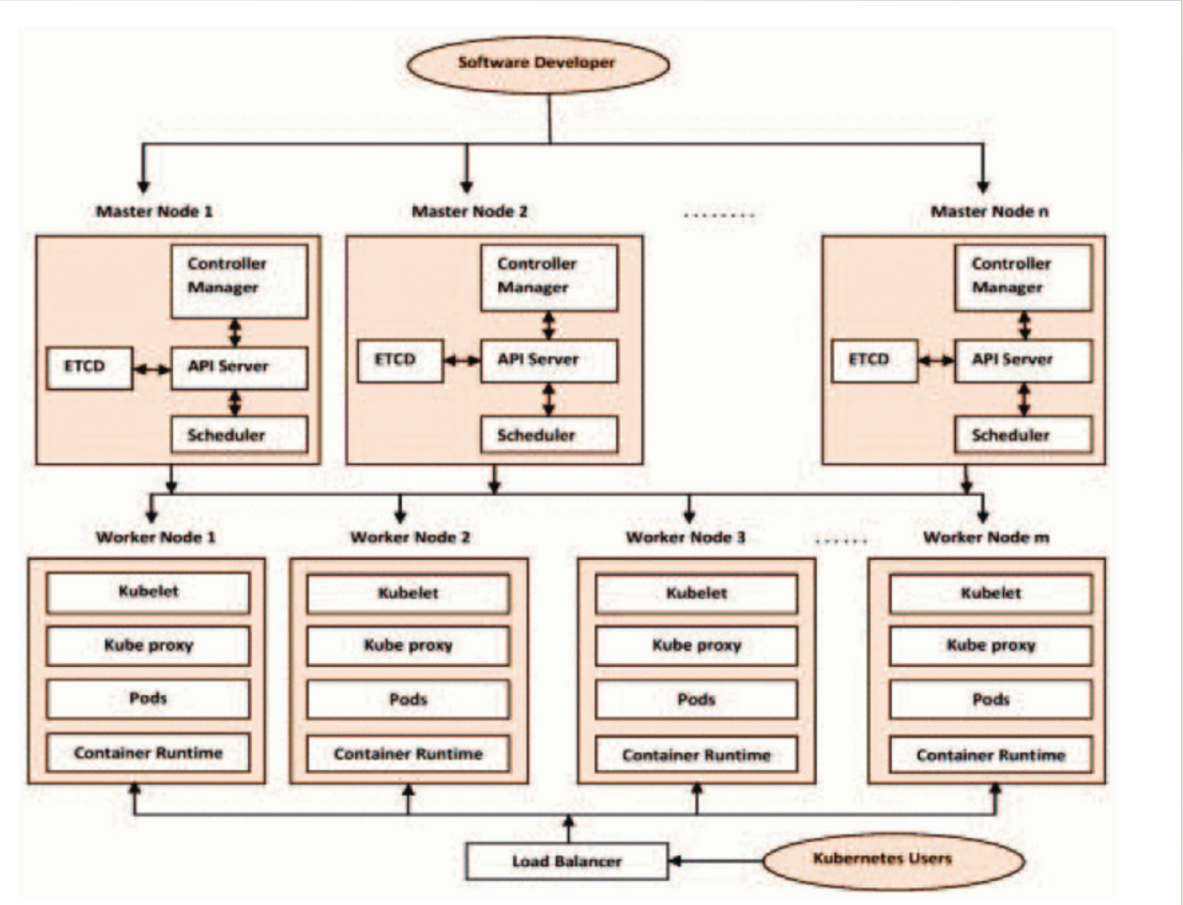
ORCHESTRATION TOOLS

- There are so many orchestration tools. This are widely used orchestration platform in the IT industry are .

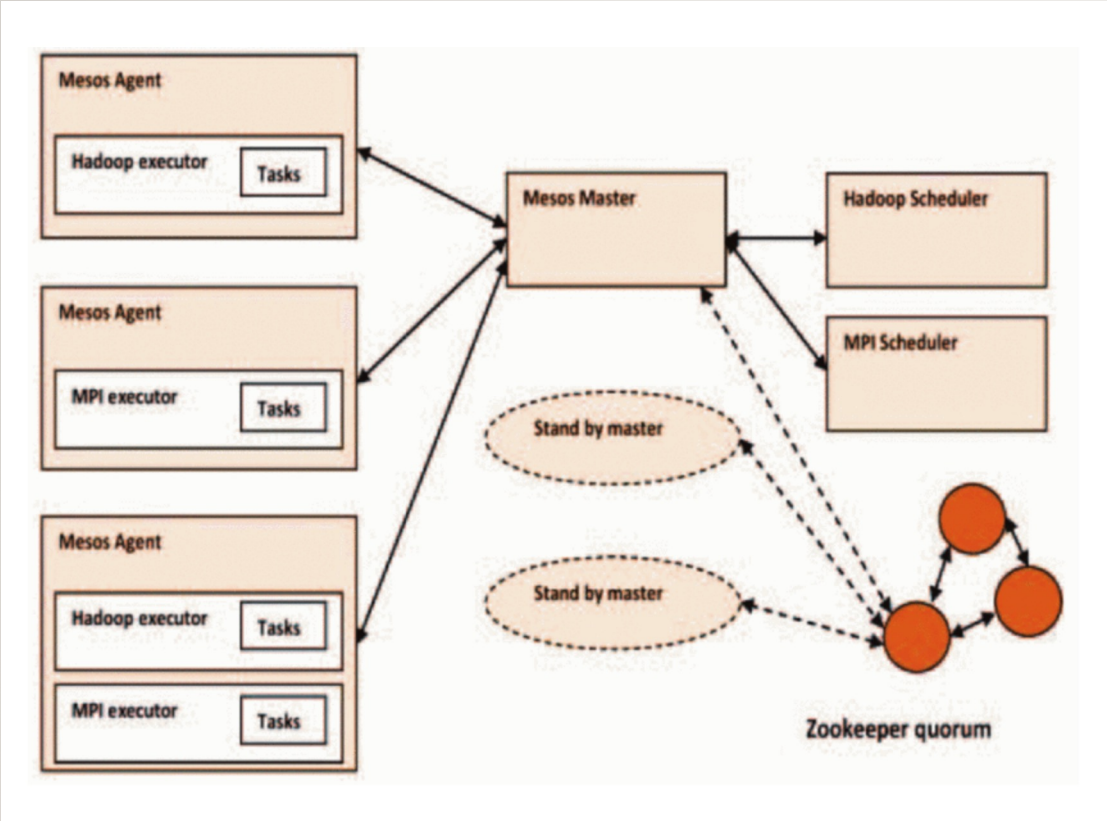
- Kubernetes
- Docker Swarm
- Apache Mesos
- RedHat and OpenShift

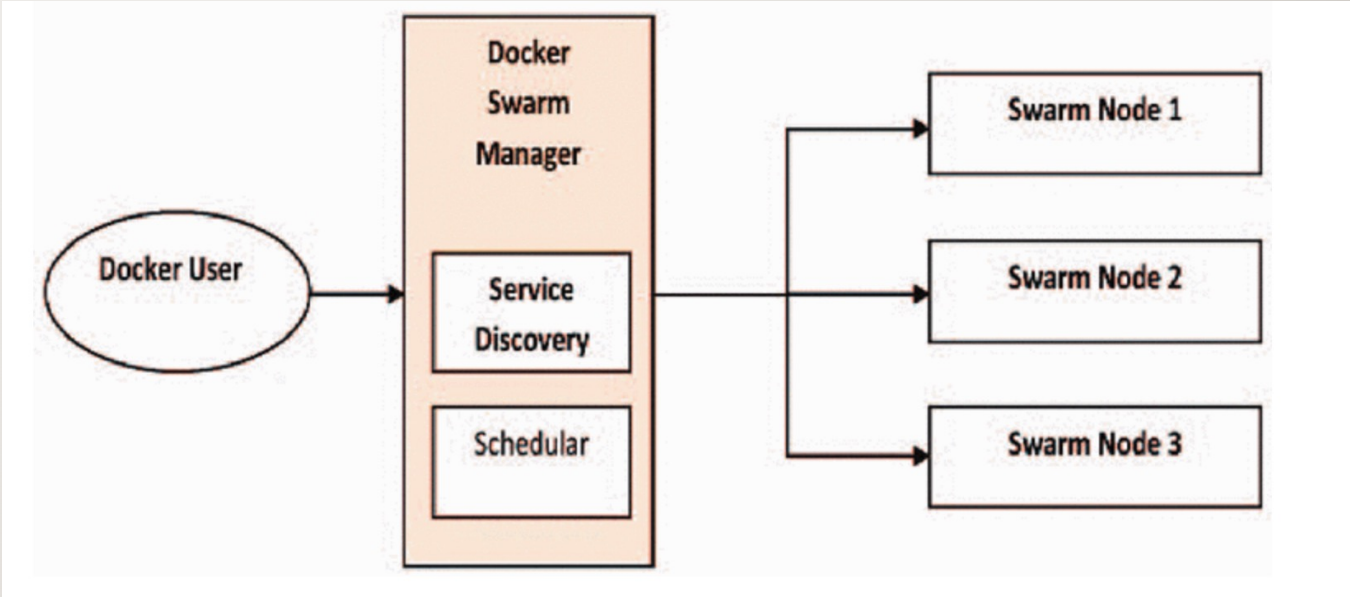
KUBERNETES

- It is an open-source orchestration tool of containers developed by Google in 2008.
- In 2015, this tool was given by Google to Cloud Native Computing Foundation.
- At present, it is the most widely used orchestration tool.
- The containers are orchestrated using YAML and JSON files in Kubernetes.



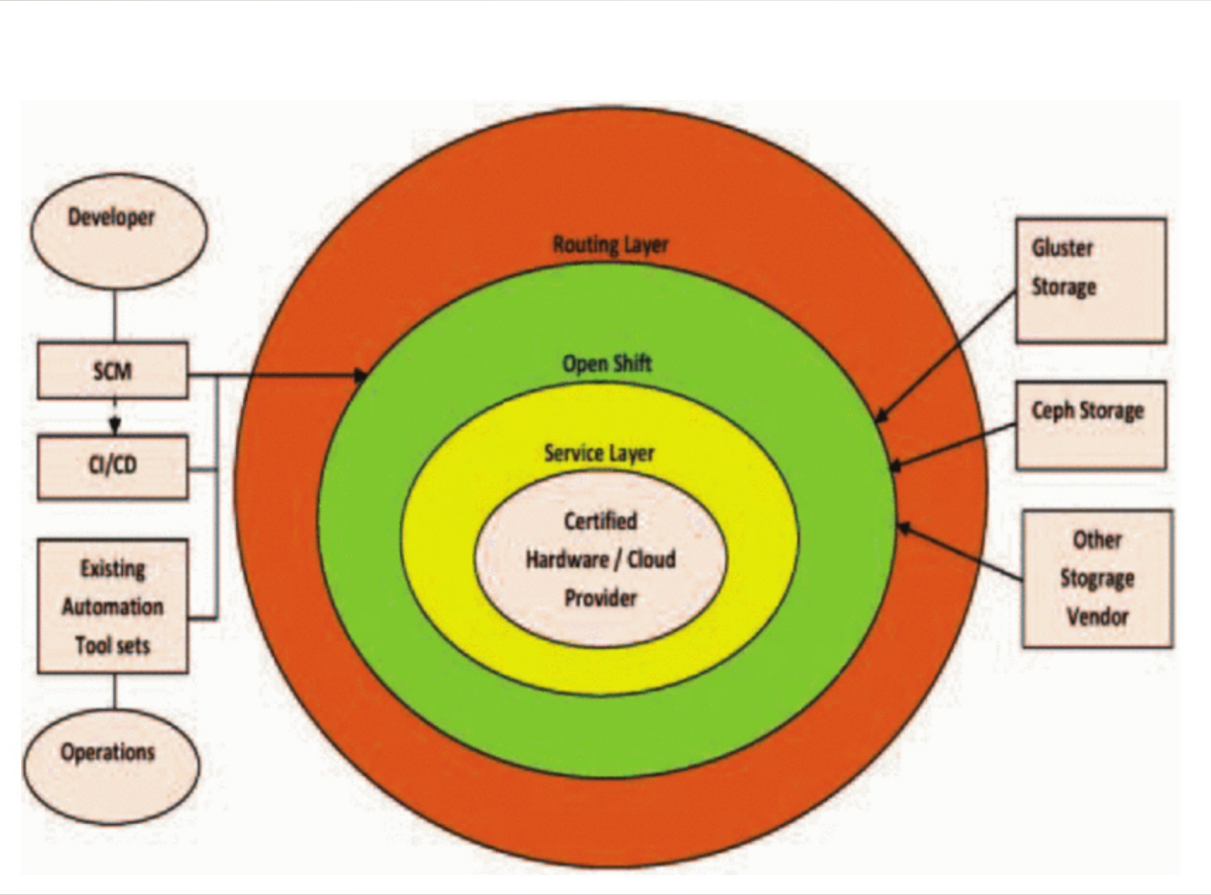
Apache Mesos





Docker Swarm

OPENSHIFT



- Red Hat helps to purchase many guaranteed applications which in turn helps in billing, visibility, administration, and responsive support.
- Platform-as-a-Service (PaaS) and Container-as-a-Service (Caas) both are offered by OpenShift.

S. No.	Parameters	Kubernetes	Docker Swarm	Mesos	OpenShift
1.	Initial Release Date	July 2015, V1.16 in Sept. 2019	March 2013, Stable release July 2019	July 2016, Stable release August 2019	4th May 2011, Stable release Oct. 18, 2021
2.	Deployment	Almost any platform	Linux, Windows, and macOS	Ubuntu, Debian Jessie, CentOS	RHELAH, Fedora, or CentOS
3.	Security	Does not come with built-in authentication or authorization capabilities	Based on Network Level Security	Does not provide authentication by default	Strict Security policies
4.	Maturity/Stability	Very mature	Mature but still evolving	Very mature, especially for very clusters counting in the thousands of servers	Evolving
5.	Scalability	Medium to large clusters	Small to medium scale clusters	Large to Very large scale clusters	Small to medium scale clusters
6.	Cluster Installation	Slightly complex to set up.	Very easy to install and setup	Generally easy to install and set up but considerably more complex with large setups.	Easy to setup
7.	Best features	Best pods scheduling features	Easy to use and more native to docker	Scale in 1000s and Rack/Host-based constraints	Easy scaling and deployment
8.	Images Supported	Docker and rkt, restricted	Docker-image format	Mostly Docker-image	OCI, Docker-container image
9.	Learning Curve	Rapid	Easy	Rapid	Easy
10.	Support	Large active community	-	-	Small community
11.	Product vs. Project	Open-source project	Open Source Plateform	Open Source Framework	Open Source, Commercial Product

CONTAINERS SERVICES

- AWS

Run containerized applications or build microservices	Amazon Elastic Container Service (ECS)
Manage containers with Kubernetes	Amazon Elastic Kubernetes Service (EKS)

- Google

➢ Google Kubernetes Engine (GKE)

➢ Cloud Run

➢ Cloud Build

CONCLUSION

- The four popular orchestration tools viz., Kubernetes, Docker Swarm, Mesos, and Redhat OpenShift. Kubernetes has the best scheduling features whereas Docker Swarm is easy to use. We also noticed that Kubernetes is the most popular and widely used platform among the tools discussed in this paper. We also found that the second most popular orchestration tool in the IT industries is OpenShift.

QUESTIONS ?

THANK YOU