Module 10 : Containers

P 2 V 2 C

Any application, web or otherwise, will need to be hosted on a system for it to function. These systems are often called as servers. for example, web applications have to be hosted on a powerful web server and made available over internet to serve web pages.
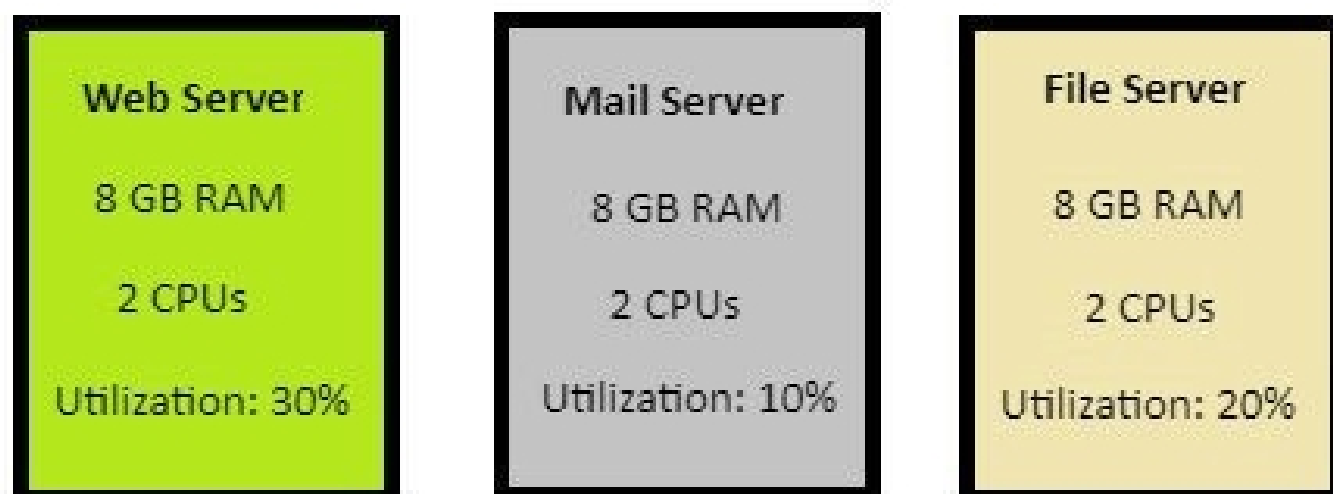
How these servers/systems have evolved over time and what physical systems, virtual machines and containers bring into the table?

Physical Systems / Servers:

Earlier days, Individual physical systems were used to host individual applications. Say, you need a web server to cater your web application, you will have to buy a dedicated physical machine with so and so configuration to power it up.

Again if you need a mail server to cater your mailboxes, you have to buy a new physical system. Your physical infrastructure keeps growing as your need grows.

Physical System

Web Server

8 GB RAM

2 CPUs

Utilization: 30%

Mail Server

8 GB RAM

2 CPUs

Utilization: 10%

File Server

8 GB RAM

2 CPUs

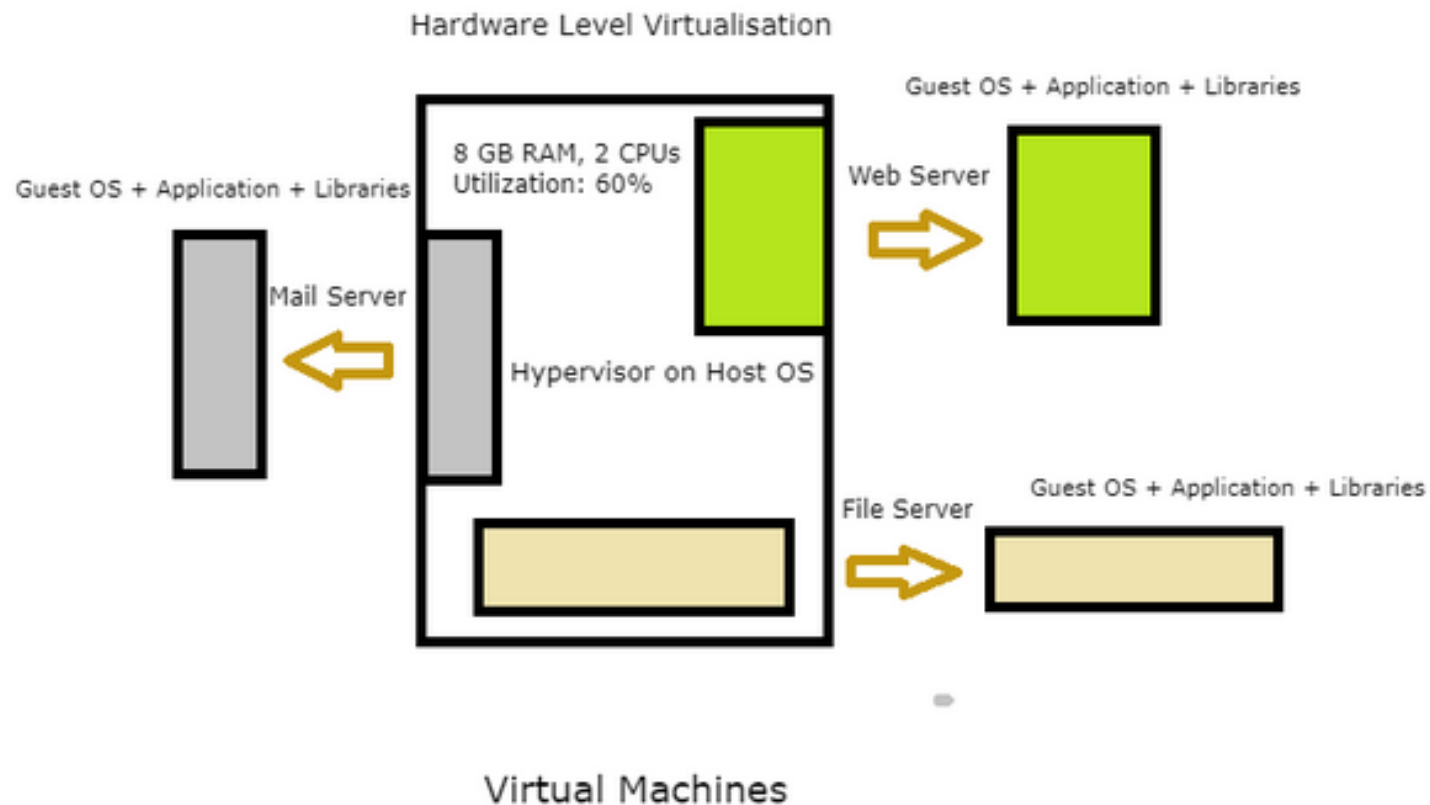Utilization: 20%

Individual Physical Servers

Virtual Machine ?

A Virtual machine provides a way to make a single physical system work as multiple isolated systems, resulting in higher infrastructure usage and reduced physical hardware infrastructure overhead.

How is it achieved?

Using hypervisor that runs on your host system, you can effectively split your underlying physical infrastructure into multiple smaller units that can run multiple isolated systems.
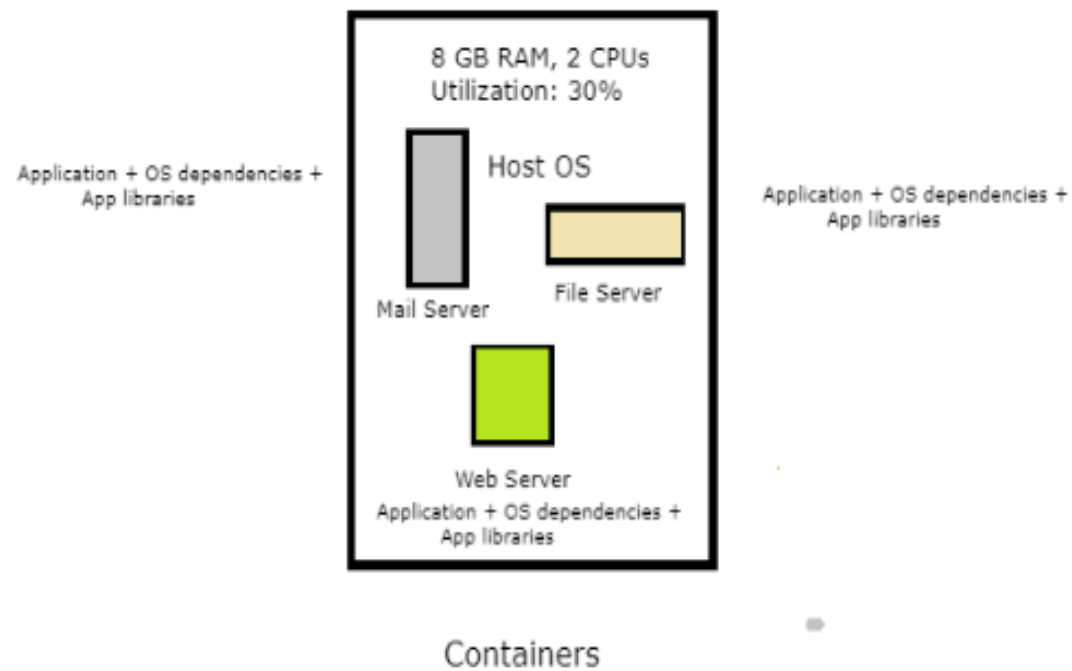
Virtual Machine

Hardware Level Virtualisation

8 GB RAM, 2 CPUs
Utilization: 60%

Guest OS + Application + Libraries

Guest OS + Application + Libraries

Web Server

Mail Server

Hypervisor on Host OS

File Server

Guest OS + Application + Libraries

Virtual Machines

Containers?

Containers enable virtualization in the sub-system level rather than hardware/OS level.

While hypervisors achieve virtualization by splitting hardware resources and running a separate set of OS on the virtualized hardware, containers utilize isolation at the subsystem level using namespaces and cgroups.

Subsystem level Virtualization

8 GB RAM, 2 CPUs
Utilization: 30%

Host OS

Application + OS dependencies +
App libraries

Mail Server

File Server

Application + OS dependencies +
App libraries

Web Server
Application + OS dependencies +
App libraries

Containers

Advantages of Containers ?

> **Portable**

> **Extremely small footprint**

> **Reduced IT management resources**
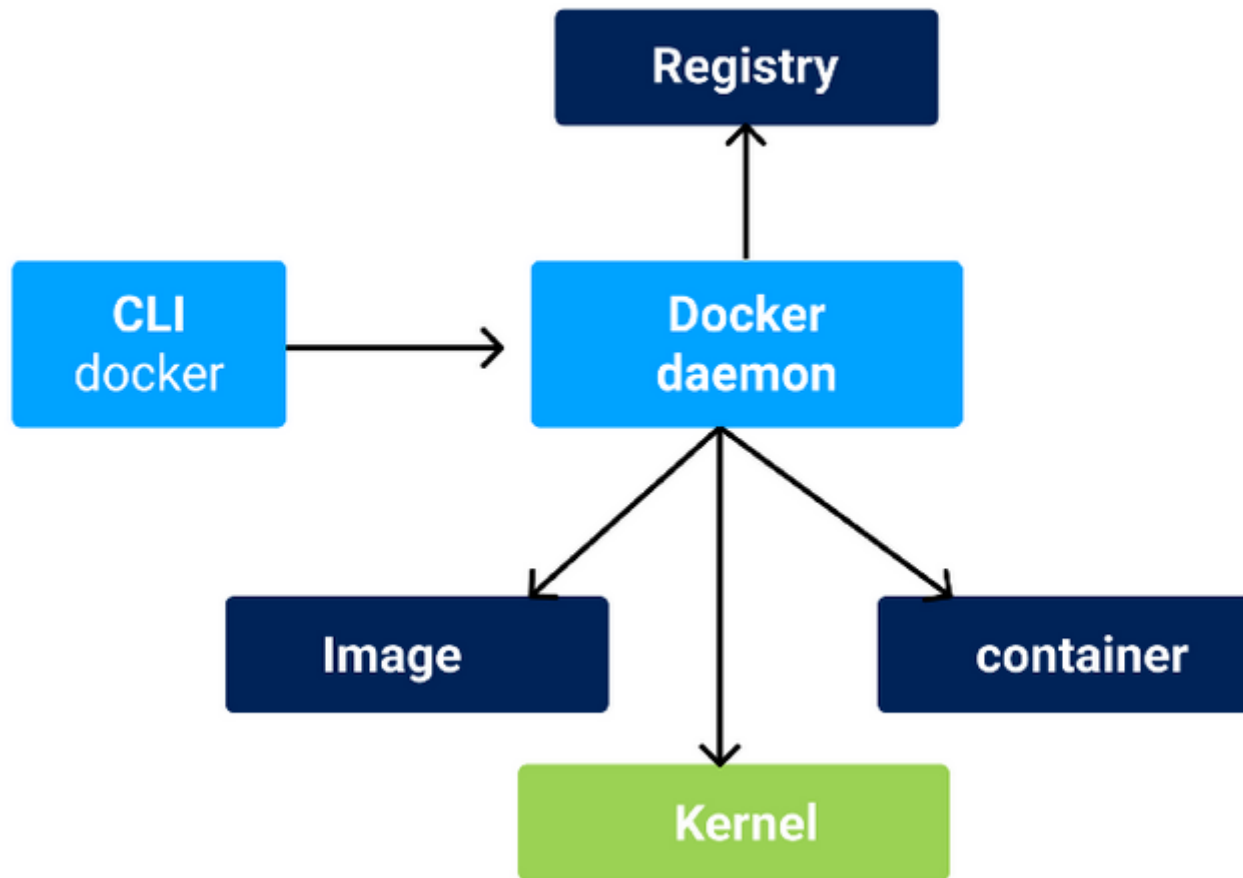
> **Quicker spinning of apps**

What is Docker ?

Docker is a tool designed to make it easier to create, deploy, and run applications by using containers.

Docker is currently the most popular container platform. Docker appeared on the market at the right time, and was open source from the beginning, which likely led to its current market domination.

Docker Flow

What is Podman ?

Podman is a daemon-less container engine for developing, managing, and running OCI Containers on your Linux System.

Containers can either be run as root or in rootless mode

Podman Flow