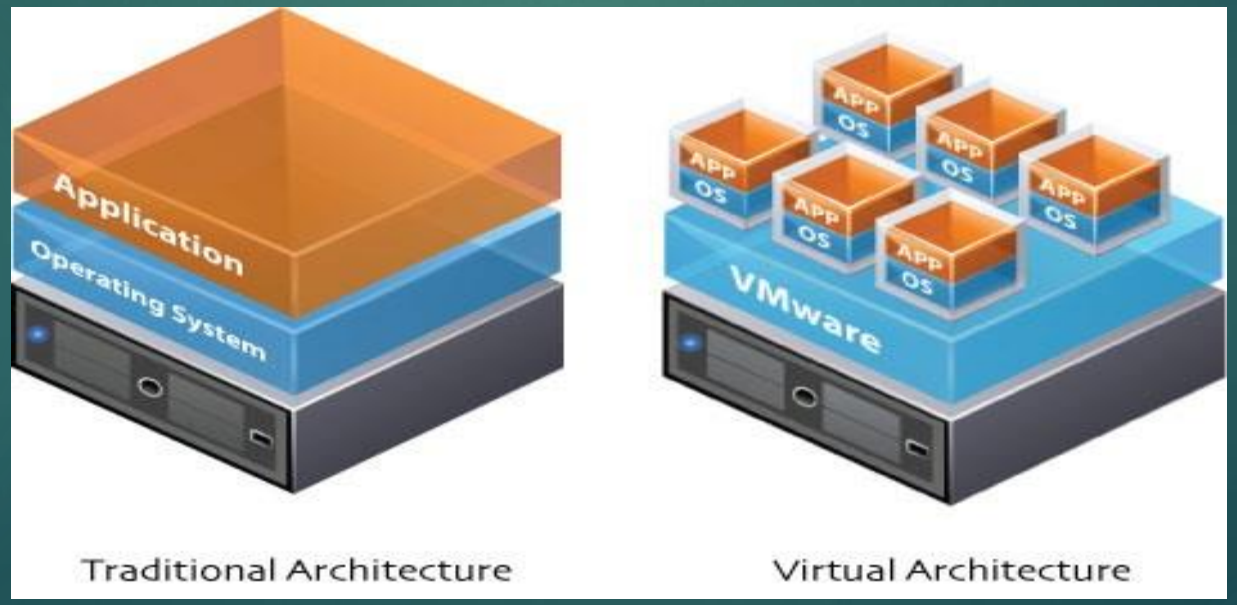
Introduction to Virtualization

What is Virtualization

- Today's x86 computer hardware was designed to run a single operating system and a single application, leaving most machines vastly underutilized.
- Virtualization lets you run multiple virtual machines on a single physical machine, with each virtual machine sharing the resources of that one physical computer across multiple environments.
- Different virtual machines can run different operating systems and multiple applications on the same physical computer.



Benefits of Virtualization

Improve Effectiveness and Reduce Costs	Increased Business Agility	Maximize Business Continuity
• Maximize Asset Utilization • Reduced Power and cooling needs • Lower Capital and Operational expenditure • Lower Carbon footprint • Increased IT staff productivity • Reduced Software Licensing ,hardware management costs	• Dynamically scale up or back • Rapid response to changing business needs • Faster provisioning of services and infrastructure	• Optimize Availability • Application Isolation • Centralized Management • Simplify disaster recovery • Increase security

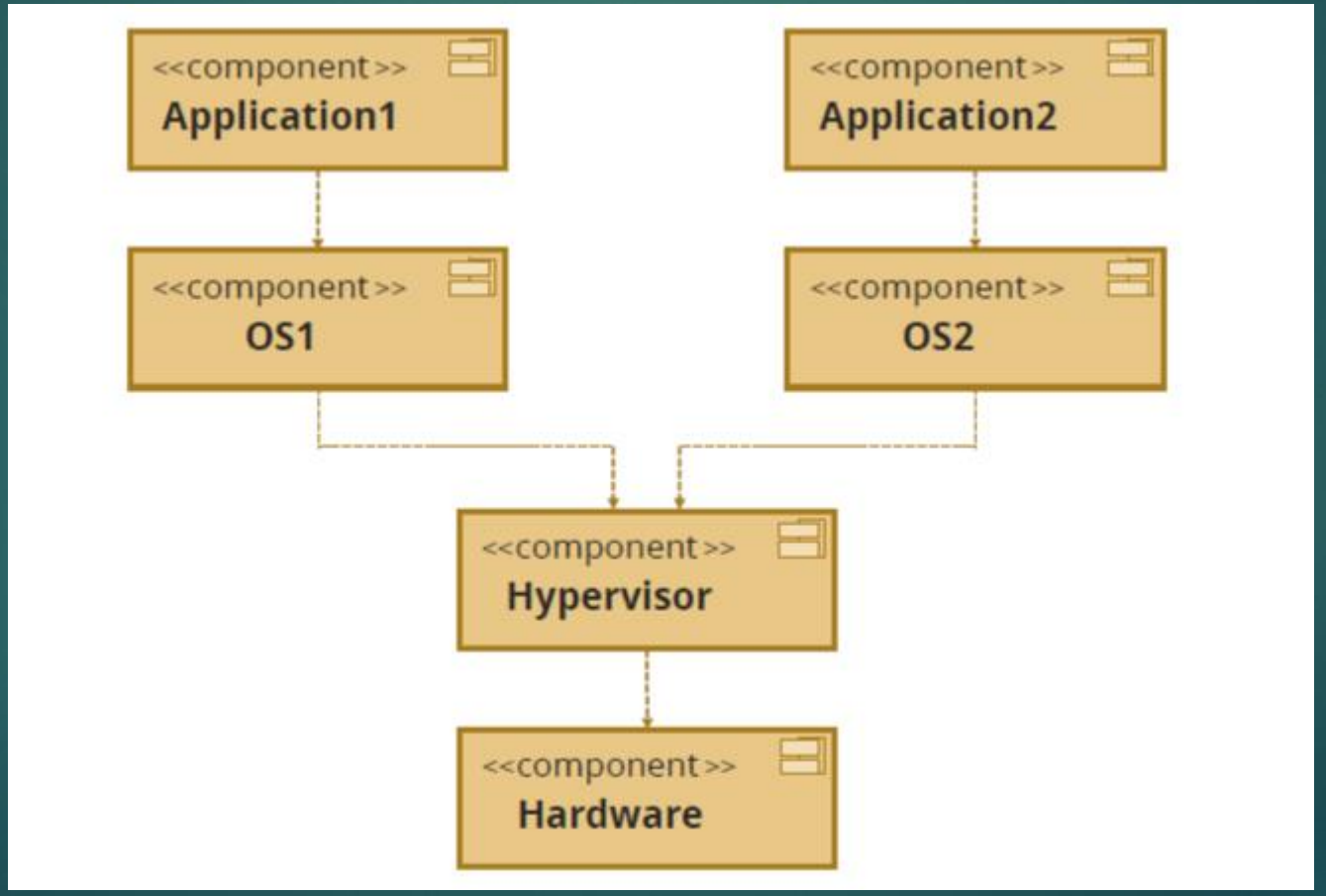
What is a Hypervisor

- A hypervisor, also called a virtual machine manager (VMM), is a program that allows multiple operating systems to share a single hardware host.

- Each operating system appears to have the host's processor, memory, and other resources all to itself.

- However, the hypervisor is actually controlling the host processor and resources, allocating what is needed to each operating system in turn and making sure that the guest operating systems (called virtual machines) cannot disrupt each other.

Bare Metal or Type-1 Hypervisor



Type 1 Hypervisors

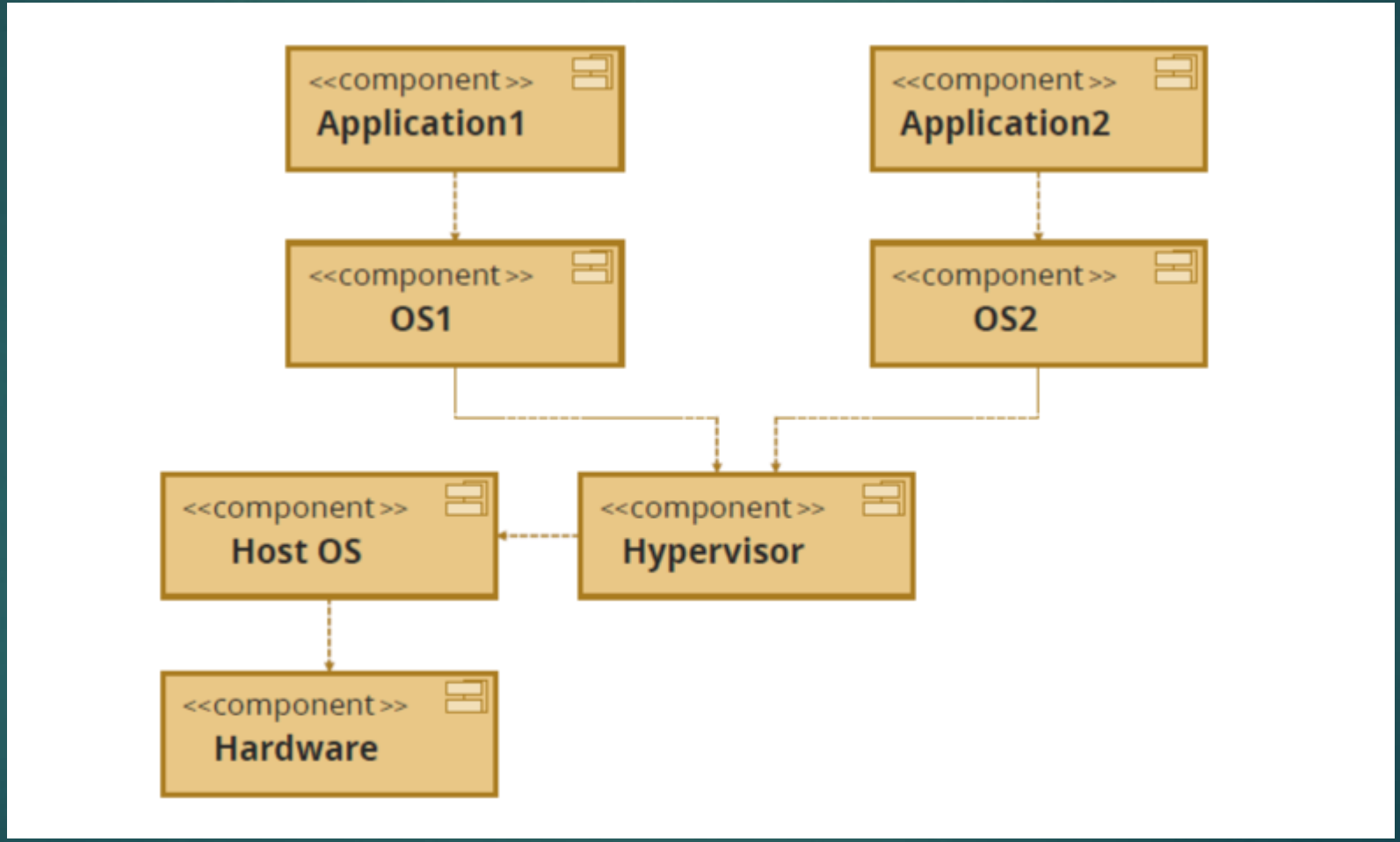
Windows Server 2012
Hyper-V

Xen
Server™

redhat
RED HAT®
ENTERPRISE
VIRTUALIZATION
For Servers

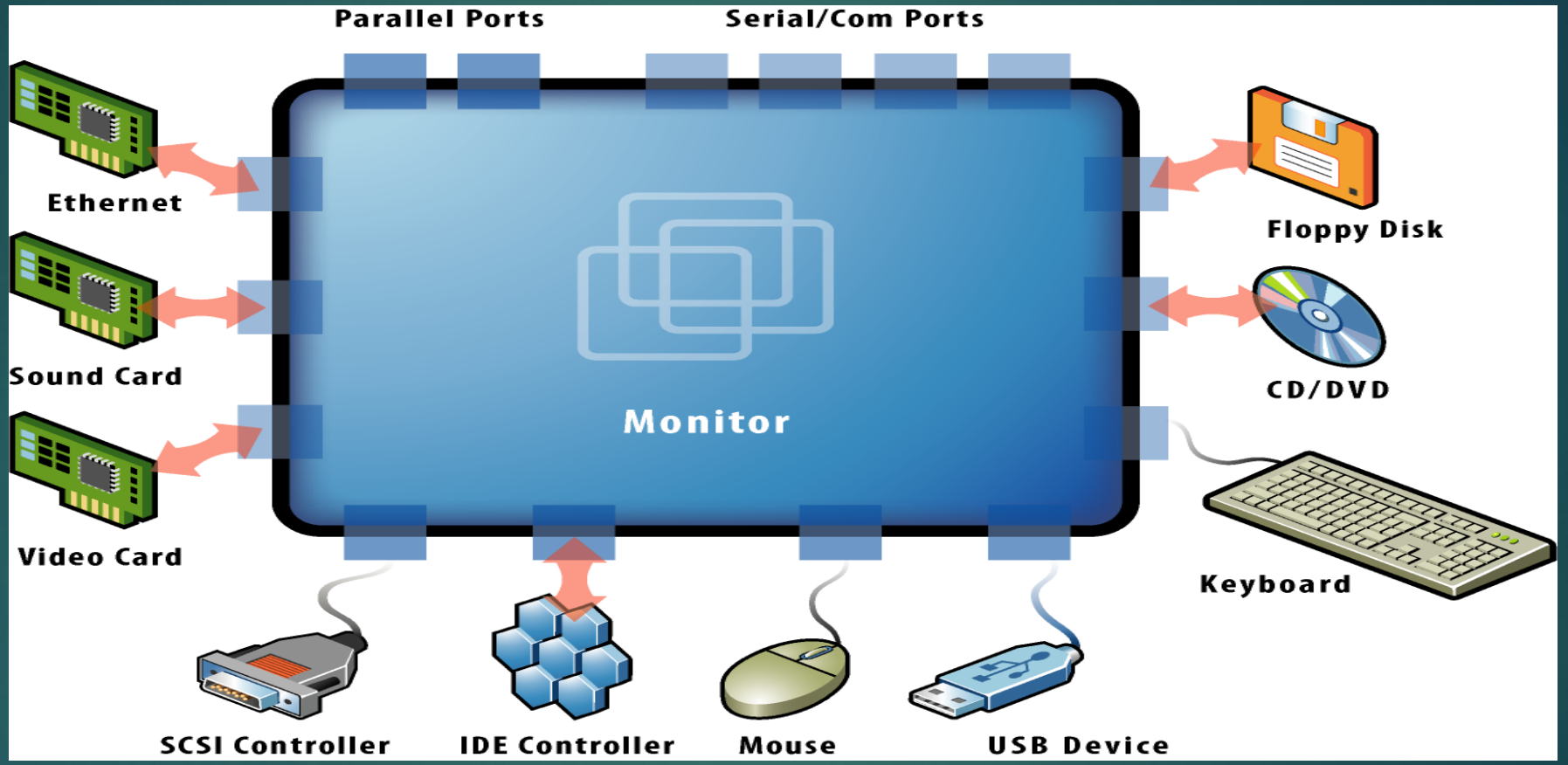
KVM

Type -2 Hypervisor



Type -2 Hypervisors

What is a Virtual Machine



Issues with Virtual Machines

Virtual Machines are full Operating Systems

- VMs are typically created by installing an OS from distribution ISO images
- Application software needs to be installed and configured

There are often performance issues

- The host OS may not leave enough free memory for the guest OS
- A 64 bit guest OS may not run on a 32 bit host OS

Virtual Machines are typically very large

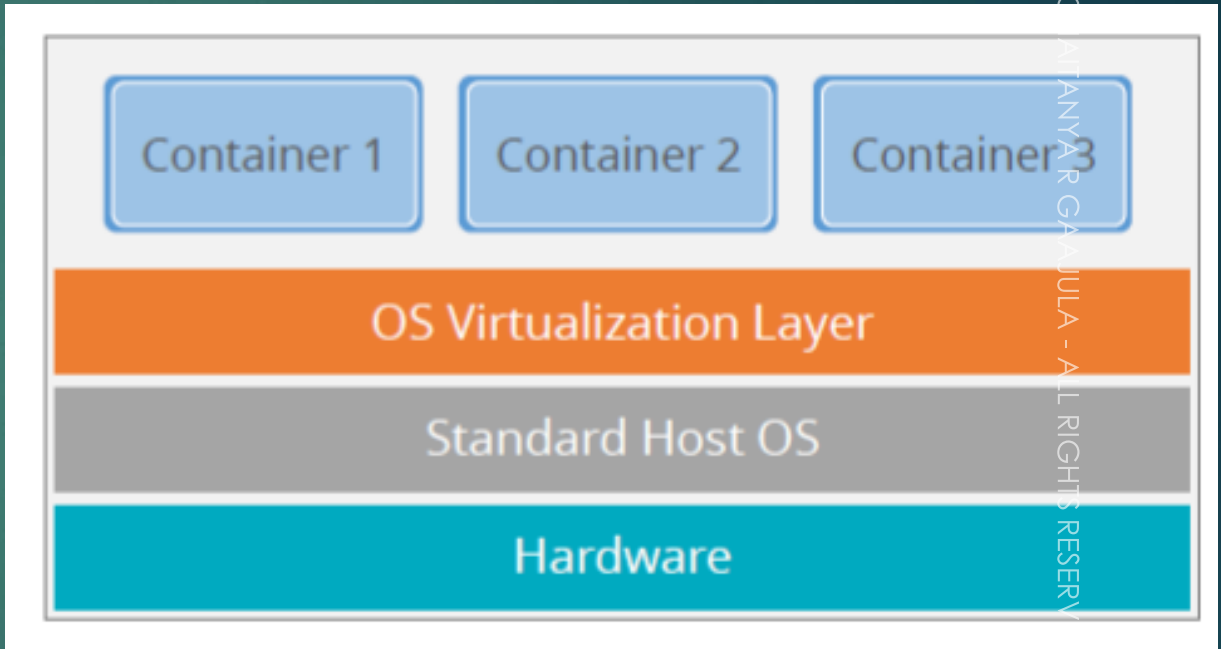
- They require virtual discs which are large files
- Virtual discs are usually broken into 2G chunks for convenience

Virtual Machines are often tens of gigabytes

- They are awkward and slow to copy from USB drives or over the Internet
- There is a need to compress the VM and break the compressed file into chunks for FTP transfers

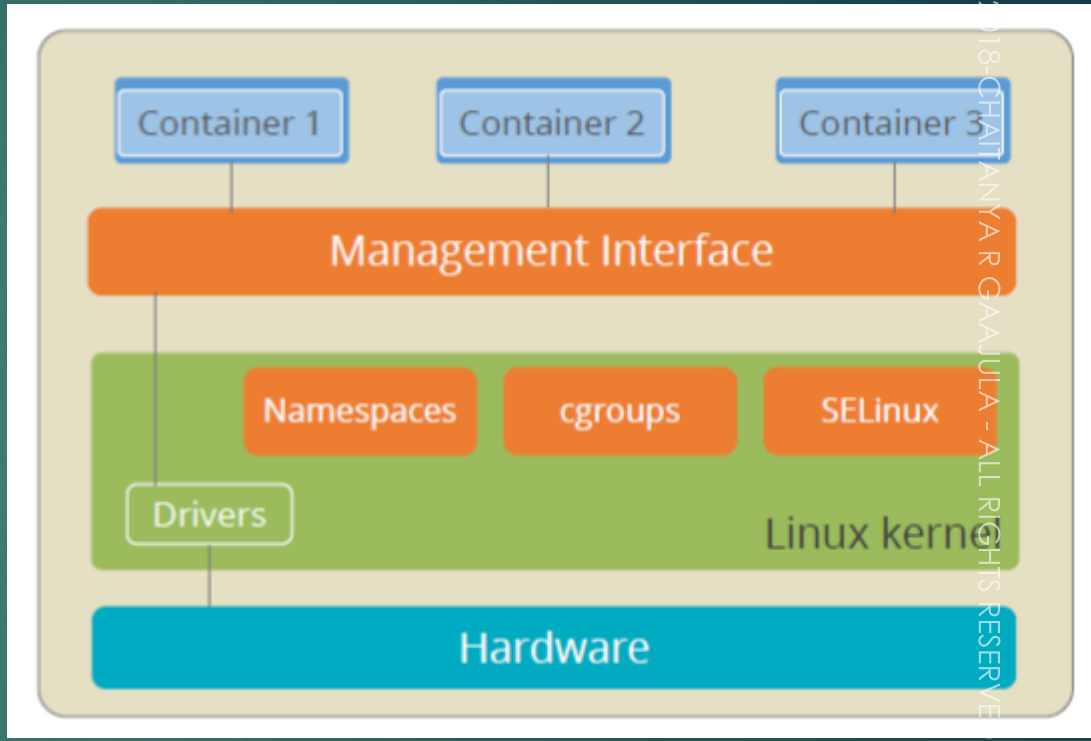
Containers

- Containers are Operating System level Virtualization
- Allows for multiple isolated user spaces
- Share a single Kernel
- Consists of a self contained Linux file system which contains a single application
- Containers are light-weight



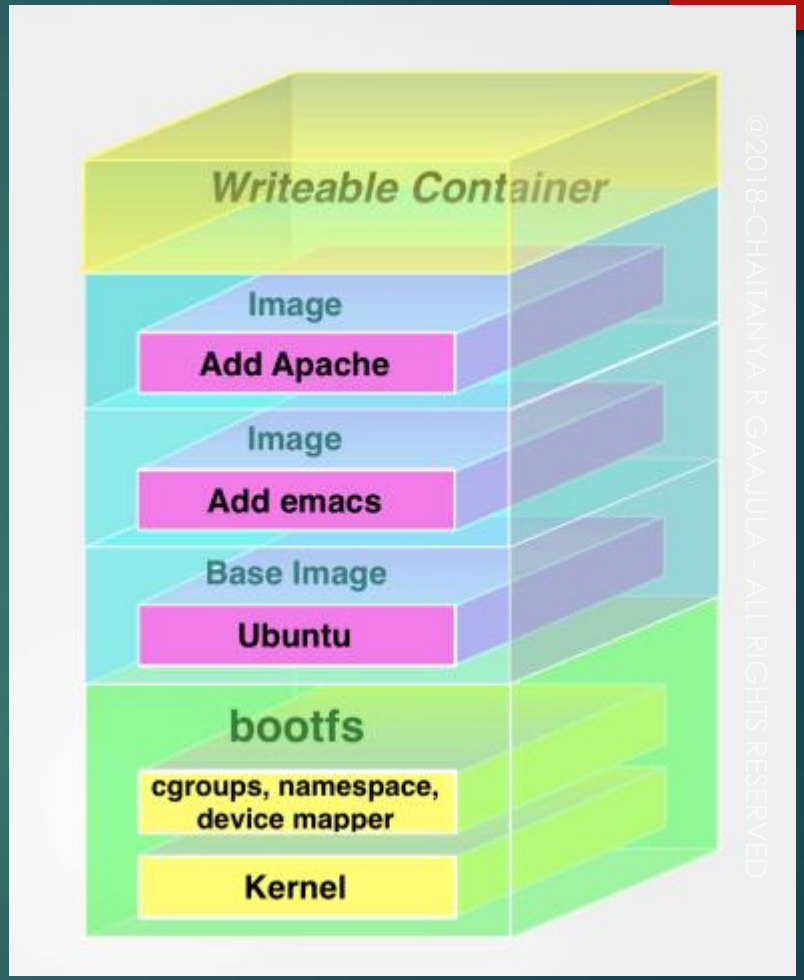
Operating System Virtualization

- Namespaces provide processes with their own view of the system and isolates the processes
- Various Namespaces provided by Linux are pid , mnt,net, uts,ipc and user
- cgroups called as Control Groups is a Linux Kernel feature that allows processes to be organized into groups whose usage of various resources like CPU and Memory can be limited and monitored
- chroot mechanism confines a process and its sub-processes to a restricted area of the file system



Union File System

- Union mount of file systems
- Files and directories of separate file systems are called branches
- A Docker image is made up of filesystems layered over each other (i.e. Branches that is stacked on top of each other) and grouped together.



THANK YOU