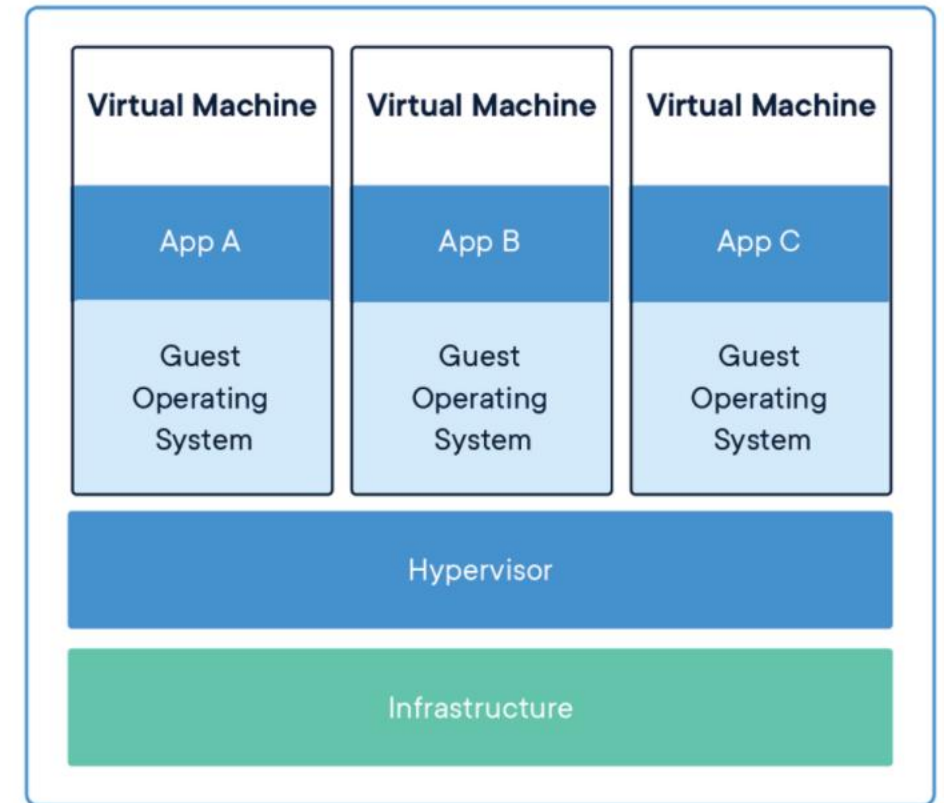# Virtual Machine

Introduction

- Virtual representation of physical computer
- It is a software-based computer.
- Virtualization makes it possible to create multiple virtual machines.
- Virtual machine cannot directly connect with physical computer. Hypervisor is used to do that job.
- Hypervisor allocates physical computing resources to virtual machines

Types of virtual machines

1. **Multi tenant:**
   - Multiple VMs are sharing common physical infrastructure.
   - Cost effective and scalable approach to provisioning VMs
   - It lacks isolation characteristics that organizations with strict security prefer.

2. **Single tenant:**
   - **Dedicated host:** Renting an entire physical machine and maintain sustained access to and control over the machine, hardware, and software.
   - **Dedicated instance:** It is not coupled with a specific physical machine. If a dedicated instance is re-booted, it could wind up on a new physical machine.

Hypervisors

- It is a crucial piece of software that makes virtualization possible.
- It creates a virtualization layer that separates CPU/processors, RAM, and other physical resources from virtual machines you create.
- The machine we install a hypervisor on is called a host machine.
- The virtual machines that run on top of them are called guest virtual machines.
- Hypervisors emulate available resources so that guest machines can use them.
- Two types:
  - Type 1 hypervisor
  - Type 2 hypervisor

Type 1 Hypervisor

- Type 1 hypervisor is a layer of software we install directly on top of physical server and its underlying hardware.
- No software or OS in between.
- These are like OS, on top of which, we can run virtual machines.
- It allows allocation of physical resources.
- With type 1 hypervisors, more resources can be assigned to your virtual machines than available resources.
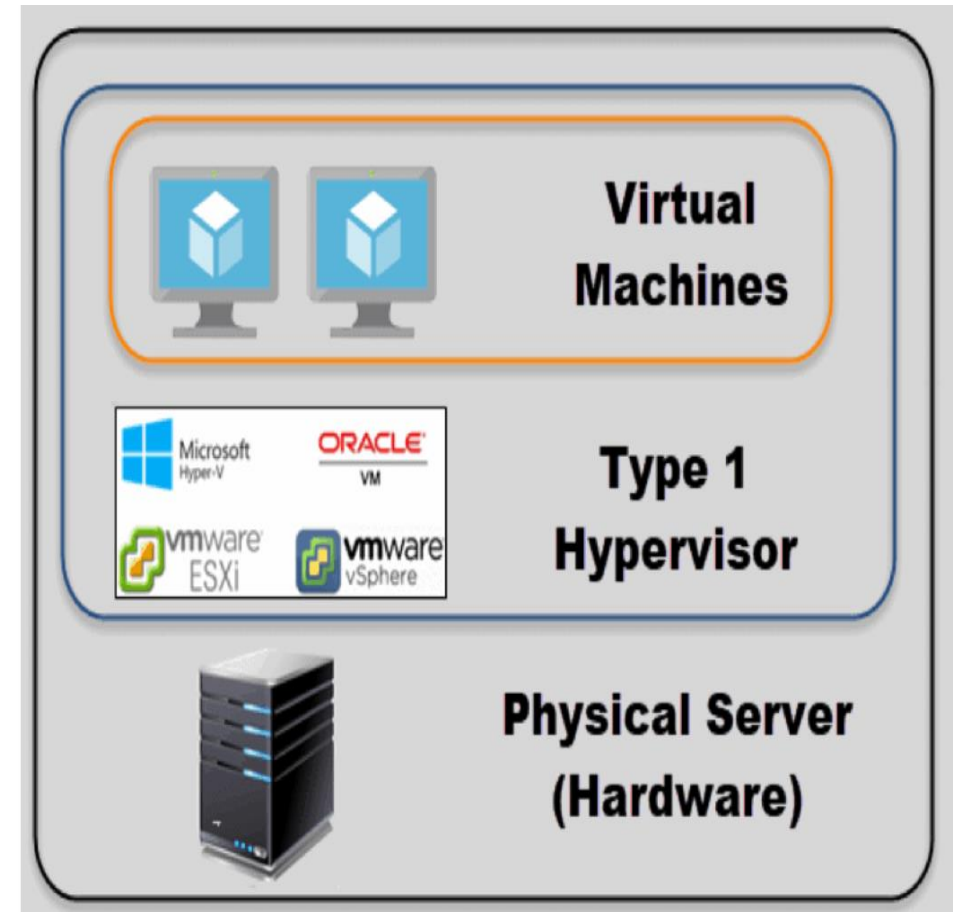
Type 2 Hypervisor

- Type 2 hypervisor runs inside of an OS of a physical host machine.
- Type 2 hypervisor is called hosted hypervisor.
- Unlike type 1 hypervisor, there is a software layer underneath.
- We have
  - A physical machine
  - An OS installed on hardware
  - A type 2 hypervisor software within OS
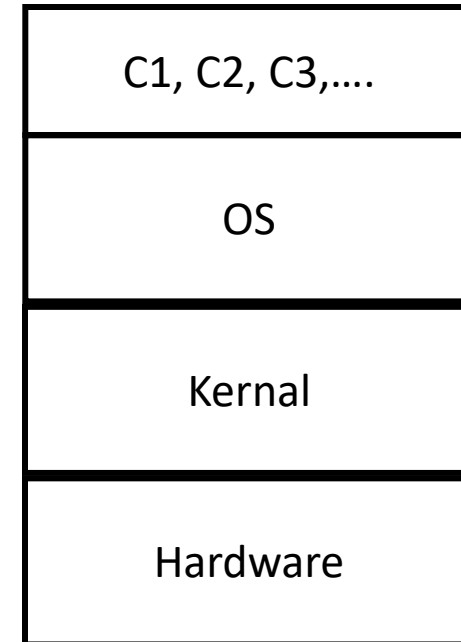 - The actual instances of guest VM
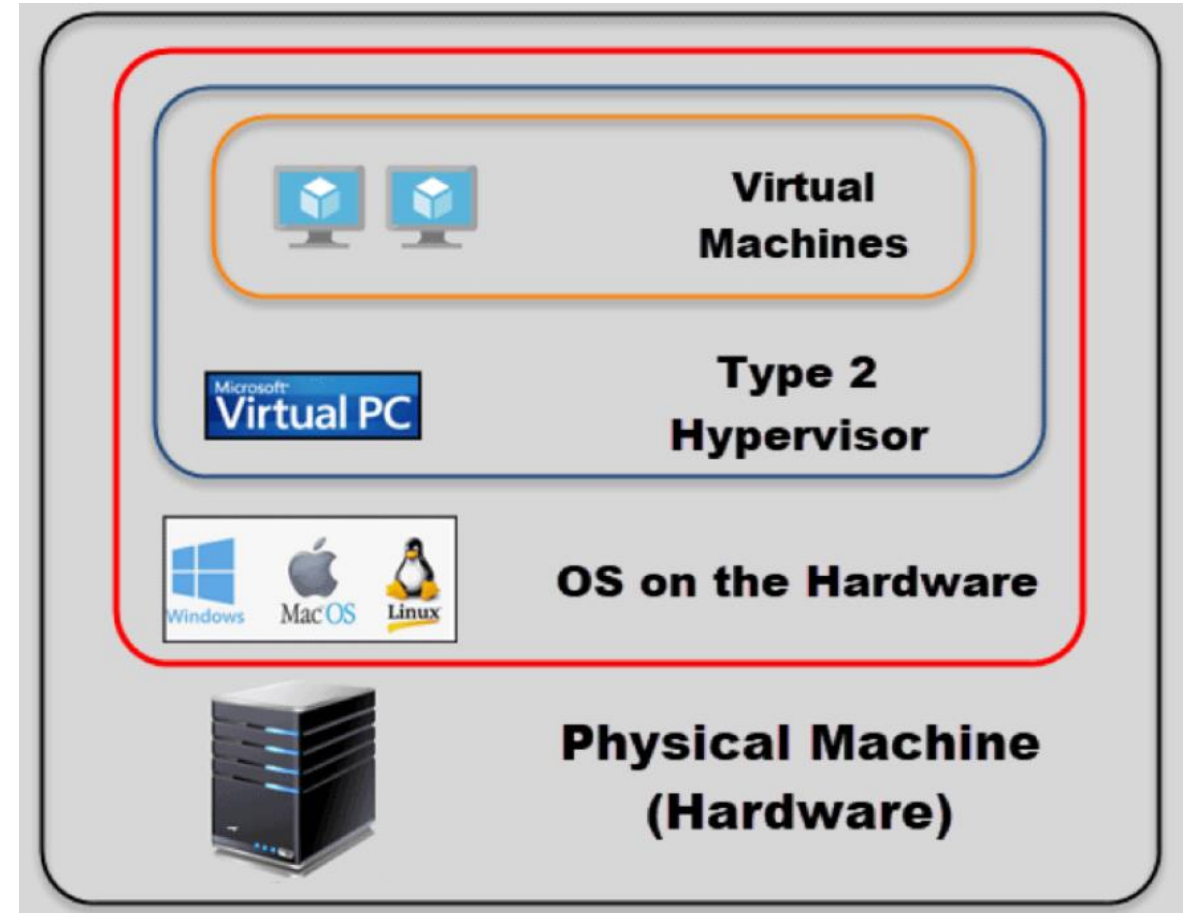
Use cases of virtual machine

- Cloud computing

- Support DevOps

- Test a new OS

- Investigate malware

- Run incompatible software

- Browse securely

Virtual machine and Containers

VM1, VM2, VM3,...
Hypervisor
Hardware

Virtual Machine
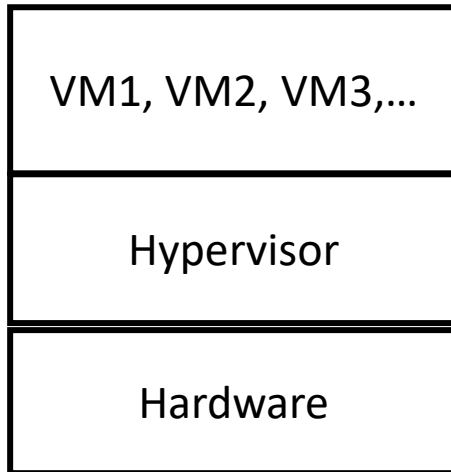
C1, C2, C3,....
OS
Kernal
Hardware

Container

Virtual machine and Containers

Virtual Machine

- Type of isolation: We can achieve isolation of machine.
- Resources are accessed: Type 1 hypervisor is creating different machines out of a server, where the interaction is happening.
- Flexibility: With VM, we have infinite flexibility of our hardware.

Container

- Type of isolation: We can achieve isolation of process.
- Resources are accessed: Kernal is allowing the illusion for processes. Each instance of the container has its own OS.
- Portability: With containers, we have infinite portability. It is also known as docker file (how to build container, how to run container, what libraries are necessary)

Thank You