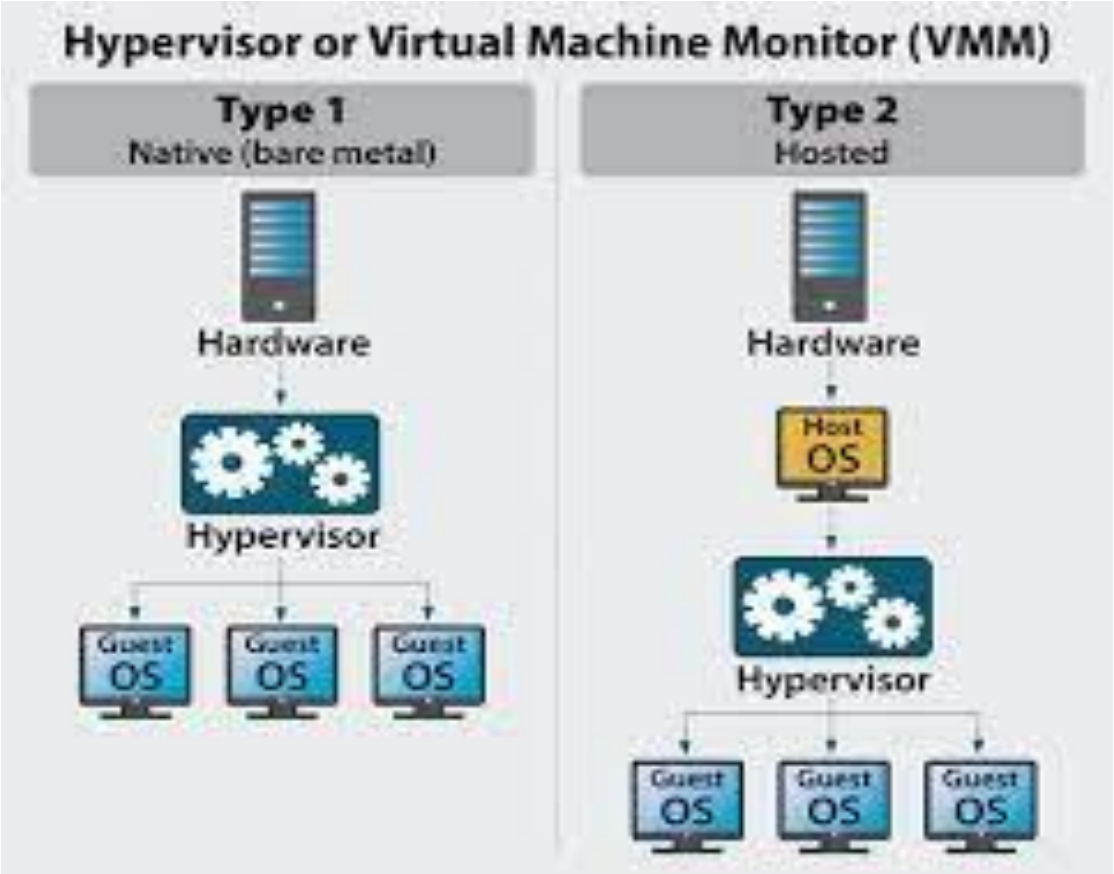
Hypervisor

By: Neelam Singh

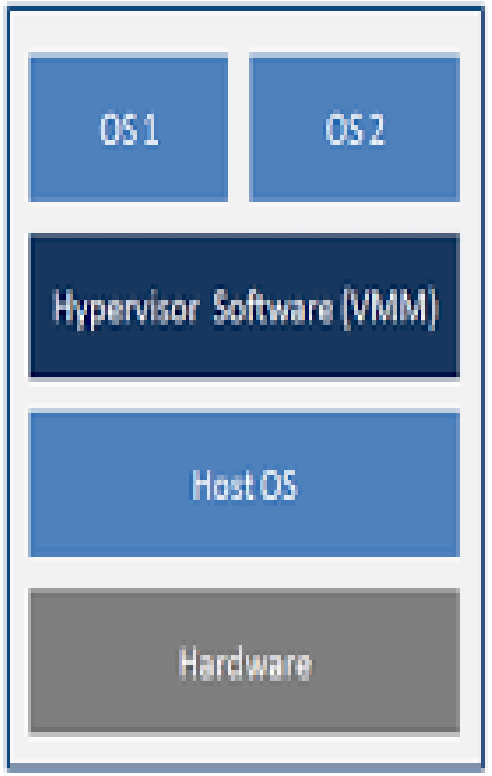
Introduction

- A hypervisor is a form of virtualization software used in Cloud hosting to divide and allocate the resources on various pieces of hardware. The program which provides partitioning, isolation or abstraction is called virtualization hypervisor. The hypervisor is a hardware virtualization technique that allows multiple guest operating systems (OS) to run on a single host system at the same time. A hypervisor is sometimes also called a virtual machine manager(VMM).

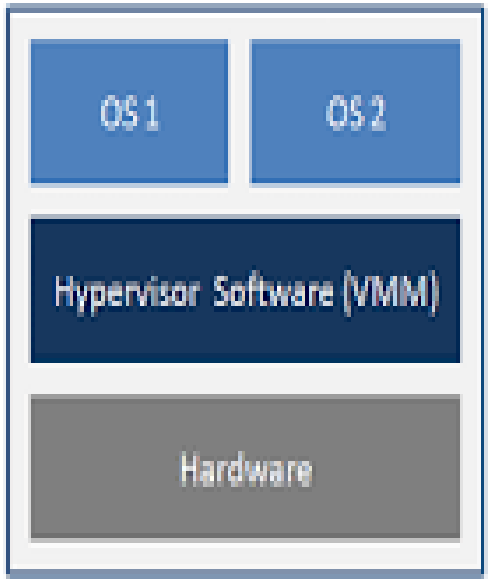


Types of Hypervisor

- There are two main hypervisor types, referred to as "Type 1" (or "bare metal") and "Type 2" (or "hosted"). A **type 1 hypervisor** acts like a lightweight operating system and runs directly on the host's hardware, while a **type 2 hypervisor** runs as a software layer on an operating system, like other computer programs.



Hosted Architecture



Bare-Metal Architecture

TYPE-1 Hypervisor

The hypervisor runs directly on the underlying host system. It is also known as “Native Hypervisor” or “Bare metal hypervisor”. It does not require any base server operating system. It has direct access to hardware resources. Examples of Type 1 hypervisors include VMware ESXi, Citrix XenServer and Microsoft Hyper-V hypervisor.

Pros & Cons of Type-1 Hypervisor:

- **Pros:** Such kind of hypervisors are very efficient because they have direct access to the physical hardware resources(like Cpu, Memory, Network, Physical storage). This causes the empowerment the security because there is nothing any kind of the third party resource so that attacker couldn’t compromise with anything.

- **Cons:** One problem with Type-1 hypervisor is that they usually need a dedicated separate machine to perform its operation and to instruct different VMs and control the host hardware resources.

TYPE-2 Hypervisor

A Host operating system runs on the underlying host system. It is also known as 'Hosted Hypervisor". Such kind of hypervisors doesn't run directly over the underlying hardware rather they run as an application in a Host system(physical machine). Basically, software installed on an operating system. Hypervisor asks the operating system to make hardware calls. Example of Type 2 hypervisor includes VMware Player or Parallels Desktop. Hosted hypervisors are often found on endpoints like PCs. The type-2 hypervisor is are very useful for engineers, security analyst(for checking malware, or malicious source code and newly developed applications).

Pros & Cons of Type-2 Hypervisor:

- **Pros:** Such kind of hypervisors allows quick and easy access to a guest Operating System alongside the host machine running. These hypervisors usually come with additional useful features for guest machine. Such tools enhance the coordination between the host machine and guest machine.

- **Cons:** Here there is no direct access to the physical hardware resources so the efficiency of these hypervisors lags in performance as compared to the type-1 hypervisors, and potential security risks are also there an attacker can compromise the security weakness if there is access to the host operating system so he can also access the guest operating system.

How does a hypervisor work?

Hypervisors support the creation and management of virtual machines (VMs) by abstracting a computer's software from its hardware. Hypervisors make virtualization possible by translating requests between the physical and virtual resources. Bare-metal hypervisors are sometimes embedded into the firmware at the same level as the motherboard basic input/output system (BIOS) to enable the operating system on a computer to access and use virtualization software.

Benefits of hypervisors

There are several benefits to using a hypervisor that hosts multiple virtual machines:

Speed: Hypervisors allow virtual machines to be created instantly, unlike bare-metal servers. This makes it easier to provision resources as needed for dynamic workloads.

Efficiency: Hypervisors that run several virtual machines on one physical machine's resources also allow for more efficient utilization of one physical server. It is more cost- and energy-efficient to run several virtual machines on one physical machine than to run multiple underutilized physical machines for the same task.

Flexibility: Bare-metal hypervisors allow operating systems and their associated applications to run on a variety of hardware types because the hypervisor separates the OS from the underlying hardware, so the software no longer relies on specific hardware devices or drivers.

Portability: Hypervisors allow multiple operating systems to reside on the same physical server (host machine). Because the virtual machines that the hypervisor runs are independent from the physical machine, they are portable. IT teams can shift workloads and allocate networking, memory, storage and processing resources across multiple servers as needed, moving from machine to machine or platform to platform. When an application needs more processing power, the virtualization software allows it to seamlessly access additional machines.