SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT213- IoT SYSTEM ARCHITECTURE

II ECE / IV SEMESTER

UNIT 4 – **Cloud Platforms for IoT**

Virtualization in cloud concepts and cloud Architecture

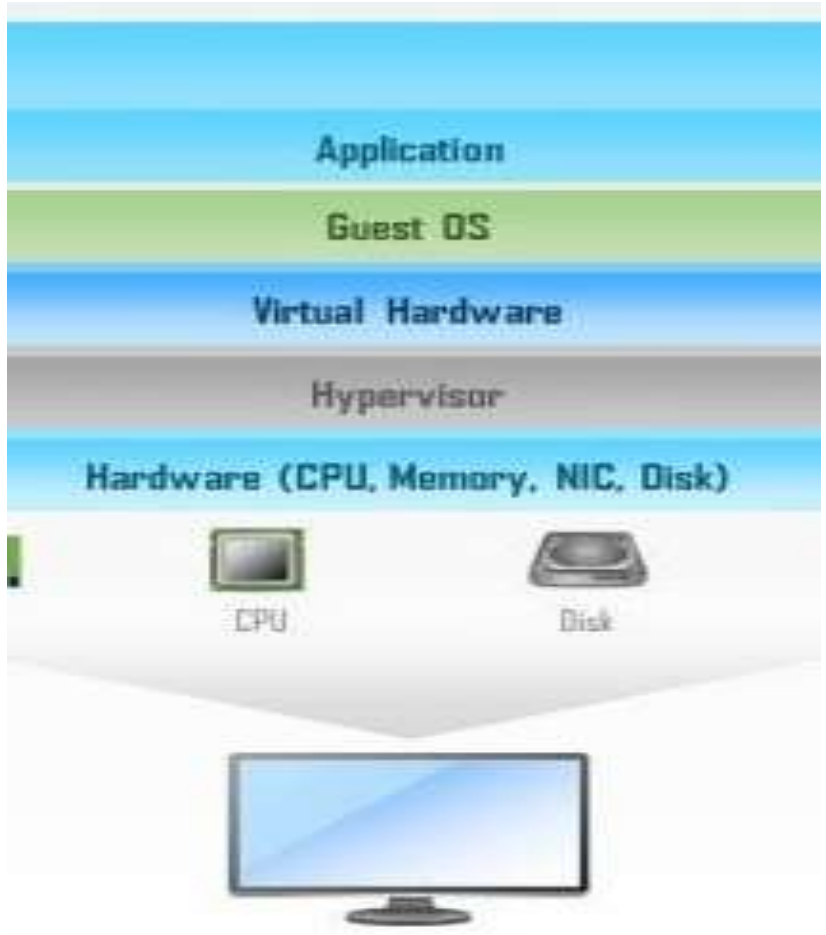
- Virtualization in Cloud Computing is making a virtual platform of server operating system and storage devices. This will help the user by providing multiple machines at the same time it also allows sharing a single physical instance of resource or an application to multiple users. Cloud Virtualizations also manage the workload by transforming traditional computing and make it more scalable, economical and efficient.

- Virtualizations in Cloud Computing rapidly integrating the fundamental way of computing. One of the important features of virtualization is that it allows sharing of applications to multiple customers and companies.

- Cloud Computing can also be known as services and application delivered to help the virtualized environment. This environment can be either public or private. With the help of virtualization, the customer can maximize the resources and reduces the physical system which is in need.

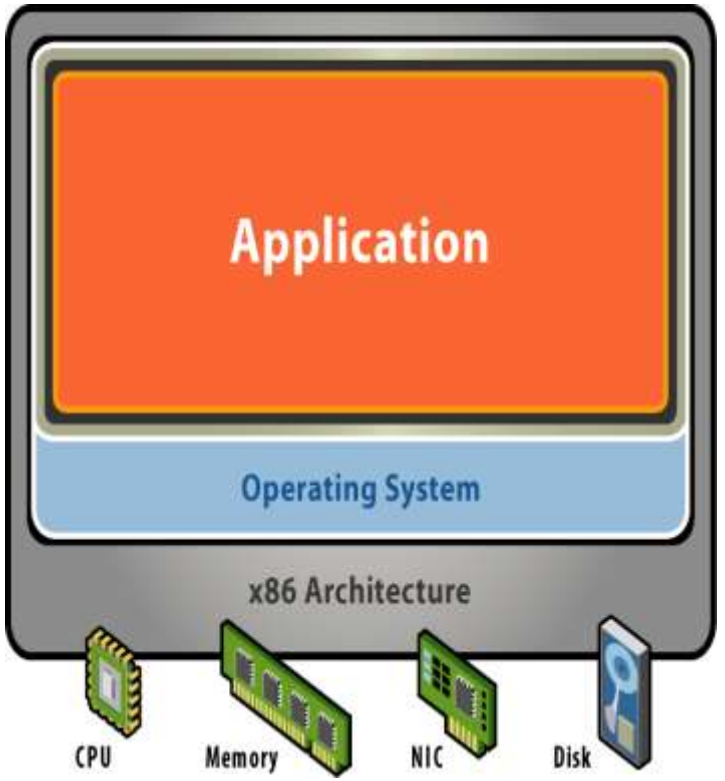
WHAT IS VIRTUALIZATION ?

- Virtualization is a process that allows for more efficient use of physical computer hardware and is the foundation of cloud computing.
- Virtualization uses software to create an abstraction layer over computer hardware, enabling the division of a single computer's hardware components—such as processors, memory and storage—into multiple virtual machines (VMs). Each VM runs its own operating system (OS) and behaves like an independent computer, even though it is running on just a portion of the actual underlying computer hardware.



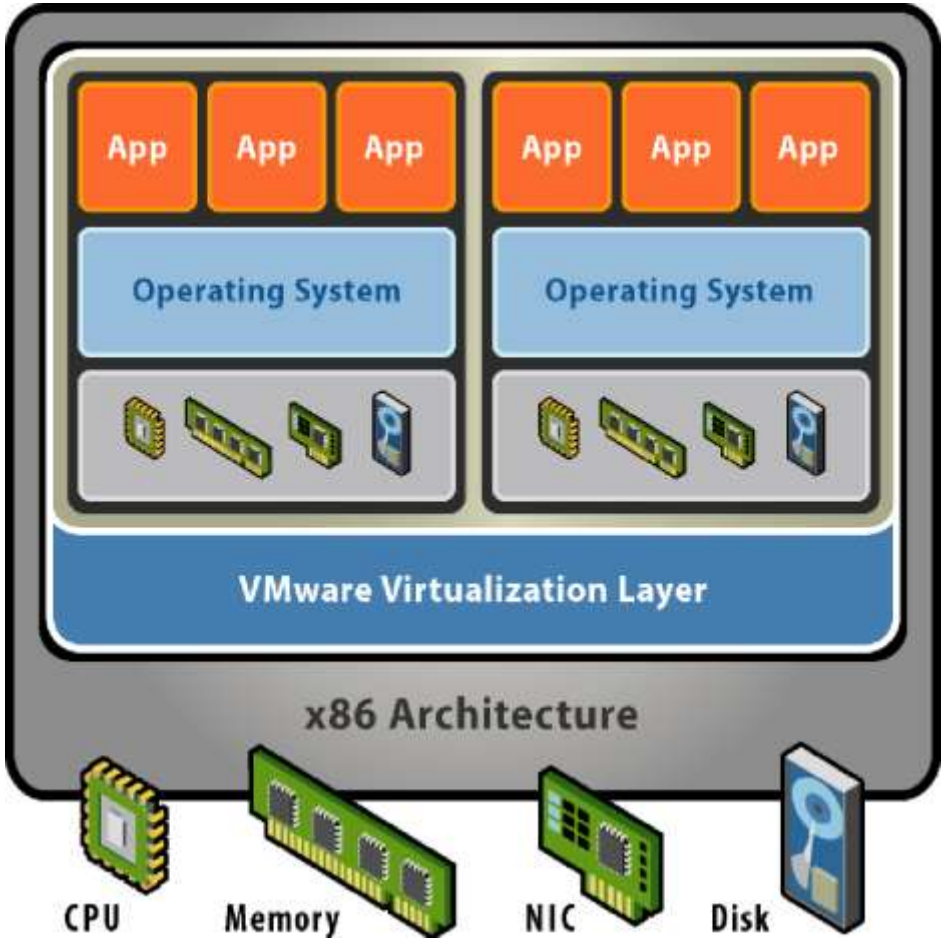
BEFORE VITUALIZATION

- Single OS Image per Machine
- Software and Hardware tightly coupled
- Running Multiple applications at same time often creates conflict
- Inflexible and has a costly infrastructure



AFTER VIRTUALIZATION

- Hardware independence of Operating System and Applications
- Virtual Machines can be provisioned to any system
- Can manage OS and application as a single unit by encapsulating them into virtual Machines
- Flexible and Efficient utilization of resources

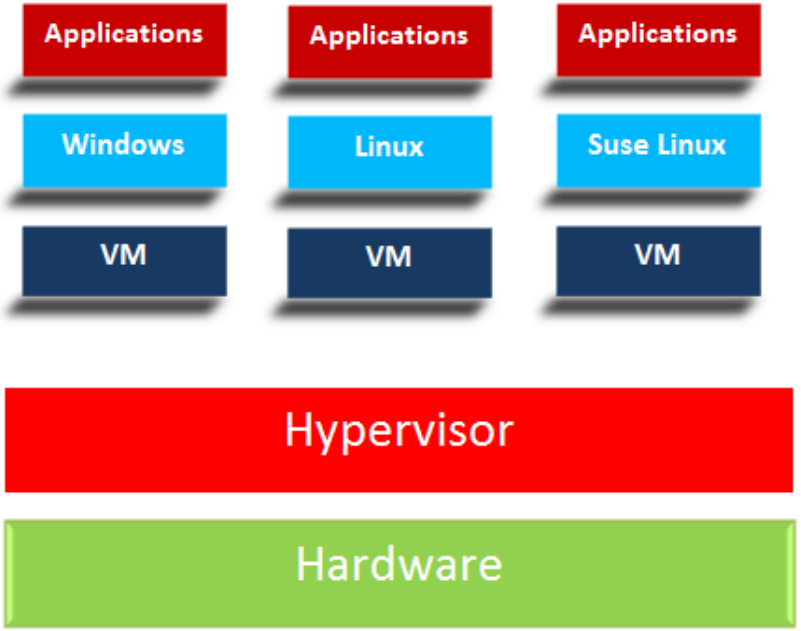


HYPERVISORS

- A hypervisor is the software layer that coordinates VMs.
- It serves as an interface between the VM and the underlying physical hardware, ensuring that each has access to the physical resources it needs to execute.
- It also ensures that the VMs don’t interfere with each other by impinging on each other’s memory space or compute cycles.
- There are two types of hypervisor:
  - Type 1 Hypervisor: Hosted on top of Bare Metal
  - Type 2 Hypervisor: Hosted on top of OS

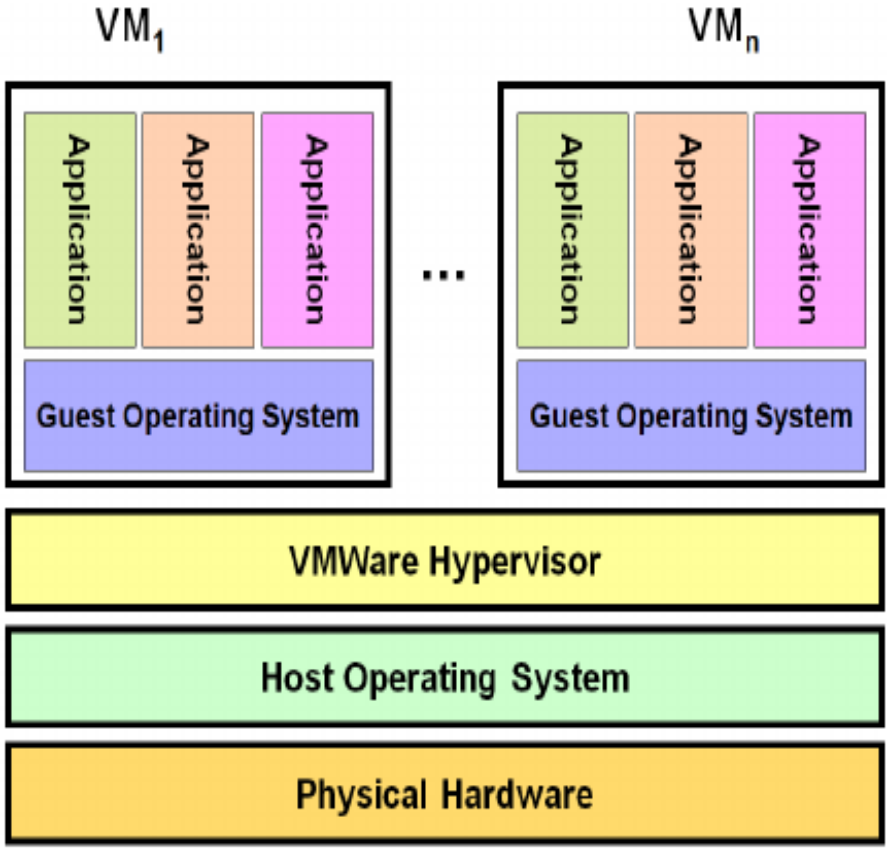
BARE-METAL ARCHITECTURE

- Hypervisor is established directly on top of the Hardware so it has direct access to hardware resources
- Doesn’t require any base OS
- They most commonly appear in virtual server scenarios.



HOSTED ARCHITECTURE

- Has a Host Operating System
- Hypervisor runs on top of OS
- Most commonly used on endpoint devices to run alternative operating systems, they carry a performance overhead because they must use the host OS to access and coordinate the underlying hardware resources.



BENEFITS OF HYPERVISOR

Speed

Hypervisors allow virtual machines to be created instantly

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

Since virtual machines are independent from the physical machine, they are portable.

Types of Virtualization

- Hardware Virtualization
- Software Virtualization
- Memory Virtualization
- Storage Virtualization
- Network Virtualization
- Data Virtualization
- Desktop Virtualization

Types of Virtualization

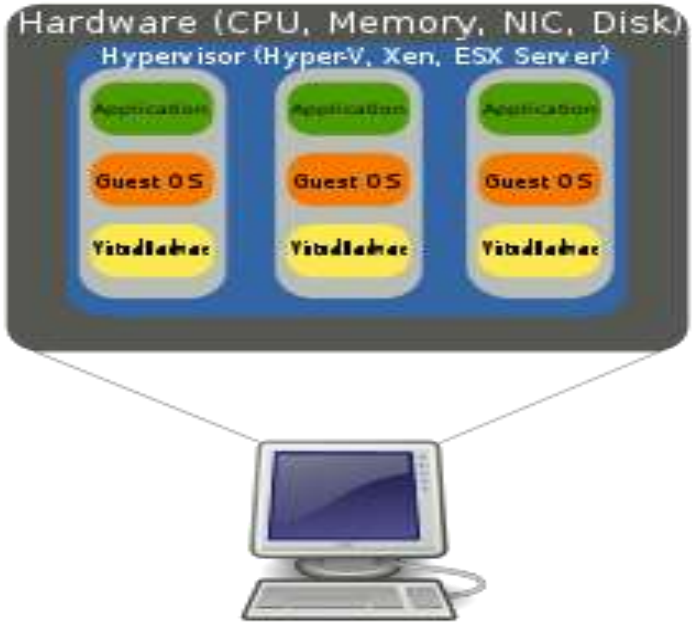
HARDWARE VIRTUALIZATION

Also known as server virtualization

When the virtual machine software or virtual machine manager (VMM) is directly installed on the hardware system is known as hardware virtualization.

The hardware resource allotment is done by the hypervisor.

The main advantages include increased processing power as a result of maximized hardware utilization.



Types of Virtualization

SOFTWARE VIRTUALIZATION

Software Virtualization involves the creation of an operation of multiple virtual environments on the host machine.

It creates a computer system complete with hardware that lets the guest operating system to run.

For example, it lets you run Android OS on a host machine natively using a Microsoft Windows OS, utilizing the same hardware as the host machine does.

Types of Virtualization

STORAGE VIRTUALIZATION

Multiple physical storage devices are grouped together, which then appear as a single storage device.

This provides various advantages such as homogenization of storage across storage devices of multiple capacity and speeds.

Partitioning your hard drive into multiple partitions is an example of virtualization.

Types of Virtualization

NETWORK VIRTUALIZATION

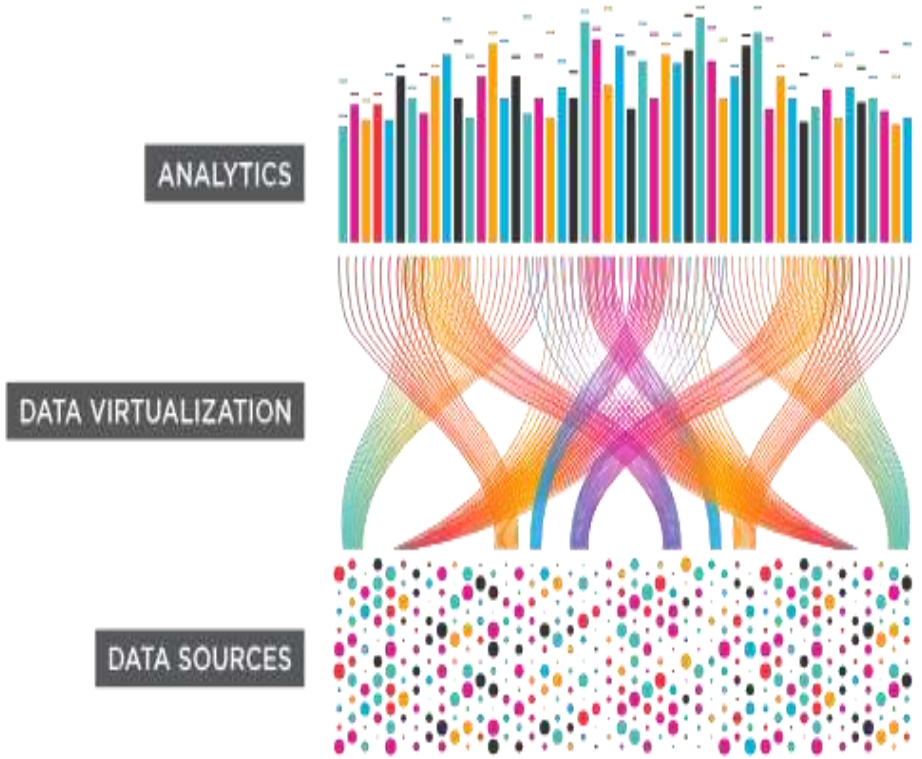
- In network virtualization, multiple sub-networks can be created on the same physical network, which may or may not is authorized to communicate with each other.
- This enables restriction of file movement across networks and enhances security, and allows better monitoring and identification of data usage which lets the network administrator's scale up the network appropriately.
- It also increases reliability as a disruption in one network doesn't affect other networks, and the diagnosis is easier.

Eg: vLAN(Virtual Local Area Network)

Types of Virtualization

DATA VIRTUALIZATION

- It lets you easily manipulate data, as the data is presented as an abstract layer completely independent of data structure and database systems.
- Decreases data input and formatting errors.
- Data virtualization tools create a software layer between the applications accessing the data and the systems storing it.
- The layer translates an application's data request or query as needed and returns results that can span multiple systems.



Types of Virtualization

DESKTOP VIRTUALIZATION

- This is perhaps the most common form of virtualization for any regular IT employee.
- The user's desktop is stored on a remote server, allowing the user to access his desktop from any device or location.
- Employees can work conveniently from the comfort of their home. Since the data transfer takes place over secure protocols, any risk of data theft is minimized