# SEC-302-CLOUD COMPUTING UNIT-3

❖ Virtualization in Cloud Computing:-

Virtualization is the "creation of a virtual (rather than actual) version of something, such as a server, a desktop, a storage device, an operating system or network resources".

In other words, Virtualization is a technique, which allows sharing a single physical instance of a resource or an application among multiple customers and organizations. It does by assigning a logical name to a physical storage and providing a pointer to that physical resource when demanded.

Creation of a virtual machine over existing operating system and hardware is known as Hardware Virtualization. A Virtual machine provides an environment that is logically separated from the underlying hardware. The machine on which the virtual machine is going to create is known as **Host Machine** and that virtual machine is referred as a **Guest Machine.**
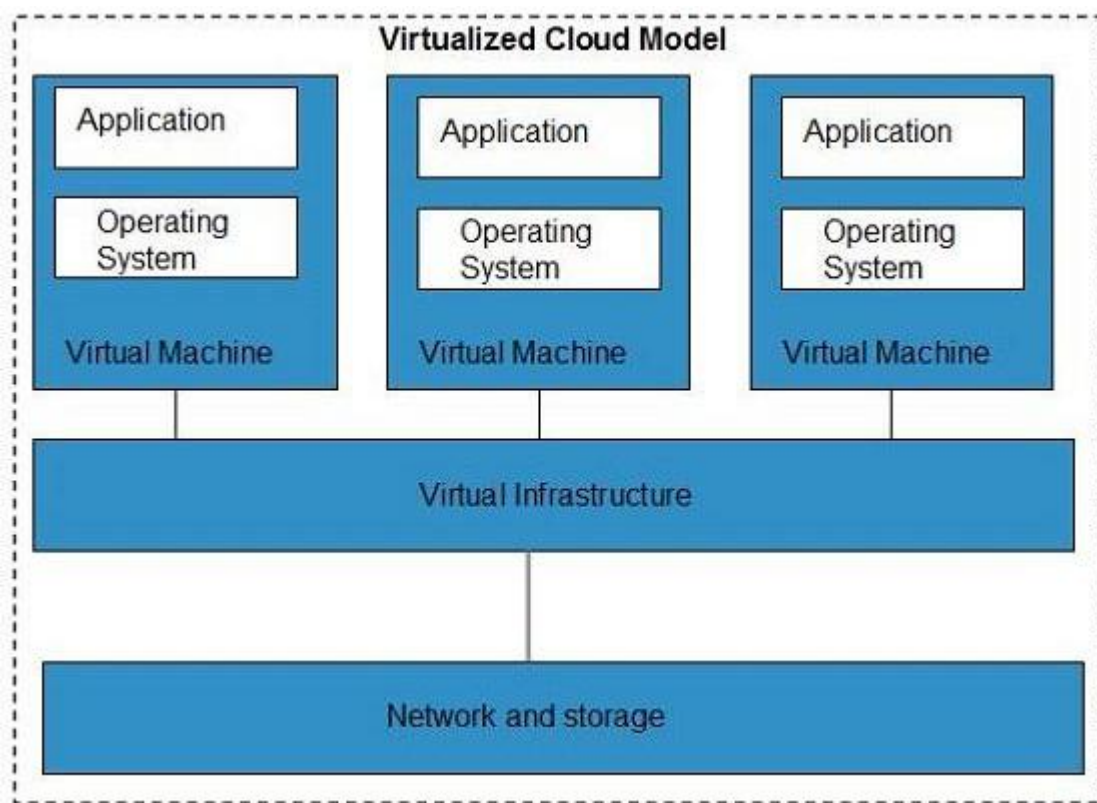
Characteristics of virtualized environments :-

Virtualization has three characteristics that make it ideal for cloud computing:

- **Partitioning:** In virtualization, many applications and operating systems are supported in a single physical system by partitioning (separating) the available resources.

- **Isolation:** Each virtual machine is isolated from its host physical system and other virtualized machines. Because of this isolation, if one virtual-instance crashes, it

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doesn't affect the other virtual machines. In addition, data isn't shared between one virtual container and another.

- **Encapsulation:** A virtual machine can be represented (and even stored) as a single file, so you can identify it easily based on the service it provides. In essence, the encapsulated process could be a business service. This encapsulated virtual machine can be presented to an application as a complete entity. Therefore, encapsulation can protect each application so that it doesn't interfere with another application.

Taxonomy of virtualization techniques :

- Virtualization is mainly used to emulate execution environments, storage and networks
- Execution virtualization is the oldest, most popular
- Two major categories: Process level, System level
- Process level techniques - on top of existing OS which has full control of the hardware
- System level- Directly on hardware and require minimum support from existing OS.

1) Execution Virtualization :-

- Includes all techniques whose aim is to emulate an execution environment that is separate from the one hosting virtualization layer.

2) Machine Reference Model :-

- Virtualizing an execution environment at different levels of the computing stack requires a reference model - Virtualization technique replaces one of the layers and intercept the calls directed towards it.

3) Other types of virtualization :-

- Hardware Virtualization :- Hardware virtualization is also known as hardware-assisted virtualization or server virtualization runs on the concept that an individual independent segment of hardware or a physical server, may be made up of multiple smaller hardware segments or servers, essentially consolidating multiple physical servers into virtual servers that run on a single primary physical server.

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

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- **Memory Virtualization :-** Physical memory across different servers is aggregated into a single virtualized memory pool.

- **Storage Virtualization :-** Multiple physical storage devices are grouped together, which then appear as a single storage device.

- **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.

- **Network Virtualization :-** It lets you easily manipulate data, as the data is presented as an abstract layer 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.

- **Desktop Virtualization :-** The user's desktop is stored on a remote server, allowing the user to access his desktop from any device or location.

❖ Virtualization and cloud computing :-

- **Virtualization** is technology that allows you to create multiple simulated environments or dedicated resources from a single, physical hardware system. Software called a hypervisor connects directly to that hardware and allows you to split 1 system into separate, distinct, and secure environments known as virtual machines (VMs).

- **Cloud computing** is a set of principles and approaches to deliver compute, network, and storage infrastructure resources, services, platforms, and applications to users on-demand across any network. These infrastructure resources, services, and applications are sourced from clouds, which are pools of virtual resources orchestrated by management and automation software so they can be accessed by users on-demand through self-service portals supported by automatic scaling and dynamic resource allocation.

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❖ **Pros and cons of virtualization :-**

❖ **Technology examples :-**

1. VMware: full virtualization :-

In full virtualization primary hardware is replicated and made available to the guest operating system, which executes unaware of such abstraction and no requirements to modify.

Technology of VMware is based on the key concept of Full Virtualization.

Either in desktop environment, with the help of type-II hypervisor, or in server environment, through type-I hypervisor, VMware implements full virtualization.

In both the cases, full virtualization is possible through the direct execution for non-sensitive instructions and binary translation for sensitive instructions or hardware traps, thus enabling the virtualization of architecture like x86.

2. Virtualization Solution:-

Virtualization isn't just for large corporations and enterprises. Although many virtualization solutions are catered toward bigger companies, there are several that also let small businesses simplify their IT and provide employees with anytime, anywhere, any-device-access to resources.

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Whether you're interested in desktop virtualization, workspace virtualization, network virtualization, automating IT tasks or other time- and money-saving virtualization services, some providers make it easier and more affordable for small businesses to do so. Below are five small business-friendly virtualization solutions.

3. End-user (desktop) virtualization:-

In its most strict sense, end-user computing (EUC) refers to computer systems and platforms that help non-programmers create applications.

However, there is a lot more to EUC and its related technology, virtual desktop infrastructure (VDI), which essentially hosts desktop environments on a central server. It is considered a form of desktop virtualization.

Key to the success of an EUC/VDI initiative is bringing the components of the platform to users and managers without requiring systems expertise, allowing a more fluid introduction of new technologies to end users.

Given the scope of roles and responsibilities, any platform that is used to support an initiative should be intuitive, agile, scalable, and manageable.

These features reduce the level of expertise required to keep up with the changing digital workplace.

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