VIRTUALIZATION

Virtualization is technology that you can use to create virtual representations of servers, storage, networks, and other physical machines. Virtual software mimics the functions of physical hardware to run multiple virtual machines simultaneously on a single physical machine.

Why is virtualization important?

By using virtualization, you can interact with any hardware resource with greater flexibility. Physical servers consume electricity, take up storage space, and need maintenance. You are often limited by physical proximity and network design if you want to access them. Virtualization removes all these limitations by abstracting physical hardware functionality into software. You can manage, maintain, and use your hardware infrastructure like an application on the web.

What is virtualization?

To properly understand Kernel-based Virtual Machine (KVM), you first need to understand some basic concepts in *virtualization*. Virtualization is a process that allows a computer to share its hardware resources with multiple digitally separated environments. Each virtualized environment runs within its allocated resources, such as memory, processing power, and storage. With virtualization, organizations can switch between different operating systems on the same server without rebooting.

Virtual machines and hypervisors are two important concepts in virtualization

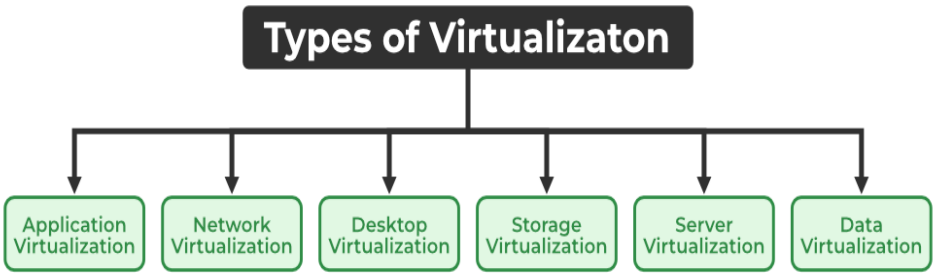
Virtualization and cloud computing

How is virtualization different from cloud computing?

Cloud computing is the on-demand delivery of computing resources over the internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining a physical data center, you can access technology services, such as computing power, storage, and databases, as you need them from a cloud provider.

Virtualization technology makes cloud computing possible. Cloud providers set up and maintain their own data centers. They create different virtual environments that use the underlying hardware resources. You can then program your system to access these cloud resources by using APIs. Your infrastructure needs can be met as a fully managed service.

Types of Virtualization
1.Application Virtualization
2.Network Virtualization
3.Desktop Virtualization
4.Storage Virtualization
5.Server Virtualization
6.Data Virtualization



Application Virtualization: Application virtualization helps a user to have remote access to an application from a server. The server stores all personal information and other characteristics of the application but can still run on a local workstation through the internet. An example of this would be a user who needs to run two different versions of the same software. Technologies that use application virtualization are hosted applications and packaged applications.

Network Virtualization: The ability to run multiple virtual networks with each having a separate control and data plan. It co-exists together on top of one physical network. It can be managed by individual parties that are potentially confidential to each other. Network virtualization provides a facility to create and provision virtual networks, logical switches, routers firewalls, load balancers, Virtual private network (VPN), and workload security within days or even weeks.

Desktop Virtualization: Desktop virtualization allows the users' OS to be remotely stored on a server in the data center. It allows the user to access their desktop virtually, from any location by a different machine. Users who want specific operating systems other than Windows Server will need to have a virtual desktop. The main benefits of desktop virtualization are user mobility, portability, and easy management of software installation, updates, and patches.

Storage Virtualization: Storage virtualization is an array of servers that are managed by a virtual storage system. The servers aren't aware of exactly where their data is stored and instead function more like worker bees in a hive. It makes managing storage from multiple sources be managed and utilized as a single repository. storage virtualization software maintains smooth operations, consistent performance, and a continuous suite.

Server Virtualization: This is a kind of virtualization in which the masking of server resources takes place. Here, the central server (physical server) is divided into multiple different virtual servers by changing the identity number, and processors. So, each system can operate its operating systems in an isolated manner. Where each sub-server knows the identity of the central server. It causes an increase in performance and reduces the operating cost by the deployment of main server resources into a sub-server resource. It's beneficial in virtual migration, reducing energy consumption, reducing infrastructural costs, etc.

Data Virtualization: This is the kind of virtualization in which the data is collected from various sources and managed at a single place without knowing more about the technical information like how data is collected, stored & formatted then arranged that data logically so that its virtual view can be accessed by its interested people and stakeholders, and users through the various cloud services remotely. Many big giant companies are providing their services like Oracle, IBM, At scale, C data, etc.

Virtualization Terminology

- **Virtual machine** refers to an instance of virtual hardware and the operating system that runs on that instance of virtual hardware. A virtual machine could be running any type of software, such as server, client, or desktop. It is often called a virtual computer, guest, domain U, domU, or unprivileged domain.

- **Virtual machine server** or **VM Server** refers to a physical computer running software that hosts, creates, and controls virtual machines. It is sometimes referred to as a host, domain 0, or privileged domain. Much like the concept of Web server, the term VM Server may be used to refer to the computer/software combination or just the software.

- **Fully virtual** refers to a virtual machine mode that completely emulates all hardware devices.

- **Paravirtual** refers to a virtual machine mode that requires the VM's operating system to be aware of the VMM.

- **VT computer** refers to a computer that supports virtualization technology, such as Intel VT or AMD Virtualization. A VT computer is required to run VMs in fully virtual mode.

- **Standard computer** refers to a computer that does not support virtualization technology and cannot run VMs in full virtualization mode.

- **Virtual machine monitor (VMM)** and **hypervisor** refer to the software layer developed and maintained by the Xen open source community that provides VM Server functionality.

- **Para virtualized operating system** refers to an operating system that is capable of running in paravirtual mode. It is also called a vm-aware, Xen-enabled, modified or optimized guest.

- **Native operating system** refers to the typical operating system that is not optimized for the virtual machine environment and must run in full virtualization mode. It cannot run in paravirtual mode. This type of operating system is also called shrink-wrapped, out-of-the-box, unmodified, or fully-virtualized guest.

Hypervisor

A **hypervisor**, also known as a virtual machine monitor or VMM, is software that creates and runs virtual machines (VMs). A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, such as memory and processing.

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 machine

VENDORS

In cloud computing, some amount of software or computing infrastructure is outsourced to a cloud vendor, which offers it as a service and delivers it over the Internet. For instance, cloud-hosted servers are infrastructure-as-a-service (IaaS), and cloud-hosted applications are software-as-a-service (SaaS).