

# VIRTUALIZATION AND CLOUD COMPUTING

Virtualization is a technology that allows multiple virtual environments to run on a single physical hardware system. It creates a virtual version of a resource, such as a server, storage device, network, or even an entire operating system, enabling more efficient use of computing resources. Virtualization improves scalability, flexibility, and resource management by enabling multiple operating systems and applications to share a single physical server, reducing costs and increasing hardware utilization.

Cloud computing is a model that delivers computing services over the internet (the cloud), including servers, storage, databases, networking, software, and analytics. It allows users to access and manage data and applications from anywhere, providing

scalability, flexibility, and cost efficiency. Cloud computing offers services in three main categories:

1. **Infrastructure as a Service (IaaS)** – Virtualized computing resources over the internet.
2. **Platform as a Service (PaaS)** – A platform that allows developers to build, test, and deploy applications.
3. **Software as a Service (SaaS)** – Software applications accessible via the internet.

Aspect	Virtualization	Cloud Computing
Definition	Creating multiple virtual environments on a single physical machine.	Delivering computing services (like storage, software) over the internet.

Core Concept	Divides one physical system into several virtual systems.	Provides scalable resources and services over the internet.
Location	Typically on-premises (within the organization).	Services are accessed remotely, usually from cloud providers.
Resource Management	Focuses on maximizing hardware utilization by sharing resources across virtual machines.	Outsources resource management to cloud providers, who offer flexible scalability.

Control	Full control over physical and virtual resources.	Limited control, as resources are managed by the cloud provider.
Cost	Requires initial investment in hardware and software.	Pay-as-you-go model; no need for upfront hardware investment.
Scalability	Limited by the physical machine's capacity.	Highly scalable; resources can be increased or decreased on demand.

Accessibility	Local access to virtual environments.	Global access via the internet, available from any location.
Examples	Virtual machines (VMware, Hyper-V), virtual servers.	Cloud services (Amazon Web Services, Google Cloud, Microsoft Azure).

