

UNIT - 1

CLOUD COMPUTING

1. Introduction

Cloud services refer to IT resources such as storage, servers, databases, software, and networking that are delivered over the Internet by a cloud computing provider. In simple terms, instead of owning physical hardware or software, organizations can access these resources online on a pay-as-you-go basis.

Cloud computing is a broad concept that includes various models for delivering and managing computing resources. These cloud service models (such as Infrastructure as a Service, Platform as a Service, and Software as a Service) and deployment models (such as Public, Private, Hybrid, and Community Clouds) define how services are provided, managed, and accessed.

Each model represents a different way of organizing and using computing resources, helping businesses operate efficiently, scale easily, and reduce costs.

The Classic Cloud Service Models

The classic category of cloud computing comprises three primary service models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). These models form the foundation of modern cloud computing and differ in terms of control, flexibility, and user management.

Platform as a Service :- Access to hardware and software tools

Software as a Service :- Access to software applications

Infrastructure as a Service :- Access to computing resources

Software as a Service (SaaS)

SaaS is a cloud-based software delivery model that allows users internet. The service provider manages all aspects of the to access applications through a simple web interface over the application, including updates, security, and infrastructure.

Users can work with these applications as if they were installed locally, without having to worry about maintenance or technical details.

Examples: Google Workspace, Microsoft 365, Facebook, Zoom.

Platform as a Service (PaaS)

PaaS provides a cloud environment for developing, testing, deploying, and managing applications. It offers developers a complete platform that includes tools, programming environments, and hosting capabilities- eliminating the need to manage underlying hardware and software infrastructure.

Examples: Microsoft Azure, Google App Engine, Heroku.

Infrastructure as a Service (IaaS)

Infrastructure-as-a-Service (IaaS) delivers computing resources -virtual machines, virtual storage, networks and other hardware components as on-demand services. Instead of buying physical servers and storage, an organisation provisions these virtual resources from a provider and pays for what it uses.

Examples: Amazon EC2, IBM Cloud, DigitalOcean.

1.1 Infrastructure-as-a-Service (PaaS)

Who manages what

Service provider: maintains the physical infrastructure (servers, storage arrays, networking, data-centre facilities) and the virtualization layer that exposes virtual resources.

Client (customer): installs and manages everything above that layer - operating systems, middleware, applications, data and user access

Advantages of IaaS

1. Scalability (on-demand capacity)

IaaS lets organisations increase or decrease computing resources instantly to match demand, avoiding both delays and wasted idle capacity.

Example: An online retailer automatically adds virtual servers during a weekend sale and scales back afterward - handling traffic spikes without overprovisioning.

2. No upfront hardware investment

The cloud provider owns and maintains the physical servers, storage and networking equipment, so clients avoid capital expenditure and the time required to deploy and maintain hardware.

Example: A software startup launches its product without buying servers; it uses provider-hosted VMs and invests its budget in development instead.

3. Utility-style billing (pay only for what you use)

IaaS is billed like a utility: users pay for consumed CPU hours, storage, bandwidth, etc. This converts large capital costs into predictable operating expenses and enables cost control.

Example: Developers run short-term test environments and are billed only for the hours those virtual machines were active.

4. Location independence (access from anywhere)

IaaS services are accessible over the internet (subject to the provider's security controls), so teams can use resources from any location. This supports remote work, distributed teams and global deployments.

Example: A distributed engineering team in three countries accesses the same virtual development environment through secure VPN connections.

5. Strong physical security at provider data centers

Public and externally hosted private clouds benefit from the providers' physical safeguards-controlled entry, cameras environmental controls and security staff which are often more comprehensive than what a single organisation could afford.

Example: A medical research group stores anonymised datasets in a cloud region that meets strict physical and operational security controls required for compliance.

6. Built-in redundancy - not a single point of failure

Cloud platforms are designed with multiple layers of redundancy, If one server, switch or even an entire data centre fails, workloads can fail over to other hardware or locations, reducing service interruption.

Example: A news website continues serving readers because its traffic is automatically routed to other servers when one availability zone experiences an outage.