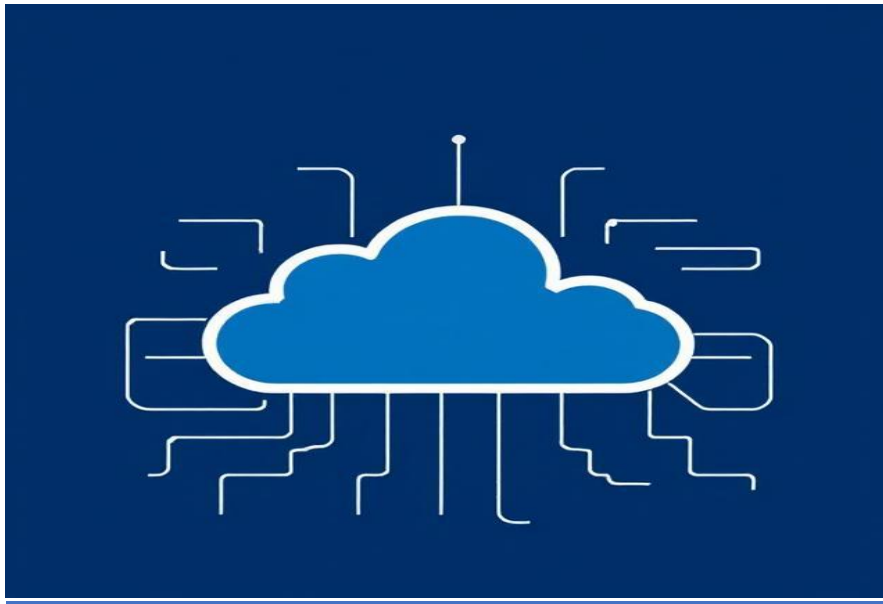


## Week-1: Basics of Cloud Computing | Fundamentals of Azure



Cloud computing has transformed the way businesses operate, offering scalability, flexibility, and cost efficiency. Understanding its fundamentals is crucial before diving into platforms like Azure, AWS, or GCP. Here's a detailed summary of Day-1 of the Fundamentals of Azure course.

### **Introduction to Cloud Computing**

Cloud computing enables businesses to deploy applications and manage infrastructure without maintaining physical servers. Instead of relying on on-premises hardware, organizations can scale resources on demand, reducing operational overhead.

Traditionally, companies had to procure and maintain physical servers with dedicated storage, CPU, and RAM. This required hiring system administrators for managing infrastructure, security patches, and upgrades.

With cloud computing, businesses now rent computing power from cloud providers like Azure, AWS, and Google Cloud. This eliminates hardware costs and enables faster deployments.

The cloud is not just about hosting applications; it also includes networking, security, storage, databases, analytics, and automation.

### **Evolution of Data Centers & Cloud Adoption**

Before cloud services, enterprises relied on private data centers, which required:

- Managing server availability
- Maintaining power supply and cooling systems
- Ensuring physical security and disaster recovery

Cloud platforms emerged to eliminate these complexities and overhead costs, allowing businesses to focus on innovation rather than infrastructure.

Amazon (AWS) pioneered cloud computing, followed by Microsoft Azure and Google Cloud, providing on-demand virtualized computing resources globally.

## Types of Cloud Models

Cloud computing is categorized into three models based on deployment and control:

- Public Cloud – Infrastructure managed by providers like AWS, Azure, or GCP. Organizations rent computing power as needed.
- Private Cloud – Dedicated infrastructure maintained within an organization for strict security and compliance needs.
- Hybrid Cloud – A combination of public and private cloud, allowing businesses to leverage both environments based on requirements.

Example: A financial institution may store customer-sensitive data in a private cloud while utilizing a public cloud for general applications.

## Virtualization & Cloud Infrastructure

Virtualization allows cloud providers to maximize server utilization by dividing a single physical server into multiple virtual machines (VMs) using a hypervisor.

Benefits of Virtualization in Cloud Computing:

- Better resource allocation
- Cost-efficient scaling
- Running multiple OS instances on a single server

Azure Virtual Machines (VMs) are created using hypervisors to provide computing resources based on customer demand, eliminating the need for organizations to install and manage physical infrastructure.

## APIs & Automation in Cloud

One of the key advantages of cloud computing is the ability to automate infrastructure management using APIs and scripts.

Cloud resources can be managed through:

- User Interfaces (UIs) – Azure Portal, AWS Console, GCP Console
- Command Line Interfaces (CLIs) – Azure CLI, AWS CLI
- APIs – Developers can programmatically provision resources

Example: In Azure, you can use Terraform or Azure Resource Manager (ARM) templates to automate deployments.

## Regions, Availability Zones & Load Balancing

Cloud platforms ensure high availability by distributing resources across multiple geographical locations.

- Regions – Azure has data centers worldwide, allowing organizations to deploy applications closer to their users for reduced latency.
- Availability Zones (AZs) – Each region has multiple AZs with independent power, cooling, and networking.

- Load Balancers – Distributes traffic across multiple servers to prevent downtime and improve reliability.

Example: A website hosted in Azure West US can have replicas in Azure East US to ensure continuity in case of an outage.

### **Scalability, Elasticity & High Availability**

Modern cloud applications must be:

- Scalable – Able to handle increasing traffic.
- Elastic – Dynamically adjust resources based on demand.
- Highly Available – Minimize downtime through redundant architecture.

Scalability: Cloud applications auto-scale based on usage. If traffic spikes, Azure automatically provisions additional resources.

Elasticity: Resources shrink or expand dynamically, optimizing cost and performance.

High Availability: Ensures applications stay online even during failures.

Example: During a cricket match or a shopping sale, websites experience a surge in traffic. Cloud platforms autoscale to meet demand, preventing downtime.

### **Disaster Recovery & Business Continuity**

Disaster Recovery (DR) is crucial for cloud environments to prevent data loss and ensure operational continuity.

Cloud platforms offer backup & recovery solutions:

- Storing backups in another region
- Enabling replication across Availability Zones
- Implementing failover strategies

Example: If an Azure SQL Database in Region A fails, automatic failover ensures access from Region B with minimal downtime.

### **Final Thoughts & Key Takeaways**

The first session covered essential cloud concepts, including:

- The shift from on-premises infrastructure to cloud platforms
- The benefits of public, private, and hybrid cloud models
- Virtualization and APIs as the backbone of cloud computing
- Scalability, elasticity, and disaster recovery

Why Cloud Matters?

- Reduced maintenance costs
- Faster deployment and scalability
- High availability and global reach