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AMAZON WEB SERVICES

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CHAPTER-1

Introduction of Cloud Computing and AWS

Introduction to Cloud Computing

- Cloud computing, however, didn't become a main stream reality and a popular term until the first decade of the 21 st century.

- This decade saw the launch of cloud services like Amazon's Elastic Compute(EC2) and Simple Storage Service (S3) in 2006, Heroku in 2007, Google Cloud Platform in 2008,Ali baba Cloud in 2009,Windows Azure (now Microsoft Azure) in 2010, IBM's Smart Cloud in 2011,and Digital Ocean in 2011.

- Some of the cloud based applications are Google's productivity apps (Gmail,Drive,andDocs)and Microsoft 365 (a cloud based version of the Microsoft Office Suite).

- Netflix's streaming services in 2007,the music platform Spotify in 2008,the file-hosting service Dropbox in 2009,the video conferencing service Zoom in 2012,and the communication tool Slack in 2013.

What is Cloud Computing ?

- Cloud security is the set of cybersecurity measures used to protect cloud-based applications, data, and infrastructure. This includes applying security policies, practices, controls etc.to help secure cloud environments against unauthorized access, online attacks, and insider threats.

- Cloud security refers to the cybersecurity policies, best practices, controls, and technologies used to secure applications, data, and infrastructure in cloud environments.

- In particular, cloud security works to provide storage and network protection against internal and external threats, access management, data governance and compliance, and disaster recovery.

Characteristics of cloud computing

- **On-demand self-service**: Cloud resources can be accessed or provisioned without human interaction. With this model, consumers can gain immediate access to cloud services upon signup.
- **Broad network access**: Users can access cloud services and resources through any device and in any networked location provided that they have permission.
- **Rapid elasticity:** Unlike on-premise hardware and software, cloud computing resources can be rapidly increased,decreased,or otherwise modified based on the cloud user's changing needs.
- **Measured service:** Usage of cloud resources is metered so that businesses and other cloud users need only pay for the resources they use in any given billing cycle.

Types of Cloud/ Cloud Environments

Public Cloud: The cloud resources that are owned and operated by a third party cloud service provider are termed as public clouds. It delivers computing resources such as servers,software,and storage over the internet. Ex. Microsoft Azure, Amazon Web Services(AWS), IBM Cloud Services.

•**Private Cloud:** The cloud computing resources that are exclusively used inside a single business or organization are termed as a private cloud. A private cloud may physically be located on the company's on-site data centre or hosted by a third-party service provider. Ex. Ubuntu, VMware, Virtually Managed Clouds.

•**Hybrid Cloud:** It is the combination of public and private clouds, which is bounded together by technology that allows data applications to be shared between them. Hybrid cloud provides flexibility and more deployment options to the business. Ex. Netflix.

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Types of Cloud Service/ Cloud Delivery Mode

- **Infrastructure as a Service (IaaS):**In IaaS,we can rent IT infrastructures like servers and virtual machines(VMs),storage,networks,operating systems from a cloud service vendor. We can create a VM running Windows or Linux and install anything we want on it.Using IaaS,we don't need to care about the hardware or virtualization software, but other than that, we do have to manage everything else. Using IaaS,we get maximum flexibility, but still, we need to put more effort into maintenance. Ex. AWS EC2(Elastic Compute 2),Google Compute Engine.

- **Platform as a Service (PaaS):**This service provides an on demand environment for developing,testing,delivering,and managing software applications. The developer is responsible for the application, and the PaaS vendor provides the ability to deploy and run it.Using PaaS, the flexibility gets reduce, but the management of the environment is taken care of by the cloud vendors. Ex. SAP Cloud, Heroku.

- **Software as a Service (SaaS):**It provides a centrally hosted and managed software services to the end users. It delivers software over the internet, on demand, and typically on a subscription basis.E.g.,Microsoft One Drive,Dropbox,WordPress,Office365,andAmazon Kindle. SaaS is used to minimize the operational cost to the maximum extent.

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Public vs Private Clouds

Feature	Public Cloud	Private Cloud
Ownership	Owned and operated by a third-party provider.	Owned and operated by the organization or a third-party provider exclusively for the organization.
Accessibility	Accessible over the internet to the general public.	Accessible only within a specific organization's network or to authorized users.
Costs	Pay-as-you-go or subscription-based pricing.	Capital expenditure for infrastructure and ongoing operational costs.
Scalability	Easily scalable on-demand to accommodate growth.	Scalability depends on the organization's infrastructure and may require additional investment for expansion.
Security	Security managed by the cloud service provider.	Organization has more control over security measures, but also requires active management.
Resource Sharing	Shared resources with other users/organizations.	Dedicated resources for a single organization, reducing concerns about resource contention.
Compliance	Compliance standards managed by the provider.	Organization has direct control over compliance measures and can enforce specific standards.
Example Providers	AWS, Azure, Google Cloud.	VMware, OpenStack, Microsoft Azure Stack.

What is Virtualization ?

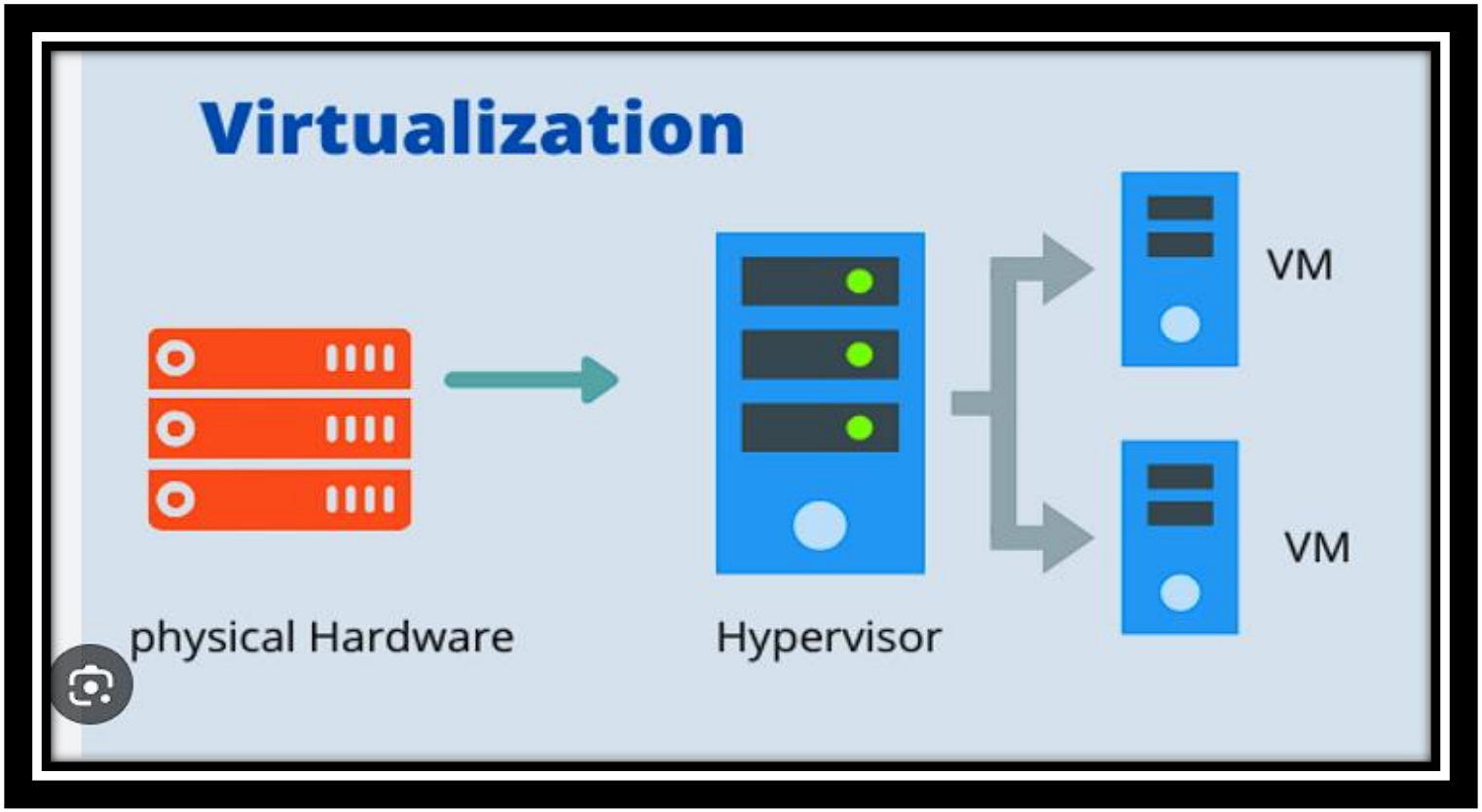
- Virtualization primarily refers to sharing all hardware resources while running several operating systems on a single machine. Cloud computing is built on the virtualization technique, making it possible to use actual computer hardware more effectively.

- Through software, virtualization can divide the hardware components of a single computer, such as its processors, memory, storage, and other components, into several virtual computers, also known as virtual machines (VMs).

What is Virtualization in cloud computing ?

- Virtualization in cloud computing is the process of creating a virtual version of a physical computing resource such as a server, network, storage device, or operating system. It allows one physical computing resource to be split into multiple virtual resources, each of which can be used for different purposes.

- This allows multiple applications and services to be run on the same physical server, which helps to reduce hardware costs and improve scalability.


Virtualization
VM
VM
physical Hardware
Hypervisor

Role of Virtualization in enabling the Cloud

- Cloud computing virtualization, also known as virtualization in cloud computing, is a fundamental technology that has revolutionized how IT resources are provisioned and managed in the cloud environment.

- Virtualization involves the creation of virtual instances or representations of physical resources such as servers, storage devices, and networks, allowing multiple virtual machines (VMs) to run concurrently on a single physical server.

- Virtualization primarily refers to sharing all hardware resources while running several operating systems on a single machine. Additionally, it aids in providing a pool of IT resources that we may share for mutually beneficial business outcomes.

- It allows one physical computing resource to be split into multiple virtual resources, each of which can be used for different purposes.
- This allows multiple applications and services to be run on the same physical server, which helps to reduce hardware costs and improve scalability.
- In cloud computing technology, virtualization plays a very crucial role. Typically, users share the data in the clouds, such as applications, but with virtualization, users share the Infrastructure.

Benefits of Cloud architecture

- **Cost Efficiency:**Pay-as-you-go models and economies of scale can result in cost savings.
- **Scalability:** Easily scale resources up or down based on demand.
- **Flexibility and Agility**:Rapid deployment of applications and services.
- **Accessibility:** Access data and applications from anywhere with an internet connection.
- **Collaboration Efficiency:** Enables collaboration among geographically dispersed teams.

Challenges of Cloud Architecture

- **Security Concerns:** Data breaches, unauthorized access, and compliance issues.
- **Downtime and Reliability:** Service outages and downtime can impact operations.
- **Data Privacy:** Compliance with data protection regulations can be complex.
- **Dependency on Internet Connectivity:** Reliance on internet connectivity for access to cloud services.
- **Cost Management:** Unpredictable costs, especially if resources are not properly monitored.

Amazon Web Services (AWS): Overview & History

Content:

Launched in 2006 as a subsidiary of Amazon.com

Provides **on-demand cloud computing services** and APIs to individuals, companies, and governments.

Started with basic storage (S3) and compute (EC2) services.

Now offers over **200 fully featured services** globally.

Dominates the cloud market with a large customer base including Netflix, NASA, and the US government.

Visual: Timeline from 2006 to present with major service launches (S3, EC2, Lambda, etc.)

AWS Global Infrastructure

Content:

AWS infrastructure is built around **Regions** and **Availability Zones (AZs)**.

33 Regions and **105 AZs** (as of 2024).

Also includes **Edge Locations** for content delivery (CloudFront).

Enables **redundancy, scalability, and low-latency** access worldwide.

Visual: World map showing AWS Regions and AZs

Region and AZ Selection

Title: 1.3 Understanding AWS Region and AZ Selection

Content:

Regions: Geographical areas (e.g., us-east-1, ap-south-1) hosting multiple AZs.

AZs: Isolated locations within a Region with independent power and networking.

Factors for selection:

Latency and proximity to users

Compliance and data residency

Cost optimization

Service availability

Visual: Table comparing 2-3 regions with latency and cost examples

AWS Services

Title: 1.4 Key AWS Services Overview

Content:

Compute: EC2, Lambda, Elastic Beanstalk

Storage: S3, EBS, Glacier

Database: RDS, DynamoDB, Redshift

Networking: VPC, Route 53, CloudFront

Security: IAM, KMS, Shield

DevOps & Monitoring: CloudWatch, CloudTrail, CodeDeploy

Visual: Categorized diagram of AWS services by function

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