



# Introduction to Cloud Computing with AWS

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## Prerequisite for understanding

- Computer Networking
- Virtualization
- Internet Technologies
- Operating system
- Storage system



# Computer Networking

- Computer networking is the practice of connecting and interconnecting multiple computers and devices to facilitate communication and the sharing of resources. It involves the design, implementation, management, and maintenance of networks that enable data transfer and communication between devices.
- Network components - ( Routers, switches, Ethernet cables ), Ip address, LAN, WAN, Security, Protocols etc..
- Understanding computer networking concepts forms the foundation for various technologies and services in cloud computing.



# Virtualization

- Virtualization is a technology that enables the creation of virtual versions of various computing resources, such as servers, operating systems, storage devices, and networks. It allows multiple virtual instances to run simultaneously on a single physical machine, effectively consolidating and maximizing the utilization of resources.
- Virtual Machines , Hypervisor, Server and network virtualization.



# Virtualization

- Imagine you have a powerful computer with lots of resources like processing power, memory, and storage. With virtualization, you can divide that computer into multiple smaller virtual computers, each called a virtual machine (VM). Each virtual machine acts like a separate computer, even though it's actually sharing the resources of the physical computer.
- Virtualization technology makes this possible by creating a layer called a hypervisor that sits between the physical hardware and the virtual machines. The hypervisor manages and controls the virtual machines, allowing them to run different operating systems and applications simultaneously on the same physical computer.



# HyperVisor

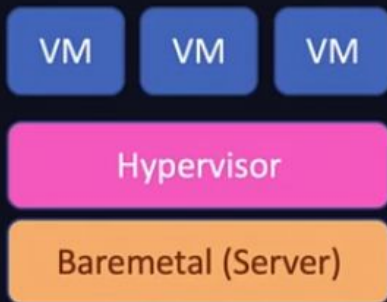
- Hypervisor: The hypervisor, also known as a virtual machine monitor (VMM), is responsible for managing and allocating physical resources to virtual machines. It creates multiple virtual environments on a single physical server and ensures that each VM has its allocated resources such as CPU, memory, and storage.
- Type 1 : Bare Metal - Runs directly to host hardware (VMware esXi, microsoft hyper V etc ..)
- Type 2 : Hosted - runs as application within the OS ( oracle virtual box , Vmware workstation etc ..)

# Virtualization S/W

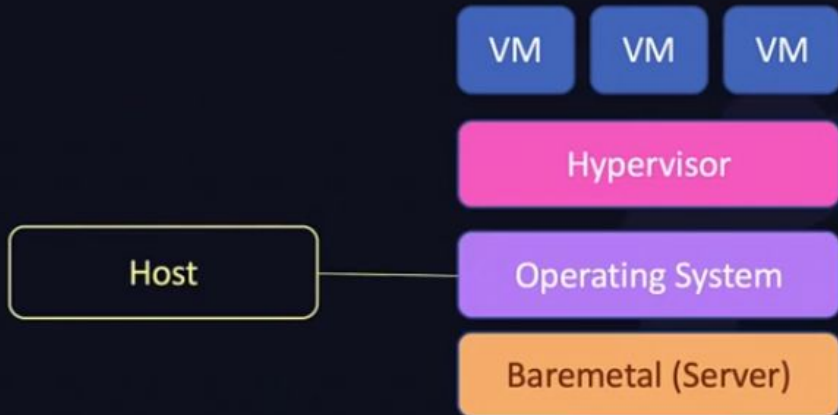
Type 1



Microsoft  
Hyper-v



Type 2





# Internet Technologies

- Internet Technologies: Having a good understanding of internet technologies like web servers, web services, and APIs (Application Programming Interfaces) will help you comprehend the interaction between cloud services and client applications.
- Transmission control Protocol (TCP) / Internet protocol (IP)
- HTTP, HTTPS, SMTP, DNS, SSL, TLS, FTP.
- Web Services and APIs: Web services provide a standardized way for different applications to communicate and exchange data over the internet. Representational State Transfer (REST) and Simple Object Access Protocol (SOAP) are commonly used architectures for building web services. Application Programming Interfaces (APIs) provide sets of rules and protocols that allow different software applications to interact and share data.





# OS

An operating system (OS) is a software program that acts as an intermediary between computer hardware and applications. It manages computer hardware resources, provides essential services to applications, and enables users to interact with the computer system.

- Hardware Abstraction
- Process and Memory Management
- Device Drivers and Input/Output Management
- User Interface
- Security and Protection
- Networking and Communication



# Storage System

**Block Storage:** Block storage operates at the lowest level and treats data as a sequence of fixed-sized blocks. It is suitable for applications that require low-level storage control, such as databases and virtual machine disk images.

**Object Storage:** Object storage organizes data as discrete objects, each having its unique identifier and metadata. Objects can be of any size and contain not only the data but also metadata and custom attributes. This storage technology is ideal for unstructured data, such as files, images, videos, and backups.

**File Systems:** File systems organize and store data in a hierarchical structure of files and directories. They provide a logical view of data and offer file-level access and management. They are suitable for applications that require shared file access, such as collaborative workloads, file sharing, and content management systems.



## What ?

Cloud computing refers to the delivery of computing services over the Internet. It allows users to access and use a wide range of resources, such as virtual machines, storage, databases, and software applications, without the need for on-premises infrastructure.



# Why ?

**Scalability:** Cloud computing allows you to easily scale your computing resources up or down based on your needs. Whether you need additional storage, processing power, or bandwidth, you can quickly adjust your resources without the need for significant upfront investments or infrastructure changes.

**Cost-efficiency:** With cloud computing, you pay for the resources you actually use. There is no need to invest in expensive hardware and infrastructure upfront, which can be a significant cost saving for businesses. Additionally, cloud services often offer flexible pricing models, allowing you to align costs with your usage patterns.



## Why ?

**Accessibility:** Cloud services are accessible from anywhere with an internet connection. This means you can access your applications, data, and services from various devices, including laptops, smartphones, and tablets. It enables remote work, collaboration, and flexibility for businesses and individuals.

**Reliability and availability:** Cloud service providers typically have robust infrastructure with redundant systems and backup mechanisms in place. This ensures high availability and reliability of services, minimizing downtime and ensuring continuity of operations.



# Cloud Computing Models

- **Infrastructure as a Service (IaaS):** IaaS provides the basic building blocks of IT infrastructure, including virtualized computing resources, storage, and networking. With IaaS, users have the highest level of control and responsibility over the infrastructure layer. They can manage and control the operating systems, applications, and data running on the infrastructure.
- **Amazon Web Services (AWS) EC2:** Users can provision virtual machines (EC2 instances) and configure them with desired operating systems, applications, and resources.



# Cloud Computing Models

- **Platform as a Service (PaaS):** PaaS provides a platform for developing, deploying, and managing applications without the complexity of infrastructure management. PaaS abstracts away the underlying infrastructure, allowing users to focus on application development and deployment. The provider takes care of the underlying infrastructure and operating system. Examples of PaaS services include:
  - In Amazon Web Services (AWS), Elastic Beanstalk is an example of a Platform as a Service (PaaS) offering. Elastic Beanstalk abstracts away the underlying infrastructure and provides a managed platform for deploying and managing applications



# Cloud Computing Models

- **Software as a Service (SaaS):** SaaS delivers ready-to-use software applications over the internet. Users can access and use the software without having to worry about installation, maintenance, or infrastructure. The software is centrally hosted and managed by the provider. Examples of SaaS applications include:
- Google Workspace (formerly G Suite): A suite of productivity and collaboration tools including Gmail, Google Docs, Google Sheets, and Google Drive.

In summary, IaaS provides infrastructure components, PaaS offers a development platform, and SaaS delivers complete software applications. These models provide different levels of abstraction and management, allowing users to choose the level of control and responsibility that best suits their needs.





# AWS - Amazon Web Services

AWS stands for Amazon Web Services, it needs no formal introduction, given its immense popularity. The leading cloud provider in the marketplace is Amazon Web Services. AWS provides more than 200 services from data centers located all over the world.

AWS has customers in over 190 countries worldwide, including 5000 ed-tech institutions and 2000 government organizations. Many companies like ESPN, Adobe, Twitter, Netflix, Facebook, BBC, etc., use AWS services.



# History

- In the year 2002 - AWS services were launched
- In the year 2006- AWS cloud products were launched
- In the year 2012 - AWS had its first customer event
- In the year 2015- AWS achieved \$4.6 billion
- In the year 2016- Surpassed the \$10 billion revenue target
- In the year 2016- AWS snowball and AWS snowmobile were launched
- In the year 2019- Released approximately 100 cloud services



# Why AWS,

1. Security: AWS provides a secure and durable platform that provides end-to-end security and storage.
2. Experience: The skills and infrastructure management born from Amazon's many years of experience can be very valuable.
3. Flexibility: It allows users to select the operating systems, language, database, and other services as per their requirements.
4. Easy to use: AWS lets you host your applications quickly and securely, regardless of whether it's an existing or new application.
5. Scalable: The applications you use can be scaled up or down, depending on your requirements.
6. Cost savings: You only pay for the compute power, storage, and other resources that you use, without any long-term commitments.



# Migration

Migration services use 3 different sub-services, DMS, SMS, and snowball to transfer the data physically from Datacenter to AWS.

1. DMS also known as Database Migration Service is used to migrate one database to another.
2. SMS is a Server Migration Service that helps to migrate on-site servers to AWS within a short period of time.
3. Snowball is used to migrate data inside in terabytes to data outside within the AWS environment.

# Services



Compute



Storage



Database



Migration



Networking and  
content delivery



Developer tools



Management Tools



Media Services



Security



Analytics



Machine Learning



Mobile Services



AR and VR



Application Integration



Customer  
Engagement



Business  
Productivity



Desktop and  
app streaming



Internet of  
Things



Game  
Development



# Compute

In the context of information technology (IT), compute refers to the process of performing calculations, executing instructions, or running programs on a computer or computing system. It involves using the processing power and resources of a computer to perform tasks and generate results.

- Processing Instructions
- Running Programs and Applications
- Data Processing

It is a fundamental aspect of IT and is crucial for various applications and domains, from simple calculations to complex computational tasks.



# Compute

Amazon Web Services (AWS) provides a wide range of compute services to cater to different application requirements and workloads.

- Amazon EC2 (Elastic Compute Cloud)
- AWS Lambda
- Amazon ECS (Elastic Container Service)
- Amazon EKS (Elastic Kubernetes Service)
- AWS Fargate
- AWS Batch



# Storage

Storage in the context of cloud services refers to the provision of digital storage space and resources on remote servers that are accessible over the internet. Cloud storage allows individuals and organizations to store and retrieve their data, files, and applications without relying on local physical storage devices like hard drives or servers.

- Scalability:
- Accessibility:
- Reliability and redundancy
- Security
- Cost Effective
- Various Storage options





# Storage

**Amazon S3 (Simple Storage Service):** Amazon S3 is an object storage service that provides secure, durable, and highly scalable storage for objects such as files, images, videos, and backups. It offers high availability, data redundancy, and easy accessibility over the internet. S3 also supports features like versioning, lifecycle management, and event notifications.

**Amazon EBS (Elastic Block Store):** Amazon EBS offers persistent block-level storage volumes for use with EC2 instances. It provides low-latency, reliable, and high-performance storage that can be attached to EC2 instances. EBS volumes are suited for database storage, application hosting, and data warehousing.

**Amazon EFS (Elastic File System):** Amazon EFS provides scalable and fully managed file storage for EC2 instances. It offers a shared file system that can be accessed concurrently by multiple instances, making it suitable for content management, web serving, and big data processing.



# Database

A database in the context of a cloud service refers to a digital system that stores, organizes, and manages structured or unstructured data in a cloud computing environment. It is a central repository where users can securely store and retrieve their data over the internet.

Cloud-based databases offer several advantages over traditional on-premises databases, including scalability, high availability, and ease of management.

**Amazon RDS (Relational Database Service):** Amazon RDS is a managed relational database service that supports popular database engines such as Amazon Aurora, MySQL, MariaDB, PostgreSQL, Oracle Database, and Microsoft SQL Server. It handles routine database tasks such as patching, backups, and scaling, allowing users to focus on their applications.



# Database

**Amazon Aurora:** Amazon Aurora is a high-performance and scalable relational database engine compatible with MySQL and PostgreSQL. It provides enterprise-grade features, automatic scaling, and multi-region replication for high availability and durability.

**Amazon DynamoDB:** Amazon DynamoDB is a fully managed NoSQL database service designed for high scalability and performance. It offers low-latency access to data and automatic scaling based on demand. DynamoDB is suitable for use cases requiring fast and predictable performance at any scale.



# Network and content delivery

**Amazon VPC (Virtual Private Cloud):** Amazon VPC enables users to create isolated virtual networks in the AWS cloud. It provides control over IP addressing, subnets, routing, and network gateways, allowing users to customize their network configuration and securely connect their AWS resources.

**Amazon CloudFront:** Amazon CloudFront is a global content delivery network (CDN) service that helps deliver static and dynamic content to end users with low latency and high data transfer speeds. CloudFront caches content at edge locations around the world, reducing the load on origin servers and improving user experience.



# Network and content delivery

**AWS Transit Gateway:** AWS Transit Gateway simplifies the connectivity and management of multiple Amazon VPCs, on-premises networks, and remote networks. It acts as a hub, providing a centralized gateway for routing network traffic between different networks and enabling consistent network policies and controls.

**AWS VPN (Virtual Private Network):** AWS VPN allows users to establish encrypted site-to-site VPN connections between their on-premises networks and Amazon VPCs. It provides secure connectivity over the internet, enabling organizations to extend their existing networks to AWS and securely access resources in the cloud.

*Thank you*

