5.4 OVERVIEW OF AWS/GCP/AZURE

1. Overview of Amazon Web Services (AWS)

Amazon Web Services (AWS) is the world's **largest and most widely adopted cloud computing platform**. It was launched in **2006 by Amazon** and provides more than **200 fully featured services** covering almost every area of Information Technology. AWS helps organizations reduce costs, become more agile, and innovate faster by providing on-demand cloud resources such as **computing power, storage, databases, networking, artificial intelligence, security, and analytics**.

Global Presence

- AWS has the **largest global market share (~33%)** in cloud computing.
- It operates in **26+ regions** worldwide, and each region contains multiple **Availability Zones (AZs)**.
- This large infrastructure ensures **high availability, fault tolerance, and low latency**.

Pricing Model

AWS follows a **Pay-as-you-go pricing model**. This means customers only pay for the services they use, with no upfront investment.

- Similar to electricity or water bills, charges depend on usage.
- AWS also offers **Reserved Instances** and **Savings Plans** for long-term cost savings.

Works:

- **Global Infrastructure:**

AWS operates a network of globally distributed data centers, enabling users to deploy applications and services wherever they need them.

- **On-Demand Services:**

Users can access a wide range of IT resources, such as virtual servers (EC2), storage (S3), and managed databases (RDS), over the internet.

- **Scalability:**

Resources can be instantly scaled up or down to meet fluctuating demand, providing flexibility for businesses of all sizes.

- **Managed Services:**

AWS handles many infrastructure responsibilities, including server maintenance, security patching, and backups, allowing customers to focus on their core business.

- **Pay-as-you-go Model:**

Customers are billed for the services they use, transforming capital IT expenses into variable operational costs.

Services of AWS

AWS offers a wide variety of services. Some of the most important include:

1. **Compute Services**
    - **EC2 (Elastic Compute Cloud):** Provides virtual machines that can be scaled up or down as required.
    - **Lambda:** A serverless compute service that allows you to run code without managing servers.
2. **Storage Services**
    - **S3 (Simple Storage Service):** Object storage for files, documents, videos, and backups.
    - **EBS (Elastic Block Store):** Block storage for EC2 (Elastic Compute Cloud allows you to **launch and manage virtual machines (called instances)** on AWS) instances. **Elasticity**: You can **increase or decrease compute capacity** as needed—hence "Elastic.
    - **Glacier:** Low-cost archival storage for backups.
3. **Database Services**
    - **RDS (Relational Database Service):** Managed databases like MySQL, PostgreSQL, and Oracle.
    - **DynamoDB:** A fully managed NoSQL database. It stores data in **key-value and document formats**. AWS handles **scaling, backups, patching, and maintenance**, so you don't have to manage servers.
4. **Networking Services**

- **VPC (Virtual Private Cloud):** Allows you to create isolated cloud networks.
- **CloudFront:** A global Content Delivery Network (CDN) for fast content delivery.

5. **Other Services**
   - **AI/ML:** Tools like SageMaker for machine learning. AWS provides **ready-made tools to build AI and ML applications** efficiently.
   - **Analytics:** Services like Redshift and Athena for analyzing big data.
   - **Security:** Identity and Access Management (IAM) for secure user access.

Advantages of AWS

- **Scalability:** Resources can be increased or decreased depending on demand.
- **Global Reach:** Data centers around the world ensure faster services. Businesses can provision and deploy resources in minutes, enabling faster development and innovation cycles.
- **Wide Range of Services:** AWS has the **largest service portfolio** among cloud providers.
- **Reliability and Security:** AWS offers a secure, reliable, and highly available platform for data and applications.

Disadvantages of AWS

- **Cost Management:** Some services can be expensive for long-term heavy workloads.
- **Complexity:** Beginners may find it difficult because there are so many options and choices of services.
- **Customization Limitations:** You can **use and configure** the service, but you **can't modify the internal workings** of the service.
- **Support Costs:** Premium support is costly for enterprises.

Use Cases of AWS

AWS is used across industries for various purposes:

- Hosting websites and enterprise applications.
- Data backup, disaster recovery, and archiving.
- Cloud migration for multinational companies.

- Running AI/ML workloads and big data analytics.
- Content delivery for streaming and e-commerce websites.

2. **Overview of Google Cloud Platform (GCP)**

Google Cloud Platform (GCP) was launched in **2008** by Google. It is best known for its **strength in data analytics, AI/ML, and containerization (Kubernetes)**.

GCP is widely used by **startups, gaming companies, and data-driven organizations** because of its strong tools like **BigQuery** and **Google Kubernetes Engine (GKE)**.

It offers flexible pricing with **per-second billing**, **sustained use discounts**, and **committed use discounts**.

works:

1. **Access:** Users access GCP services over the internet through a web-based console.
2. **Projects:** Resources are organized within a project, which includes settings for billing, authentication, and monitoring.
3. **Infrastructure:** Services run on Google's global network of data centers, which are grouped into regions and zones for redundancy and performance.
4. **Applications:** Businesses can build, deploy, and host applications, store data, and analyze workloads on this secure, scalable infrastructure.

Key Services of GCP

- **Compute Engine:** Provides scalable virtual machines.
- **Google Kubernetes Engine (GKE):** Lets you run containers easily with managed Kubernetes.
- **BigQuery:** A fast and powerful platform for analyzing data.
- **Cloud Storage:** Secure and highly scalable storage for files and data.
- **Vertex AI:** A complete platform for building and deploying AI and ML models.

Advantages of GCP

- **AI and Analytics:** GCP has some of the best tools for AI, machine learning, and big data.
- **Scaling:** Resources automatically increase when demand goes up.
- **Global Network:** Offers fast and secure connections all over the world.
- **Strong Security:** Uses advanced encryption and meets compliance standards.

Disadvantages of GCP

- **Pricing Complexity:** Billing and discounts can be confusing for new users.
- **Too Many Services:** Beginners may feel overwhelmed by so many options and may not know which service to use.
- **Vendor Lock-in:** Once you use GCP services, it can be hard and expensive to move to another cloud provider because each provider works differently.

Use Cases of GCP

- GCP can be used to **run big online games**.
- It helps in **setting up virtual computers on the cloud**.
- You can **analyze large amounts of data using BigQuery**.
- It is useful for **building apps that use AI and machine learning**.

3**. Overview of Microsoft Azure**

Microsoft Azure, launched in **2010**, is the **second-largest cloud provider** and integrates seamlessly with Microsoft's ecosystem, making it a popular choice for enterprises. Azure provides **200+ services**, spanning computing, storage, AI, networking, DevOps, and hybrid cloud solutions.

Azure is particularly strong in **hybrid cloud computing**, enabling businesses to combine on-premises infrastructure with cloud services. It offers flexibility, cost-effectiveness, and integration with Microsoft products such as **Windows Server, SQL Server, Office 365, and Active Directory**.

Working of Azure:

- **Application Development & Hosting:** Create and run apps that can grow easily, using virtual computers, containers, or serverless tools.

- **Data & Analytics:** Store and analyze data, use data warehouses, and get insights with machine learning and business tools.
- **AI & Machine Learning:** Add smart features to apps like voice recognition, image analysis, and predictions.
- **Networking & Security:** Set up safe and fast networks for your apps and data.
- **DevOps:** Use tools that make building, testing, and updating software faster and easier.

Choosing a Cloud Provider:

Choosing between AWS, Azure, and GCP depends on your **business needs**. Here are some important points to consider:

1. **Service Offerings:** Make sure the provider has the services you need.
2. **Scalability:** Can the provider grow with your business needs?
3. **Performance and Reliability:** Check uptime and how often services go down.
4. **Security:** Look for encryption, compliance, and monitoring tools.
5. **Cost:** Compare pay-as-you-go or reserved pricing options.
6. **Support and SLA:** Make sure customer support is good and uptime is guaranteed.
7. **Geographic Presence:** Check where the provider's data centers are located.
8. **Integration and Compatibility:** See if it works with your existing tools and systems.
9. **Vendor Lock-In:** Check how easy it is to switch providers later.
10. **Innovation Roadmap:** Look for providers who invest in new technologies.

Pricing Models:

- **AWS:** Pay only for what you use (**pay-as-you-go**), or save money with **reserved instances** and **savings plans**.
- **Azure:** Pay-as-you-go, or use **reserved instances**; Microsoft users can get extra discounts with **Azure Hybrid Benefit**.
- **GCP:** Pay-as-you-go, **per-second billing**, and get discounts with **sustained use** or **committed use plans**.

Comparison of AWS, GCP, and Azure

Feature / Aspect	**Amazon Web Services (AWS)**	**Google Cloud Platform (GCP)**	**Microsoft Azure**
Launched	2006	2008	2010
Market Share (approx.)	~33% (largest)	~10%	~22%
Global Regions	26+ regions, 84+ AZs	35+ regions	60+ regions
Strength / Focus	Scalability, global reach, broadest set of services	AI, ML, big data, containerization	Hybrid cloud, enterprise integration with Microsoft products
Core Compute Service	EC2 (Elastic Compute Cloud)	Compute Engine	Azure Virtual Machines
Core Storage Service	S3 (Simple Storage Service)	Google Cloud Storage	Azure Blob Storage
Database Services	RDS, DynamoDB, Aurora	Bigtable, Firestore, Spanner	Azure SQL Database, Cosmos DB
AI/ML Services	SageMaker, Rekognition	Vertex AI, TensorFlow support	Azure AI, Cognitive Services
Serverless Computing	AWS Lambda	Cloud Functions	Azure Functions
Networking	VPC, Route 53, CloudFront	VPC, Cloud CDN, Cloud Interconnect	Virtual Network, Load Balancer
Pricing Model	Pay-as-you-go, Reserved Instances, Savings Plans	Pay-as-you-go, Per-second billing, Sustained/Committed discounts	Pay-as-you-go, Reserved, Azure Hybrid Benefit

Feature / Aspect	**Amazon Web Services (AWS)**	**Google Cloud Platform (GCP)**	**Microsoft Azure**
Security	IAM, Key Management, GuardDuty	Identity & Access Management, Encryption by default	Active Directory integration, Security Center
Advantages	- Largest service portfolio - Strong global presence - Wide developer ecosystem	- Best in AI/ML and big data - Strong Kubernetes support - Competitive pricing	- Best hybrid cloud support - Tight integration with Microsoft products - Enterprise-grade security
Disadvantages	- Complex for beginners - Some services costly - Limited customization in few areas	- Smaller market share - Service variety less than AWS - Ecosystem tied to Google	- Expensive for some workloads - Microsoft dependency - Slightly weaker Linux support
Use Cases	- Web/app hosting - Backup & recovery - Load balancing - Enterprise migration	- Big data analytics (BigQuery) - AI/ML apps - Gaming infrastructure - Virtual desktops	- Hosting enterprise apps - Machine Learning models - Blockchain apps - Hybrid cloud deployments
Best For	Businesses needing scale, variety, and global reach	Data-driven companies, AI/ML-focused workloads	Enterprises already using Microsoft ecosystem