Cloud Computing & AWS Overview

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1. What is Cloud Computing?

Cloud Computing **= On-demand delivery of IT resources (servers, storage, databases, networking, software)** over the internet, with **pay-as-you-go pricing**.

Benefits:

- Scalability (grow/shrink resources easily)
- Cost efficiency (no upfront hardware)
- Reliability (global data centers)
- Security (built-in controls, compliance)
- Flexibility (many services on-demand)

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2. Cloud Deployment Models

- **Public Cloud** → Resources hosted by providers (AWS, Azure, GCP).
- **Private Cloud** → Used by one organization (on-premises or hosted).
- **Hybrid Cloud** → Combination of on-prem + cloud.
- **Multi-Cloud** → Using services from multiple cloud providers.

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3. Key Cloud Concepts

- **Elasticity** – Scale up/down resources automatically.
- **High Availability (HA)** – Keep apps running with minimal downtime.
- **Fault Tolerance** – System continues working despite failures.
- **Disaster Recovery** – Backup & restore strategy in case of failure.
- **Pay-as-you-go** – Pay only for what you use.

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4. Cloud Service Models

- **IaaS (Infrastructure as a Service)** → Virtual servers, storage, networking. (e.g., AWS EC2, S3)
- **PaaS (Platform as a Service)** → Pre-configured platforms for devs. (e.g., AWS Elastic Beanstalk)
- **SaaS (Software as a Service)** → End-user applications (e.g., Gmail, Salesforce).

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5. Cloud Providers

- **AWS (Amazon Web Services)** → Largest provider, 200+ services.
- **Microsoft Azure** → Enterprise-friendly, integrates with Microsoft stack.
- **Google Cloud Platform (GCP)** → Strong in data, AI/ML.
- **Others**: IBM Cloud, Oracle Cloud, Alibaba Cloud.

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6. AWS Overview

- Launched in 2006.
- Offers **200+ fully featured services**: compute, storage, databases, networking, AI/ML, security, DevOps, etc.
- Leading in **market share** worldwide.

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7. Various AWS Services (Popular Categories)

- **Compute** → EC2, Lambda, ECS, EKS
- **Storage** → S3, EBS, EFS, Glacier
- **Database** → RDS, DynamoDB, Aurora, Redshift
- **Networking** → VPC, Route53, CloudFront, API Gateway
- **Security** → IAM, KMS, Shield, WAF
- **Analytics** → Glue, Athena, EMR, QuickSight
- **Monitoring** → CloudWatch, CloudTrail, Config

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8. Global Infrastructure – Regions & Availability Zones

- **Region** = Geographic area (e.g., Mumbai, N. Virginia).
- **Availability Zone (AZ)** = Isolated data centers inside regions.

- **Edge Locations** = For caching & CDN (CloudFront).

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9. Identity and Access Management (IAM)

- **IAM** manages authentication & authorization in AWS.
- Concepts:
    - Users (individual accounts)
    - Groups (collection of users)
    - Roles (temporary permissions)
    - Policies (JSON rules defining access)

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10. EC2 Instance (Elastic Compute Cloud)

- Virtual server in AWS cloud.
- Different **instance types** (General, Compute, Memory, GPU, Storage).
- Pricing Models: On-Demand, Reserved, Spot, Savings Plans.
- https://www.youtube.com/watch?v=ue_o5spSWoE

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11. Auto Scaling

- Automatically adjusts number of EC2 instances based on demand.
- Ensures performance & cost efficiency.

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12. Load Balancing

- **Elastic Load Balancer (ELB)** distributes traffic across multiple EC2s.
- Types: Application LB, Network LB, Gateway LB, Classic LB.

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13. Object Storage (Amazon S3)

- **S3 (Simple Storage Service)** → Scalable object storage.
- Stores files as **objects** (key, value, metadata).

- Used for backup, hosting, big data, analytics.
- https://www.youtube.com/watch?v=77IMCiiMiIo

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14. Amazon Virtual Private Cloud (VPC)

- Private network in AWS.
- Contains **subnets, route tables, internet gateways, NAT gateways**.
- Provides network isolation & security.
- https://www.youtube.com/watch?v=7_NNInH7sAg

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15. Relational Database Service (RDS)

- Managed database service.
- Supports MySQL, PostgreSQL, Oracle, SQL Server, MariaDB, Aurora.
- Handles backups, patching, scaling, availability.
- https://www.youtube.com/watch?v=eMzCI7S1P9M

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16. Monitoring Services

- **CloudWatch** → Metrics, logs, alarms, dashboards.
- **CloudTrail** → Tracks user activity & API calls.
- **AWS Config** → Resource compliance tracking.
- https://www.youtube.com/watch?v=Yxl7e88cTAQ&t=616s

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17. AWS S3 / Storage Tiers

- **Standard** → Frequent access.
- **Intelligent-Tiering** → Moves between frequent/infrequent automatically.
- **IA (Infrequent Access)** → Rarely accessed.
- **One Zone-IA** → Cheaper, single AZ.
- **Glacier / Deep Archive** → Archival storage.

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18. Elastic Block Store (EBS)

- Block-level storage for EC2.
- Types: gp3/gp2 (SSD), io2/io1 (Provisioned IOPS), st1 (Throughput HDD), sc1 (Cold HDD).
- Persistent & high-performance.
- https://www.youtube.com/watch?v=77qLAI-IRpo

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19. Elastic File System (EFS)

- **Managed file storage (NFS)** for EC2.
- Scales automatically.
- Multi-AZ, shared file system.
- Use case: Web servers, big data, content management.
- https://www.youtube.com/watch?v=6ZIPBC78U0s

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20. AWS Glue

- **Serverless ETL (Extract, Transform, Load) service**.
- Prepares & transforms data for analytics.
- Features:
    - **Data Catalog** → Central metadata store.
    - **Crawlers** → Discover schema automatically.
    - **Jobs** → Runs ETL scripts in **Python/Spark**.
    - **Integration** with S3, Redshift, Athena, RDS, DynamoDB.
- Use Cases:
    - Data preparation for ML.
    - Data warehouse loading.
    - Big data analytics pipelines.

https://www.youtube.com/watch?v=z0Owwd3u6Dw

In summary:
This list covers **end-to-end AWS basics** → from **Cloud Computing fundamentals** → to **AWS services (EC2, S3, RDS, VPC, EBS, EFS, Glue)** → to **security & monitoring**.