

## Overview of Cloud Computing

Cloud Computing is the on demand delivery of IT resources available from the Internet with a pay-as-you-go model.

- 3 characteristics of the cloud :
1. On demand.
  2. Accessible from the Internet
  3. Pay-as-you-go model

1. On-demand : Resources are always available as per your demand. Example : When you go home switch your lights, you don't care about the generation of electricity you are using as per your needs and demand and paying according to your usage. Similarly, cloud computing allows you to provision any IT resources on demand.

2. Accessible from the Internet : From anywhere and anytime you can access your resources which you have deploy in the cloud.

3. Pay-as-you-go model : Pay as per your usage.

Example : If you need to run your server for 2 hours, then pay for 2 hours server usage not more than that.

## Advantages of Cloud Computing AWS

All the resources are available instantly according to needs. In traditional model it takes 2-3 months to provision the resources before actual start of the project. If want to update or scale up infrastructure, no wait, do it instantly.

In traditional method you firstly want to decide the hardware size. Suppose, On Black Friday you anticipate 20 times more orders than the rest of the year. What do you do? Do you provision 20 more hardware?

Yes : 20 times unused memory (capacity) for entire year.

No : Won't be able to meet the demand on Black Friday.

**Solution :** "Cloud" as it is elastic, so you can scale up & scale down based on your need at any point of time.

**"Innovation"** Suppose you want to do some experiment (something new) you need hardware & you will pay for it but if later on experiment got FAIL then there will be loss of money that you have pay for your new hardware.

**Solution:** "Operational expense model", Zero up-front cost even if you does not go well, just pay for that thing that you have used. These variable expense model facilitates innovation.

Avoiding spending money on Data Centers. You can deploy or operate from different region. So you can deploy or host your application from different part of the globe. If you want disaster recovery system on different continent you can.

### 3 Model of Cloud Computing

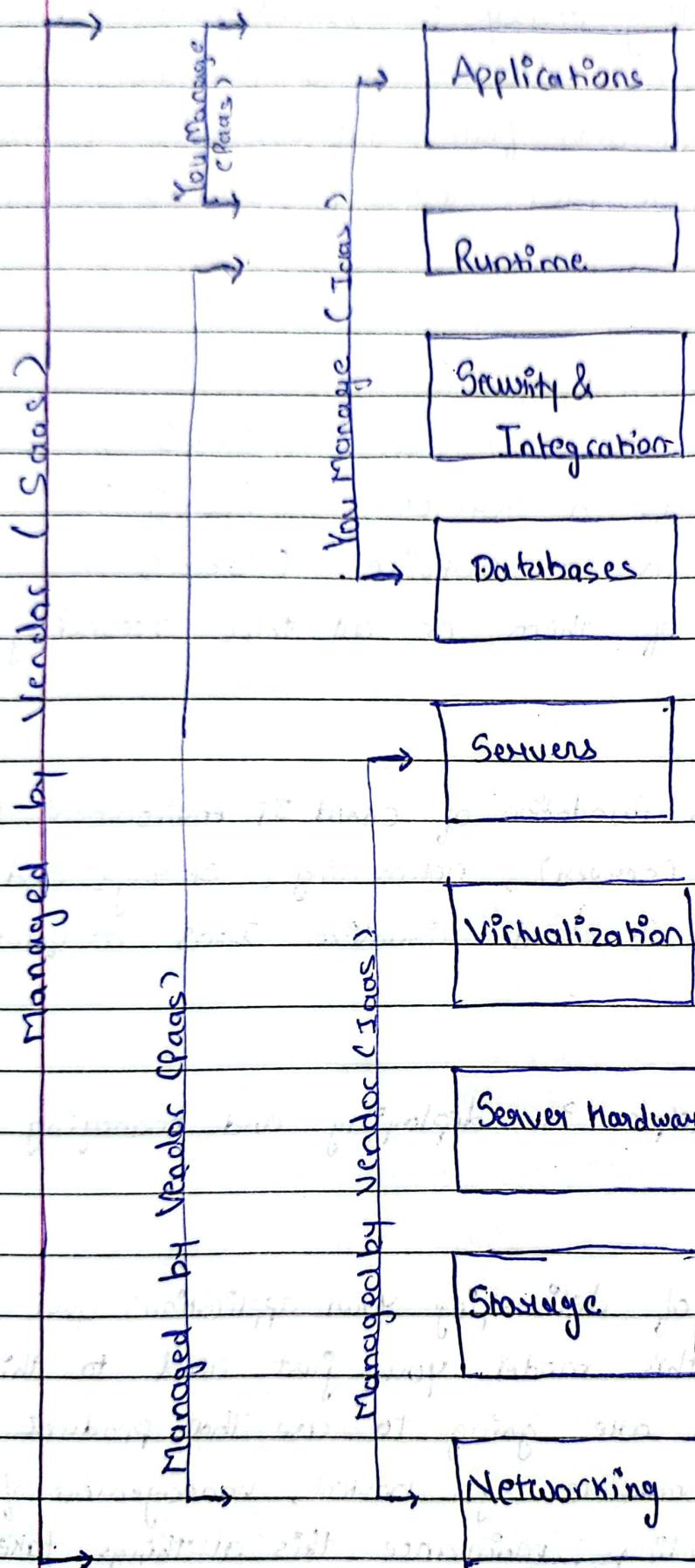
1. Infrastructure as a Service (IaaS)
2. Platform as a Service (PaaS)
3. Software as a Service (SaaS)

Choose any one of them or all three according to your needs.

1. IaaS : Provides foundation of cloud IT environment that includes compute (server), networking, storage and space in a data center. To cloud visualize IaaS as your own data center.

2. PaaS : It helps in deploying and managing the application

3. SaaS : Way of delivering your applications over the internet. With this model you just need to think about how you are going to use that product because how software get hosted, management of software patching or upgrading, maintenance this all things take care by vendor.



### 3 Cloud Computing Deployment Models.

1. All-in cloud
2. Hybrid
3. On-premise or Private Cloud .

1. All-in cloud : Design and deploy an application in public cloud using Cloud Service (AWS), that kind of deployment is called as all-in cloud.

Example : Netflix opted all-in cloud strategy, closing all its data centers & hosting all the streaming content in AWS.

2. Hybrid : Some applications on cloud and some applications will on premises.

Example : Big companies already have their applications on their data center so they directly not switched to AWS but new application deployment will be on AWS.

3. On-premise or Private cloud : Deploy the resources in your own data center using virtualization or resource management tools, it is called as On-premise or Private cloud.

## Aws Security and Compliance

Customer

Responsible for security "In" the cloud.

Customer Data

Platform, Applications and Access Management

Operating System, Network and Firewall Configuration

Client side	Server side	Network
data Encry. & Data Integrity auth.	Encry. (File System &/or Data).	Traffic Protection (Enc/int/ids)

AWS

Responsible for security "of" the cloud.

Aws (Global) Infrastructure

Compute	Storage	Database	Networking
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Regions

Availability Zones

Edge Locations

## AWS Products and Services

EC2 : Includes virtual servers, called as "Instances". Varieties of instances like CPU intensive, Memory intensive, Accelerated computing optimized as in GPU Optimized, Storage optimized. I/O instances, General purpose instances this all servers are depend on use cases.

Example : database work load : Memory - Instance.

Run Machine learning : Compute - Instance.

Ec2 Auto Scaling : For some reasons your instance goes down Amazon EC2 auto scaling quickly spins up new instance. Defining auto scaling policy for various metrics & health checks. Auto Scaling integrates with Elastic Load Balancer (ELB).

AWS lambda : "Serverless". Pay only when code get execute No charge when code is not running. Code is scaled high availability as well.

Amazon EC2 Container Service : ECS allows to run Docker containers on AWS. Don't install, scale operate your own cluster management infrastructure Launch & manage Docker-enabled applications via API calls. ECS integrate with ELB & EBS. No separate charges.

Aws Elastic Beanstalk : Run & manage web applications without worrying about infrastructure. Deploy your application with any coding language. This will automatically handles deployment, load balancing, auto scaling, health monitoring. No pay only resource charges that you have used.

Amazon Lightsail : Best for small businesses, developers, students, who needs virtual private server (VPS).

Provides storage, networking, capacity, and compute capabilities to manage & deploy web sites & webapp in cloud. One-stop to launch your project instantly.

AWS Batch : Run hundreds of thousands of batch computing jobs on AWS.

## Networking

Amazon VPC : Own data center in cloud. Multiple Amazon VPC you can connect them as well using Amazon VPC Peering.

Amazon Route 53 : Domain Name System (DNS) web service. Translates the name like www.facebook.com to numeric IP addresses like 192.0.1.1. Integrated with EC2, S3, ELB, Cloudfront, used to route users to infrastructure outside of AWS. Also configure DNS

health checks and thus traffic can be routed to a healthy endpoint used to register domain names.

ELB : Automatically distributes the load across multiple EC2 instances. Supports HTTP, HTTPS, TCP traffic. Integrated with AutoScaling so scale up or down EC2 instances. It does health checks so can remove unhealthy/failing instances. Help to achieve fault tolerance for your application. supports EC2 instances across different AZ in a region.

AWS Direct Connect : Establish private dedicated network connectivity from data center to AWS. Provides 1Gbps to 10 Gbps connections, multiple connections if requires more capacity.

## Security & Compliance

IAM : Used to create users, groups, roles and also manages and controls access to AWS services and resources.

Amazon Inspector : Automated security assessment service that helps to identify security vulnerabilities in your applications. To use first install Amazon agent on each EC2 instance. Then agent monitors EC2 instance collects the data and passes it on instance service.

AWS Certificate Manager (ACM) : Manage Secure Socket Layer (SSL) certificates for use with AWS services. Using ACM, you can provision, manage & deploy SSL / Transport layer security (TLS) certificates. No charge to manage certificates.

WAF : Detects malicious traffic targeted at web applications. Protect against common attacks such as SQL injection, Scripting. Using this rules block web traffic from certain IP addresses, filter certain traffic from certain geographical locations, safeguarding your application.

AWS Shield : Protects against distributed-denial-of-service (DDoS) attacks targeted at web applications. AWS Shield Standard is free, protects most commonly occurring DDoS attacks. Advanced, have higher levels of protections targeting on web applications, ELB, Route 53, CloudFront.

## Storage & Content Delivery

S3 : Store the data, store unlimited amount of data, file size can't exceed 5TB.

Amazon Glacier : Low-cost cloud storage, used for data archiving and long-term backup purposes. CHEAPER than S3. Optimize storage cost by moving infrequently

access object / file to glacier from S3 or vice versa.

Amazon Elastic Block Storage (EBS) : Provides persistent block storage for EC2 instances. Choose Magnetic or Solid-state drive (SSD) for EBS volume. It will replicate within AZ provide fault tolerance and high availability. Create EBS snapshots in S3. Supports Input/Output Operations per second (IOPS) that helps you to pre-provision the IOPS based on your applications need.

EFS : Easy, Scalable, Shared file storage within EC2.

AWS Storage Gateway : Integrate on-premise storage with AWS cloud storage. Delivered as virtual machine installed in on-premise data center.

Import/Export options : Transfer large amount of data into AWS using physical storage appliance. Your mail storage device with data on it. AWS Snowball in which AWS ships physical device to premises, load the data & ship back to AWS. Physical device is called Snowball. Two sizes, 80TB & 50TB. Direct Connect which dedicated virtual network from your location to AWS datacenter. Amazon Kinesis Firehose, capture & automatically load streaming data into S3.

Cloudfront : global content delivery network (CDN)  
Services of Aws. Delivers static & dynamic content of web applications (images, videos, and other assets)

### Database

RDS : fully managed relational database service. Supports MySQL, Oracle, PostgreSQL, MariaDB, Amazon (AWS) Aurora (AWS owned database).

Dynamo DB : No-SQL database service of AWS. Consists of SSD storage. Supports documents and key-value models.

Gremlin : Mobile, Web, Gaming, IoT and many other applications.

Amazon Redshift : Fully managed Petabyte-Scale data warehouse service. Stores in "Columnar format" that provides "Better I/O Efficiency". Data backup continuously on S3. Access it via ODBC or JDBC.

Amazon Elastic Cache : Help in deploying in-memory cache or data store in cloud. 2 open source in-memory engines : Redis and Memcached. "Closely improved the performance of applications". Integrated CloudWatch and SNS.

Amazon Aurora : Supports MySQL and PostgreSQL. Supports 64TB database size. By default, data is mirrored/copied across 3 AZ's, 6 copies of data are kept. Backed up constantly to S3.

### Analytics

Amazon Athena : "Serverless", users analyse data in S3 using 'SQL', It uses Presto with full standard SQL that supports JSON, ORC, CSV, Avro and Apache Parquet.

Amazon EMR : Easily & cost effective process enormous amount of data. Utilizes Hadoop framework running on S3 & EC2.

AWS Data Pipeline : Process, Move, transform data from different AWS compute & storage services

Amazon Kinesis : Fully managed service that makes easy to collect, analyze & process real time "Streaming Data". Users get insights timely and react quickly to new information. Ingest real-time data such as web site click streams, application logs, IoT data & more into db, data warehouse, data lake. You can build your own real-time applications using this data.

## Application Services

Amazon API Gateway : Full managed service provided to developers. Handles all aspects of building, deploying, robust API for backend services (code running Lambda, EC2, webapp). Handles hundreds of thousands of concurrent API calls.

AWS Step Function : Provides graphical interface for users to visualize and arrange components of their applications.

Amazon Elastic Transcoder : Convert video/audio files from source format into output format of their choice.

## Developer Tools

AWS CodeCommit : Host highly scalable private Git repositories securely.

AWS CodePipeline : Fully managed continuous integration delivery service for quick reliable application and infrastructure updates.

AWS CodeBuild : Fully managed build service that builds & compiles source code, runs tests, and

produces SW packages that are ready to deploy.

AWS CodeDeploy : Fully managed service that automates code deployments to any instances like EC2 & servers running on premises.

## Management Tools

AWS CloudFormation : Gives developers & system administrators an easy way to create & manage collection related to AWS resources. Help to deploy resources in different AZ's / region.

AWS CloudWatch : Monitoring Services. Collect, track metrics, log files, and set alarms. Monitor EC2, DynamoDB, RDS, custom metrics generated by your applications.

AWS CloudTrail : Records "AWS API calls" & user activity in your account & deliver log files to you via S3.

## Messaging

AWS SNS : Help developers to publish message from an application and immediately deliver them to subscribers or other applications.

Amazon SES : Send and receive e-mail using your own email addresses and domains.

Amazon SQS : Access to message queues to store messages waiting to be processed. Enables quickly build message queuing applications that runs on any computer.

### Migration.

Aws Snowball : Transport petabyte of data in cloud. eliminates challenges like 'large scale data transfer (high costs network, security, long transfer time)'.

Aws Server Migration Service : Agentless service that help schedule and track large scale of server migration. Migrates thousands of on-premises workloads to Aws.

### Artificial Intelligence

Amazon Lex : Provides conversational chatbox using voice and text.

Amazon Polly : Converts text into lifelike speech.

Amazon Rekognition : Powered by deep learning. Its API detects thousands of scenes & objects, analyses faces, compare faces for similarity.

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Amazon Machine learning : Fully managed machine service that allows you to efficiently build predictive applications including demand forecasting, fraud detection & click prediction.

### Internet of things (IOT) :

Aws Greengrass : Run local compute, messaging & data caching for connected IoT devices in an efficient and secure way. It enables devices to run Lambda functions, keep data in sync, communicate with other devices securely though internet connectivity is not possible.

Aws IoT Button : Use this button for control temperature of room, open garage door, order food, remotely control all electrical appliances at your house & soon.

### Mobile Services:

Amazon Cognito : Add users to signup/sign in in your mobile & web apps fast & reliably. Authenticate users through FB, twitter, Amazon. Application works when devices are offline and save data locally on user's device.

AWS Mobile Hub : You can select & configure features to add to your mobile app. Add new features and capabilities to your mobile apps.

AWS Device Farm : Testing web service where users can interact & test their iOS, web, Android app on several device platform.

Amazon Mobile Analytics : Measure app usage & revenue, track key pairs and patterns