AWS Cloud Concepts and Services

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Cloud Computing

- Cloud computing is the on-demand delivery of compute power, database, storage, applications and other IT resources via the internet with pay as-you-go pricing.
- **Some advantages of cloud:**

> Trade capital expense for variable expense

> Massive economies of scale

> Stop guessing capacity

> Increase speed and agility

>Stop spending money in running and maintaining data centers

> Go global in minutes

Types of Cloud

1. **Public Cloud :** A public cloud is an IT model where public cloud service providers make computing services including compute , storage, and applications available on-demand to organizations and individuals over the public internet.Examples are AWS,Azure Web Services , Google Cloud.
2. **Private Cloud :** Private cloud is a cloud computing environment in which all hardware and software resources are dedicated and accessible only by, a single customer. Examples are openstack and cloudstack
3. **Hybrid Cloud :** A hybrid cloud is a mixed computing environment where applications run using a combination of computing, storage, and services in different environments public clouds and private clouds, including on-premises data centers or edge locations.
4. **Community Cloud** : Community cloud is a shared resources among Vendors.

CLOUD SERVICES

SaaS - Software as a Service

Software as a Service (SaaS) is a cloud-based software model that delivers applications to end-users through an internet browser.

PaaS - Platform as a Service

PaaS provides the infrastructure and application development platform to easily develop applications over a cloud platform.

IaaS - Infrastructure as a Service

Contains the basic building blocks for cloud IT and typically provide access to networking features, computers, storage

Data Center

Components :

1.Server

2.Storage

3.Networking Device consists of Switch and router

4. Power Backup

5. Internet service provider(Leased Lines)

6.Racks

Ways to interact with AWS

- AWS Management Console - GUI using web server
- AWS Command Line Interface (CLI) - scripting for accessing services
- Software Development Kits (SDKs) - access services directly from your code (Java, Python, etc)

Built using REST like API

AWS Cloud Adoption Framework

- Provides guidelines and best practices for organizations

Six perspectives :-

➢ Business
➢ People
➢ Governance
➢ Platform
➢ Security
➢ Operations

Cloud Economics and Billing

AWS Pricing model

- Three fundamental drivers of cost:

  COMPUTE   STORAGE   DATA TRANSFER

- Pay for what you use
- Pay less when you reserve
- Pay less as AWS grows and when you use more

AWS Cloud Financial Management

AWS Billing and Cost Management

- It is a web service that provides features that helps you pay your bills and optimize your costs.
- Amazon Web Services bills your account for usage, which ensures that you pay only for what you use.

AWS Pricing Calculator

- It is a web service that you can use to create cost estimates that match your AWS use case.
- AWS Pricing Calculator is useful both for people who have never used AWS and for those who want to reorganize or expand their usage.

AWS Regions

- Physical geographical area
- Region - 2 or more Availability Zones (AZs)
- AZ - 1 or more data center
- Each region has full redundancy and connectivity
- Data replication across regions is controlled by us
- Points of presence - used by many AWS services to measure internet, performance, etc
- Regional edge cache - used when you have content not accessed frequently to remain in edge location

AWS Services

AWS STORAGE SERVICES

Amazon Simple Storage Service (Amazon S3) - It is storage for the internet.

- Used to store and retrieve any amount of data at any time, from anywhere on the web.
- Global service
- Serverless service
- File inside a S3 bucket - object
- File size - 0 to 5 TB
- Has 100 buckets, and each bucket has unlimited storage
- Ex - Files, videos, etc

Amazon Elastic Block Store (EBS) -

- Provides Block level storage volumes for use with EC2 instances.
- The instance and the EBS volumes should be on same availability zone.
- 20 TB storage and each volume can have size of 1TB size

Amazon Elastic File System (EFS) -

- Simple, serverless, elastic, set-and-forget file system that automatically grows and shrinks as you add and remove files with no need for management or provisioning.

AWS Elastic Disaster Recovery (AWS DRS) -

- Minimizes downtime and data loss with fast, reliable recovery of on-premises and cloud-based applications using affordable storage, minimal compute, and point-in-time recovery.

Compute

- Elastic compute cloud (EC2) - provides resizable compute capacity as Virtual machines in cloud (servers). Uses AMI (Amazon Machine Images)
- EC2 auto scaling - automatically add and remove EC2 instances according to conditions (scale up & down)
- Elastic container service (ECS) - scalable, high performance container (supports docker containers)
- Elastic container registry (ECR) - fully managed docker container
- Elastic Beanstalk - deploying, scaling web applications on Apache, Microsoft IIS, etc
- Lambda - run code without provisioning and managing servers
- Elastic Kubernetes Service (EKS) - deploy, manage and scale containerized applications that use kubernetes on AWS
- Fargate - compute engine for ECS to run containers without managing servers or clusters

Database

1. **Relational Database Service (RDS) :**
   - Open source cloud database
   - Setup , operate and scale a relational database in cloud .
   - Resizable capacity
   - Automates time consuming admin

2. **Aurora :**
   - Designed for unparalleled high performance and availability at global scale with MySQL and PostgreSQL compatibility .

3.   RedShift :

- Uses SQL to analyse structured and semi structured data across data warehouses and operational databases.

4. DynamoDB :

- Fully manager key value NoSQL DataBase.
- Serverless Service
- High Performance & Scalable
- Built in security,backup and restore in memory caching .

5. Elasticache:

- Fast temporary storage for small amounts of data

6. Elastic MapReduce (EMR)

- manages cluster platform that simplifies running big dara frameworks includin Apache Hadoop, Apache Spark

Networking and Content delivery

- Virtual Private Cloud (VPC) - logically isolated sections of AWS cloud to launch AWS resources in virtual network
- Elastic load balancing - automatically distributes incoming traffic across multiple targets like EC2, containers, IP address, lambda, etc. Types include: Application and network load balancers
- CloudFront - fast content delivery network (CDN) delivers videos, applications, data, APIs with low latency and high speed
- Transit Gateway - enables to connect to VPC and their on-premises network to single centrally manages gateway
- Route 53 - scalable DNS to route end user to internet applications

- Direct Connect - establish dedicated private network from your datacenter (office) to AWS
- Virtual Private Network (VPN) - secure private tunnel for your network or device to AWS global network

Security, identity and Compliance

- Identity and Access Management (IAM) - manage access to AWS services, resources securely
- Cognito - add user authentication and control to web and mobile applications
- Artifact - on-demand access to AWS security, compliance reports and select online agreements
- Key management Service (KMS) -create and manage encryption keys
- Shield - managed distributed denial of service protection that safeguards running applications on AWS

AWS Organizations

➔ Account management services that allows users to consolidate multiple AWS accounts into a organizations to create and centrally manage .
➔ **Organization Unit** : It helps us to create group accounts.
➔ **Service Control Policies (SCP) :** It can control each service and restrict the actions .
➔ Consists of 2 feature sets Consolidated Billing and All Features.
➔ Consolidating billing includes paying accounts and linked accounts.

Cost management

- Cost and Usage report - comprehensive set of AWS cost and usage data, additional metadata like services, pricing, reservation
- Budgets- set custom budgets that alert when your AWS costs or usage exceed budgeted amount
- Cost Explorer - easy to use interface, visualise and understand cost and usage overtime

Management & Governance

- Management console - web based User Interface for accessing AWS account
- Config - track resource inventory and changes
- CloudWatch - monitor resources and application
- Auto scaling - scale multiple resources
- CLI - unified tool to manage AWS services
- Trusted advisor - helps optimize performance and security using best practices
- Well-Architected Framework - reviewing and improving workloads
- CloudTrail - tracks user activity and API usage across your AWS accounts

Simple Queuing Services(SQS) :

➔ Fully managed message queuing service for distributed applications , message oriented API and pull based .
➔ Reliable . highly scalable , hosted queue for storing messages in transit computers .

Simple Notification Service (SNS):

➔ A managed service that provides communication in form of notifications from publishers(EC2,Cloud watch,S3) to subscribers (Amazon SQS, SMS,Lambda).

Simple Email Service(SES) :

➔ A managed service that provides communication in form of Email from publishers to subscribers .

Message Broker Service(MQ) :

➔ Streamlines setup,operation and management of message brokers on AWS based on Apache ActiveMQ and RabbitMQ.
➔ Used when customers require industry standard API and protocols.
➔ Useful when migrating existing queue-based applications into cloud.

Simple Workflow Service(SWF) :

➔ It makes easy to coordinate work across distributed application components.

API Gateway :

➔ Fully managed service that makes it easy to create,maintain , monitor and secure REST,HTTP at any scale.

AWS Cloud Development Kit (AWS CDK)

- It is a framework for defining cloud infrastructure in code (IaC) and provisioning it through AWS CloudFormation.

Lightsail

- For dynamic web hosting (simple)

VPN CloudHub

- Uses an Amazon VPC virtual private gateway with multiple customer gateways, each using unique BGP autonomous system numbers (ASNs)

Network Address Translation (NAT):

➔ a way to map multiple private addresses inside a local network to a public IP address before transferring the information onto the internet.

VPC Peering :

➔ Mapping two different VPC"s of different regions or different accounts to create a communication medium.

Access Control Lists (ACL):

➔ Allows or denies specific inbound or outbound traffic at subnet level

Outposts :

➔ Communication which happens on AWS private subnet to corporate data center private subnet.

Global Accelerator :

➔ Each edge location connected to the accelerator through global network to increase traffic.
➔ Improves availability,performance and security of public applications.

Cloud Formation :

➔ Infrastructure as code (IaC) service that allows you to easily model, provision, and manage AWS and third-party resources.

Athena :

➔ Big-Data application
➔ serverless, interactive analytics service built on open-source frameworks, supporting open-table and file formats.

- **AWS CodeStar** - includes CloudFormation, Code commit, Code build, Code deploy
- **Code commit** - store our code in particular facility by AWS
- **Code Build** - convert into executable format and also test
- **Code deploy** - send to server (EC2 instances)
- **Kinesis** - Click stream analysis
- **Macie** - fully managed data security and data privacy service
- **Web application Firewall (WAF)** - creates rules to filter web traffic based on conditions that include IP address, HTTP headers and body or custom URLs.
- **Managed Microsoft active directory** - used for authentication of users from AWS to on-premises and vice versa .It allws Single Sign-On authentication .

Scaling Policies

- **Target tracking** - attempts to key group at or close to metric
- **Simple scaling** - adjust group size based on a metric
- **Step scaling** - based on metric - based on size of alarm breach
- **Schedules scaling** - at specific time

Routing Policies

- **Simple** - simple DNS response
- **Failover** - if primary is down then routes to secondary destination
- **Geolocation** - uses geographic location you are in to route to closest region
- **Geo Proximity** - routes you to closest region
- **Latency** - directs you based on the lowest latency route to resources
- **Multivalue answer** - returns several IP address and functions as basic load balancer
- **Weighted** - uses relative weights assigned to resources to determine which to route to .