AWS Certified

Cloud Practitioner

* Sony Shrestha

AWS allows you to share a single server with other AWS customers using virtualization.

Cloud computing services are delivered via the Internet and managed through web browser.

**Cloud Terminology**

1. Availability
2. Agility
3. Durability
4. Elasticity
5. Availability

* always up and running

1. Agility

* high speed

1. Durability

* data is not corrupted

1. Elasticity

* auto scaling, scale up and scale down

**6 advantages of Cloud Computing**

1. Go global in minutes
2. Stop guessing capacity
3. Stop spending money running and maintaining data centers
4. Increase speed and agility
5. Benefit from massive economic of scale
6. Trade capital expense for variable expense
7. Go global in minutes

* You can deploy your applications around the world at the click of a button.

1. Stop guessing capacity

* Start with what you want then scale-up or scale-down

1. Stop spending money running and maintaining data centers

* No need to manage servers
* Focus on your applications instead of managing hardware

1. Increase speed and agility

* High speed

1. Benefit from massive economic of scale

* Huge discount

1. Trade capital expense for variable expense

* Pay for what you use instead of making huge upfront investments

**Cloud Computing Models**

1. IaaS
2. PaaS
3. SaaS
4. IaaS

* Infrastructure as a Service
* It is the basic building block that you can rent like an EC2 instance.
* Eg: Web hosting

1. PaaS

* Platform as a Service
* Mostly used by developers to build application.
* Eg: Storefront website

1. SaaS

* Software as a Service
* It is complete product or application that you can rent.
* Eg: Email Provider

**Cloud Deployment Models**

1. Private Cloud
2. Public Cloud
3. Hybrid Cloud
4. Private Cloud

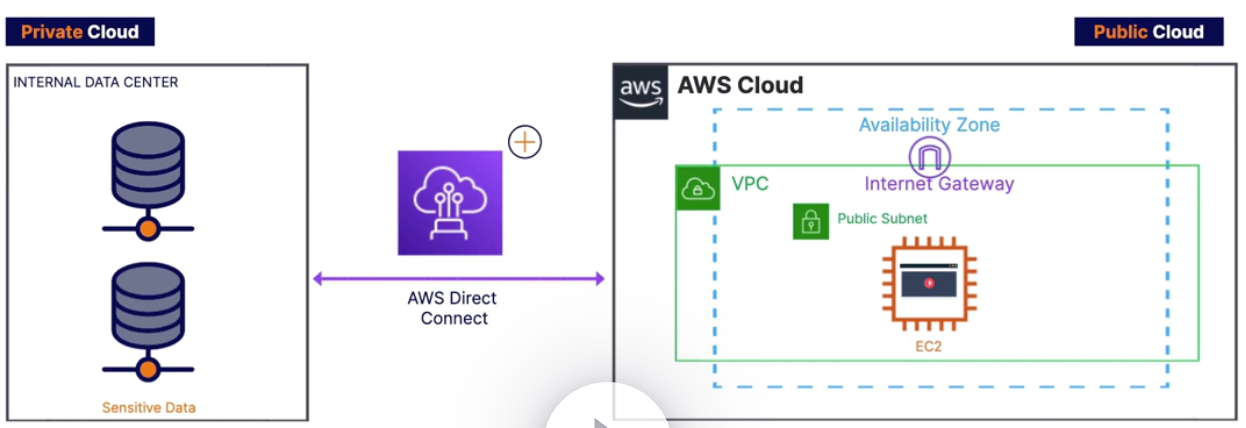
* Called on-premises
* Exists in your internal data center. Everything runs on internal data center
* Does not offer advantage of cloud computing
* There is increased level of security

1. Public Cloud

* Offered by AWS
* Offers advantages of cloud computing

1. Hybrid Cloud

* Combination of private and public cloud
* Highly sensitive data resides in private cloud, application that reads these data run in AWS and they communicate with each other using a service provided by AWS called AWS Direct Connect.



Note:

Hybrid deployments are supported by Direct Connect.

**AWS Global Infrastructure**

1. Availability Zone
2. Region
3. Edge Location

Note:

240 countries

80 availability zone

25 regions

Data Center

Collection of servers

1. Availability Zone

* Consists of one or more physically separated data centers, each with redundant power, networking, and connectivity, housed in separate facilities.
* Characteristics of Availability Zone
  + They are physically separated
  + They use separate power grids
  + They are connected among themselves within a region through low-latency links
  + Fault tolerance- If one Availability zone gets out of service, other should not get impact
  + Allows for high availability
* An availability zone is associated with a single region
* Availability Zone contains server you are renting, and it is where you deploy your applications

1. Region

* Physical location
* Collection of multiple availability zones
* When deploying your application, select region that is closest to users. It improves performance and availability
* Characteristics of Region
  + Fully independent and isolated- if one region gets impact, other will not be affected
  + Resource and service specific- resources are not automatically replicated across regions.

1. Edge Location

* Mini data center
* Cache content for faster delivery of content to users
* There are more edge locations than availability zones and regions
* It is not used to launch resources like EC2 instance. It is just used to cache content.
* Reduces latency and speeds up delivery of your application
* Related to Content Delivery Network (CDN) and Amazon CloudFront

**Ways to access AWS**

1. AWS Management Console
2. AWS Command Line Interface (CLI)
3. AWS Software Development Kit (SDK)
4. AWS Management Console

* Allows you to access your AWS account and manage resources using web browser
* Root user is created when we initially sign up for your account. He has unrestricted access to your account, and it cannot be restricted.
* For best practice, use root user for first time access. After that create separate users for day-to-day activities.
* For best practice, protect root user with MFA (Multi-Factor Authentication) This is where a code is sent to your phone that you then have to enter in order to officially sign into your accounts. MFA is sometimes called 2-factor authentication because you have to enter two things your password and code sent to your phone.
* Following tasks can only be performed by root user:
  + Deleting account
  + Changing email address
  + Changing service plan

1. AWS Command Line Interface (CLI)

* It is called programmatic way to access your AWS account
* Allows you to access AWS account through a terminal or command window on your local laptop
* Mostly used by developers
* Some new features are available via command line before console
* When you set up CLI locally, you will have to do some configurations like generating secret key and access key and then using that access keys locally.

1. AWS Software Development Kit (SDK)

* Access AWS account through application code
* Allows you to access AWS Services from popular programming languages like Java, Python, C# and many more

**Compute Services**

1. EC2 (Elastic Cloud Compute)
2. Lambda
3. AWS Fargate
4. Amazon Lightsail
5. Amazon Outposts
6. AWS Batch

**EC2 (Elastic Cloud Compute)**

**Introduction**

* Elastic Cloud Compute
* Virtual server in the cloud
* Allows you to rent and manage virtual servers in the cloud
* Has elastic compute power: It can grow and shrink based on load in your application
* Are not serverless
* You are able to provision an EC2 instance at the click of a button
* You can also use pre-configured template called AMI (Amazon Machine Image) to launch your resources.
* You will receive 750 compute hours per month on Free Tier Plan
* You can deploy your applications directly to EC2 instances.

**EC2 in real world**

1. Deploy a database

Deploy a database to EC2 gives you full control over the database.

1. Deploy a web application

Deploy web application to multiple availability zones to make web application highly available.

**Methods to access EC2 instance**

1. AWS Management Console
2. Secure Shell (SSH)
3. EC2 Instance Connect (EIC)
4. AWS Systems Manager
5. AWS Management Console

* You are able to configure and manage instances via a web browser.

1. Secure Shell (SSH)

* Allows you to connect to your instance from local laptop using SSH Client and keys
* Puttygen converts .pem(privacy enhanced mail) file to ..ppk (putty private key)

1. EC2 Instance Connect

* Allows you to connect to instance without using SSH client and keys and directly using terminal in web browser
* For this, you must grant IAM users permission to push public key to the instance.

1. AWS System Manager

* Allows you to manage EC2 instances via a web browser or CLI

Note

The must common way to connect to Linux EC2 instance is via Secure Shell (SSH)

For this key pair is generated.

A key pair, consists of a private key and a public key, which proves your identity when connecting to an EC2 instance.

When user connects to SSH Client laptop, he uses private key. When he connects to EC2 instance, he uses public key.

**EC2 Pricing Model**

1. On demand
2. Spot
3. Reserved Instance
4. Dedicated Hosts
5. Savings Plans
6. On demand

* Fixed price in which you are billed based on instance type used
* You pay for what you use
* No contract
* Use on-demand instances when
  + You cannot make upfront payment or long-term commitment
  + Your applications have unpredictable workloads that cannot be interrupted
  + Your applications are under-development
  + Your applications will not run for more than a year

1. Spot

* Spot instance lets you take advantage of unused EC2 capacity
* Your request is available only if capacity is available
* Use Spot instance when
  + Your application is not concerned about start and stop time of execution
  + Your workload can be interrupted
* You can save upto 90% off on-demand prices
* You pay for spot that is in effect at the beginning of each hour

1. Reserved Instance

* Allows you to commit to a specific instance type for 1 or 3 years
* Use reserved instance when
  + Your application has steady state usage and you can commit for 1 or 3 years
  + You can make upfront payment
  + Your application requires capacity reservation
* You can save upto 75% off on-demand prices
* You are required to sign a contract of 1 or 3 years
* You can pay all-upfront, partial upfront or no upfront. All upfront for maximum term earns the highest discount

1. Dedicated Hosts

* Allows you to pay for physical server that is dedicated to running your instances. No other AWS customers is going to have applications running on this server. The server basically belongs to you
* Use dedicated hosts when
  + You want to bring your own server-bound software license from vendors like Microsoft and Oracle
  + You have regulatory or corporate compliance requirements around tenancy model
* You can save upto 70% off on-demand prices
* You can bring your existing per-core, per-socket and per-VM software licenses.

1. Savings Plan

* You do not commit for specific instance type instead you commit to compute usage (measured per hour) for 1 to 3 years
* Use savings plan when
  + You want to lower your bill across multiple compute services
  + You want flexibility to change compute services, instance types, OS or regions
* You can save upto 72% off on-demand prices
* Savings can be shared across various compute services like EC2, Fargate and lambda

Features

1. Elastic Load Balancing
2. EC2 Autoscaling
3. Elastic Load Balancing

* Automatically distributes your incoming traffic across multiple EC2 instances
* Types
  + Classic Load Balancer
  + Application Load Balancer
  + Gateway Load Balancer
  + Network Load Balancer

1. EC2 Autoscaling

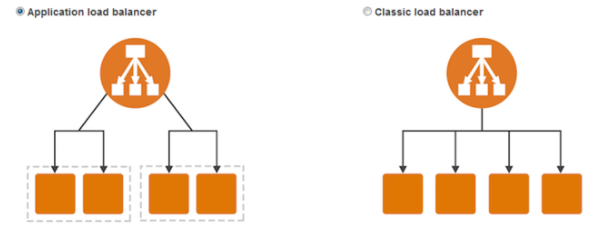
* Scale up or scale down based on workload in your application
* Reduces impact of system failure and improves availability of your applications
* You can also use autoscaling with Aurora and DynamoDB

Classic Load Balancer

* All incoming traffics will be equally distributed among number of servers we have

Application load Balancer

* Incoming traffics are distributed based on needs of customers
* It has some level of intelligence.
* It enables content-based routing and allows requests to be routed to different application/server behind single load balance.



Note

Horizontal Scaling vs Vertical Scaling

Horizontal Scaling (Scaling out)- adds or replaces instances

Vertical Scaling (Scaling up)- upgrades an existing instance

Tag

Allows you to track your instance by adding key/value pair

Eg: We can add a tag to specify “This instance is dedicated for Management purpose.”

AWS lambda

Introduction

* Serverless compute service that allows you to run your code without managing servers
* Allows developers to focus on core business logic for the application they are developing instead of worrying about managing servers
* Scales automatically
* Lambda functions can be written in popular programming languages like Java, Go, Node Js, C#, Python
* You can author your code using your favorite development environment locally and upload or you can write code via the console.
* Lambda can execute your code in response to some events
* Lambda functions have a 15-minute timeout. So, lambda is not for processes that run longer than 15 minutes.

Pricing Model

1. Compute time
2. Request
3. Always free
4. Compute time

* Time between start of execution and end of execution

1. Request

* A request is counted each time it starts execution
* Test invokes on the console is also considered as a request

1. Always free

* 1 million free requests per month (even after free usage tier expires)

Note

Duration: execution tine

Billed Duration: time you are actually billed for

AWS Fargate

Introduction

* Serverless compute service for containers
* Allows you to manager containers like Docker
* Works with Amazon Elastic Container Service (ECS)
* Scales automatically

AWS Lightsail

Introduction

* Quickly launch all the resources you need for small projects
* Deploy preconfigured applications like WebPress Website with the click of a button
* Includes Virtual Server, SSD based storage, static IP address, data transfer and DNS management
* Provides a low, predictable monthly fee, as low as $3.50
* Used to start small and scale as you grow

AWS Outspots

* AWS delivers and installs servers in your internal data center
* Allows you to run cloud services in your internal data center
* Supports hybrid deployment model

AWS Batch

* Allows you to process large workloads in smaller chunks (or batches)

Storage Services

1. Amazon S3

Amazon S3

Introduction

* Object Storage Service
* Objects are stored in buckets
* Unlimited storage- Millions of objects can be stored per bucket
* Objects can be private or public
* Objects can be uploaded via Management Console, CLI or from code using SDK
* Is a regional service, but bucket names must be globally unique
* You can set security at bucket level or individual object level using Access Control Lists (ACL), Bucket policies or Access Point policies
* You can enable versioning to create multiple versions of your file in order to protect against accidental deletion or roll back to previous version or file
* You can use S3 access logs to track access to your buckets and objects
* Data stored is replicated across multiple servers and so it gives high availability and durability in regional level.
* We can also set up Cross-Region Replication where your data is replicated across regions. But, S3 does not do that out of box. You have to set that up.

Two aspects of data accessibility

1. Durability
2. Availability
3. Durability

* Objects are never lost or compromised
* Amazon S3 Standard gives 99.999999999% (11 9’s) durability

1. Availability

* Access data quickly
* Amazon S3 Standard gives 99.99% availability

S3 Storage Class

There are different ways of storing your data

1. S3 Standard
2. S3 Intelligent Tiering
3. S3 Standard- Infrequent Access
4. S3 One Zone- Infrequent Access
5. S3 Glacier
6. S3 Glacier Deep Archive
7. S3 Outposts
8. S3 Standard

* General purpose storage
* Data is stored across multiple availability zones
* Recommended for
  + Data that are frequently accessed
* Durability of 99.999999999%
* Availability of 99.99%

1. S3 Intelligent Tiering

* Automatically moves your data to most cost-effective storage class
* Automatic cost savings
* Data is stored across multiple availability zones
* Recommended for
  + Data with unknown or changing access pattern like new app or data lake
* Durability of 99.999999999%
* Availability of 99.9%

1. S3 Standard- Infrequent Access

* Data is accessed less frequently but requires rapid access (millisecond access)
* Cheaper than S3 Standard
* Data is stored across multiple availability zones
* Recommended for
  + Data which is not frequently accessed but requires rapid access (millisecond access)
* Durability of 99.999999999%
* Availability of 99.9%

1. S3 One Zone- Infrequent Access

* Data is accessed less frequently but requires rapid access (millisecond access)
* Costs 20% less than S3 Standard Infrequent Access
* Data is stored in single availability zone
* Data can be lost
* Recommended for
  + Data which is not frequently accessed but requires rapid access (millisecond access)
  + Availability and Durability is not so essential
* Durability of 99.999999999%
* Availability of 99.5%

1. S3 Glacier

* Cold Storage for archival data
* Data Retrieval takes longer time
* 3 retrieval options: 1-5 min, 3-5 hours, 5-12 hours
* Data is stored in multiple availability zones
* Recommended for
  + Storage of archival data
* Durability of 99.999999999%

1. S3 Glacier Deep Archive

* Like S3 Glacier but longer access time
* 2 retrieval options: 12 hours, 48 hours
* Cheapest of all S3 options
* Data is stored in multiple availability zones
* Recommended for
  + Long-term archival data which is accessed once or twice a year
  + Retaining data for regulatory compliance requirement
* Durability of 99.999999999%

1. S3 Outposts

* Provides object storage on-premises
* Recommended for
  + Data that needs to be kept local (on-premises)

S3 in real world

1. Static Website

Deploy static websites to S3 and use CloudFront for global distribution

1. Data Archive

Archive data using Amazon Glacier as a storage option for Amazon S3

1. Analytics Services

Stores data in Amazon S3 for use with analytics services like Redshift and Athena