Neoskills

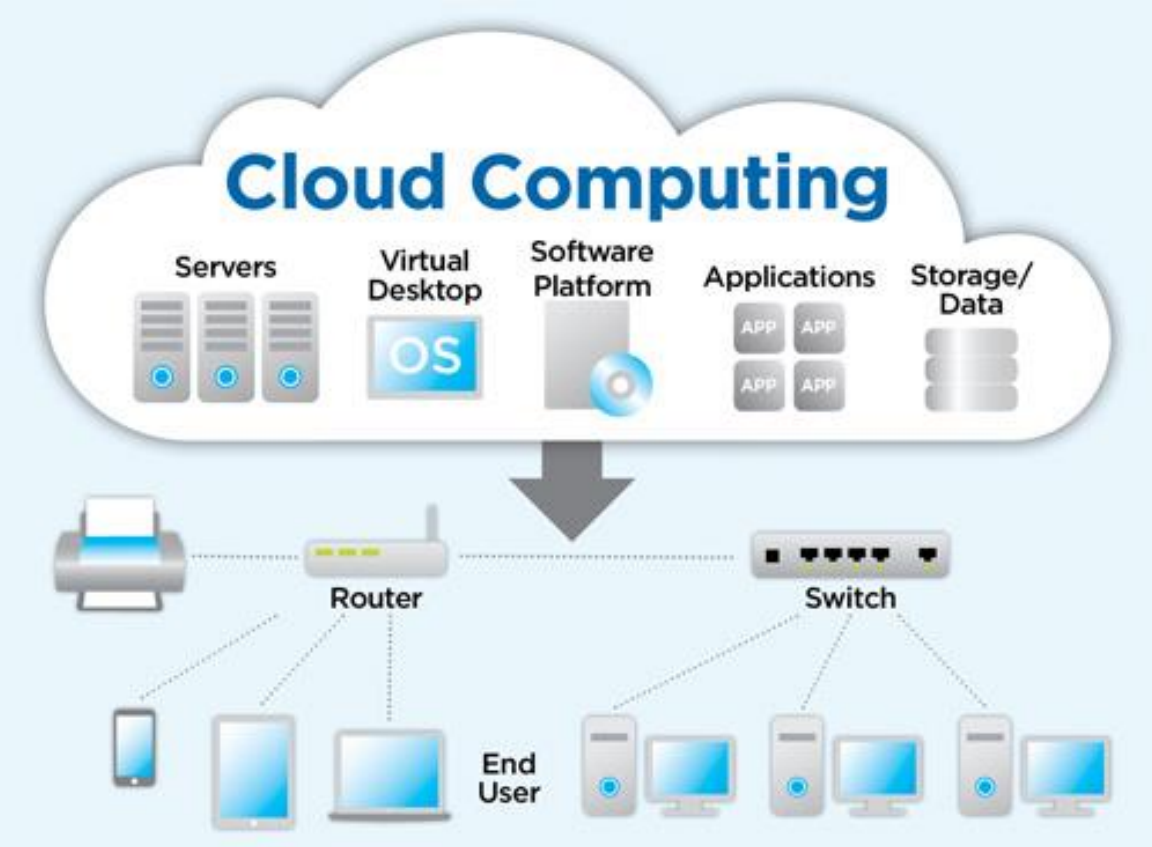
Architecting on AWS –Associate Level

Introduction

- Definition of Cloud
- Attributes of Cloud
- History of Cloud
- Technology behind Cloud
- Advantages and Disadvantages of Cloud
- Application to Business
- Cloud Service Providers
- Cloud Computing Terminologies
- Cloud Computing Architecture

Cloud Definition

- Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
- This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment model



“Cloud computing, method of running application software and storing related data in central computer systems and providing customers or other users access to them through the Internet”

5 Essential characteristics

- **On-demand self-service**

  within an existing contract, a user/customer can add new services, storage space or computing power without a formal request for change.

- **Broad network access**

  "any time, any place, and any device", with enough bandwidth.

- **Resource pooling**

  this characteristic is also known as Multi-tenancy. Many users/customers share a varied type and level of resources.

- **Rapid elasticity**

  this characteristic has to do with the fundamental Cloud aspects of flexibility and scalability. For example, web shops

- **Measured service**

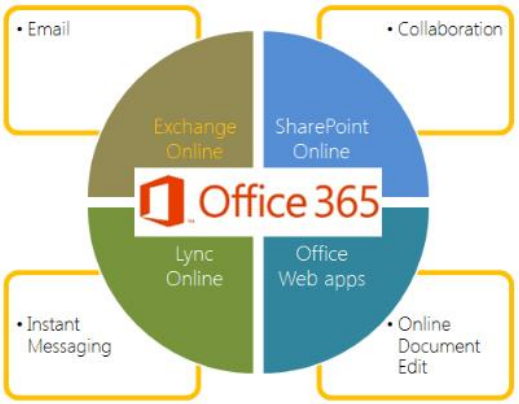
  this means monitored, controlled, and reported services. This characteristic enables a pay-per-use service model. It has similarities to the mobile telephone concept of service bundles, where you pay a standard subscription for basic levels, and pay extra for additional service without changing the contract

Cloud Service Models

Cloud Software as a Service (SaaS)

- This is the most common type of Cloud service.
- SaaS is a break with tradition that organizations buy or develop their own business applications and run and manage them on their own IT Infrastructure.
- Traditional Way - application hosting, pay per license, emulation, terminal services
- Into Cloud solutions -multi-tenancy, pay-per-use, web based interfaces, elastic
- The key benefits are that the customer does not need to worry about the development and management of these applications.
- Pays by subscription or pay-per-use model

Software as a Service (SaaS) Examples



Cloud Platform as a Service (PaaS)

- Not owning a computer platform, but being able to use it ‘on demand’ can save costs in ownership, management and maintenance & overall development cost
- In a typical software development environment platforms are used for the time the project runs, and a new project often has other or newer platform requirements.
- During some stages of the development process, i.e. testing, there often is a need for an up-scaled environment to simulate a production environment. PaaS services can offer this on demand scalability.

Platform as a Service (PaaS) Examples

Neoskills

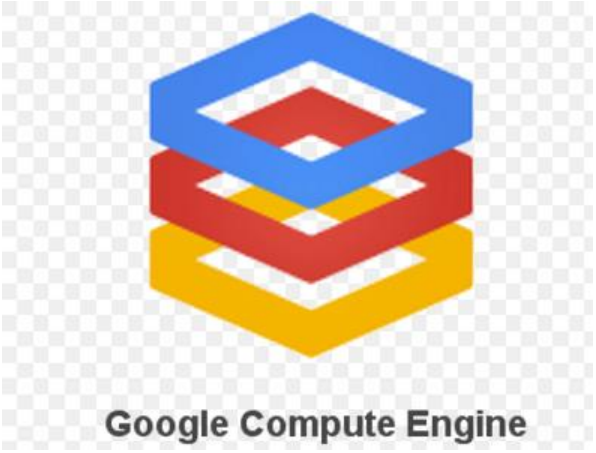
Cloud Infrastructure as a Service (IaaS)

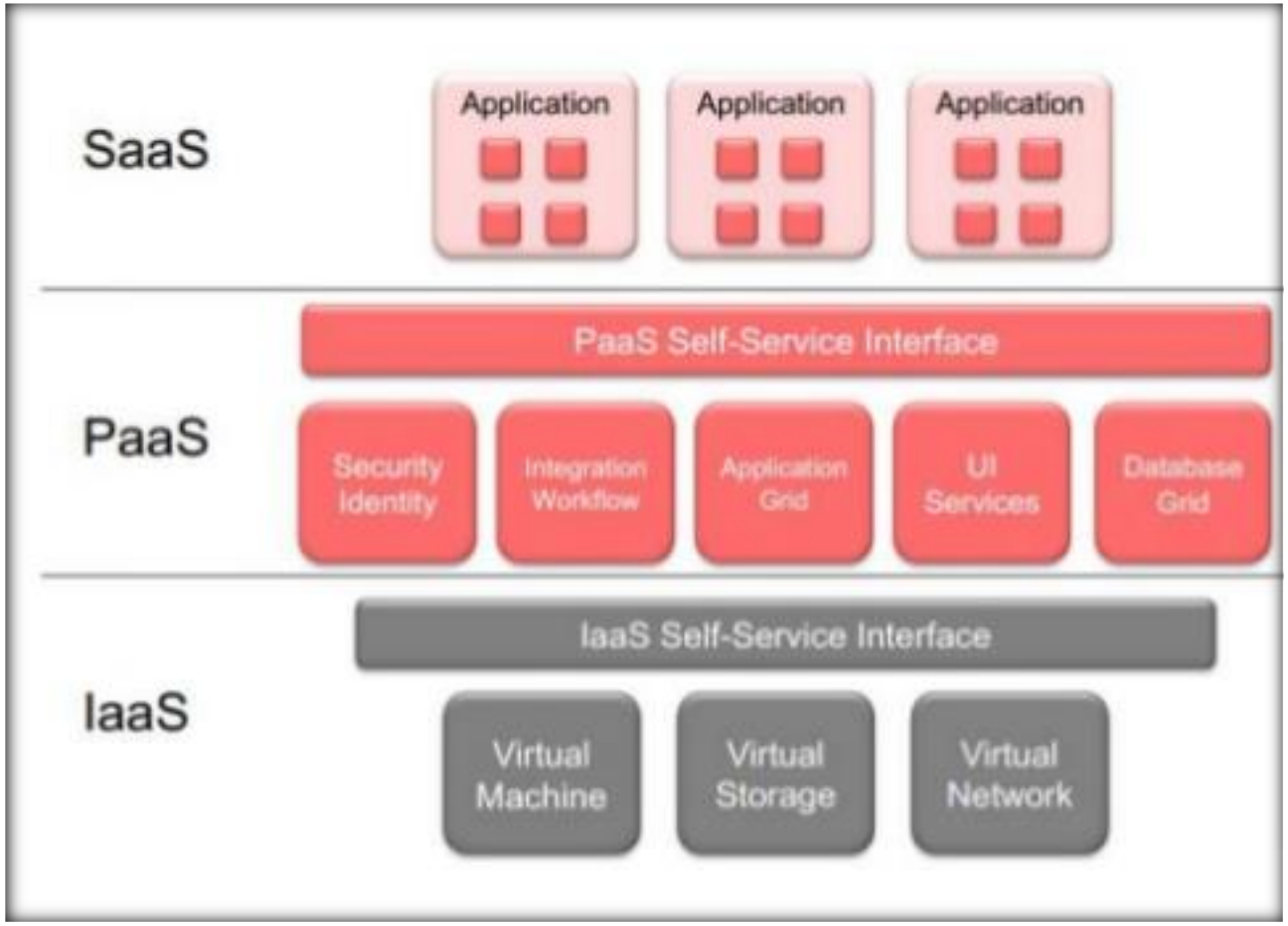
- IaaS services are sold by so called hardware service providers
- From which a customer can rent physical or virtual hardware like storage, servers or Internet connectivity.
- Services are sold according to a utility computing service and billing model.
- Customers pay on a per-use basis, typically by the hour, week or month. Some providers also charge customers based on the amount of virtual machine space they use.
- This pay-as-you-go model eliminates the capital expense of deploying in-house hardware and software.

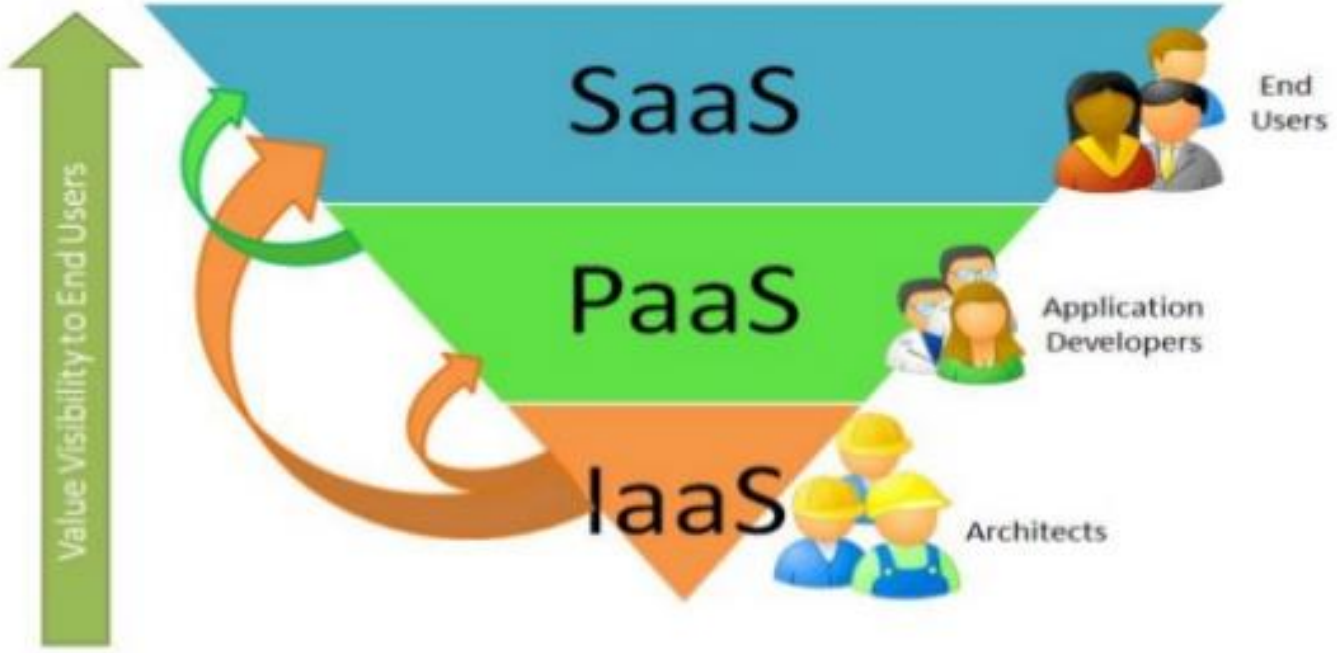
  –Amazon AWS ,Rackspace ,Microsoft Azure

Infrastructure as a Service (IaaS) Examples

Neoskills




SaaS
Application
Application
Application
PaaS
PaaS Self-Service Interface
Security Identity
Integration Workflow
Application Grid
UI Services
Database Grid
IaaS
IaaS Self-Service Interface
Virtual Machine
Virtual Storage
Virtual Network


Value Visibility to End Users
SaaS
PaaS
IaaS
End Users
Application Developers
Architects

Function-as-a-Service (FaaS)

- Build and run applications without thinking of servers
- Software developers can leverage this to deploy an individual “function”, action, or piece of business logic.
- Services that are event-driven and instantaneously scalable
- Use of FaaS –
    - Scheduled tasks or jobs
    - Process a web request
    - Process queue messages

How Cloud Computing evolved

- The Idea Phase-

This phase incepted in the early 1960s with the emergence of utility and grid computing and lasted till pre-internet bubble era. Joseph Carl Robnett Licklider was the founder of cloud computing.

- The Pre-cloud Phase-

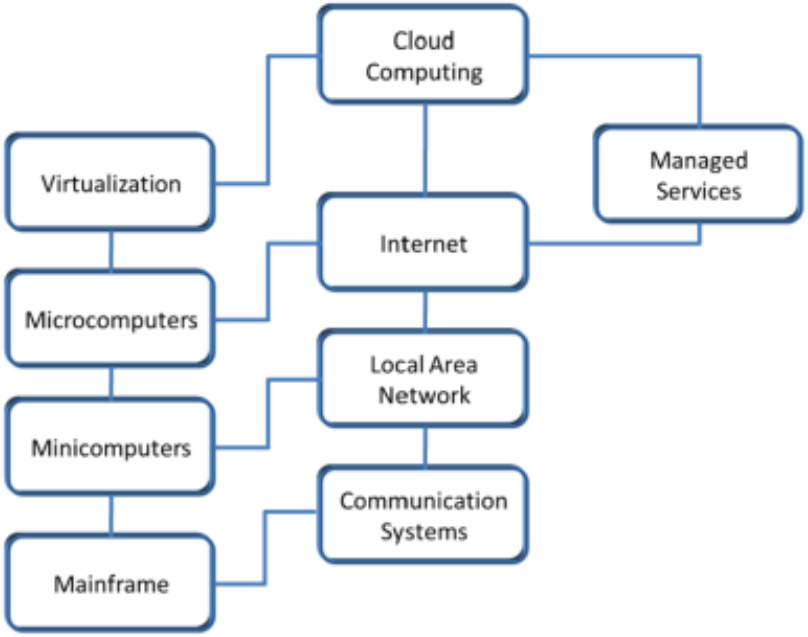
The pre-cloud phase originated in the 1999 and extended to 2006. In this phase internet as the mechanism to provide Application as Service.

- 3. The Cloud Phase-

The much talked about real cloud phase started in the year 2007 when the classification of IaaS, PaaS, and SaaS got formalized.

Historic timeline

'In the beginning there was the mainframe computer'



Number of key factors have contributed to the present day existence of "the Cloud".

- The development of the Internet.
- The move from Mainframe computing to the present day large number of personal devices with connection to the Internet.
- The development of computer networks.

Cloud Deployment Models

- Private cloud
  - –enterprise owned or leased
- Community cloud
  - –shared infrastructure for specific community
- Public cloud
  - –Sold to the public, mega-scale infrastructure
- Hybrid cloud
  - –composition of two or more clouds


Private Cloud
Single Organization
Community Cloud
Several Organizations
Public Cloud
General Public or Large industry Group
Hybrid Cloud
Private
Public

Cloud Advantages

Reduced Cost

because of the pay-per-use and/or subscription model organizations do not have to invest in IT infrastructure upfront. For Cloud providers costs are lower because of the economics of scale and the multi-tenancy principle; no ‘floor space’ is left unused.

Automated

updates, security patches and backups are no longer a concern of the customer. No longer do IT personnel need to worry about keeping software up to date.

Flexibility

Cloud computing offers more flexibility than legacy IT services. Within an existing or standard contract a customer can change the ‘Cloud mix’ of services in a dynamic way to support business demands and requirements.

More Mobility

data and applications can be accessed through the Internet from any type of ‘smart’ computing device at anytime and anywhere.

Shared Resources

customers share resources allowing smaller organizations to have access to corporate scale IT facilities, services and supporting services. Users belonging to one or more customers can work together in a shared project environment.

Agility and scalability

enterprises can scale their IT infrastructure up or down ‘on demand’. More IT functionality for a lower price; by sharing.

Cloud Disadvantages

- Security (Data located in other countries)
- Privacy (you never know who can access your data)
- Data Transfer charges are additional
- Migration from one public cloud to another is a challenge

Benefits of Cloud to Business

- No upfront Capex cost
- Can start with a small setup to service the consumers
- Elastic Growth
- Pay as per you go
- Provisioning of the H/W and Applications on the fly

Ecommerce Business

- Business wants to sell services and products on the web
- Business does not have an idea about the YOY growth
- Investor doesn’t want to invest upfront
- Needs IT infrastructure and Applications to be dynamic and should be able to handle the load
- The setup should provide redundancy
- Should be able to provision the applications near the users across countries
- Will pay only for the services used

Common Use Cases

- Web site hosting
- Application hosting
- Content delivery & media distribution
- High performance computing, large scale analytics, real time analytics
- Storage, backup, disaster recovery
- Development & test environments

Cloud and Virtualization

- IS Virtualization a Cloud ?
- Virtualization is a technology used in cloud

Virtualization

- Virtualization is the creation of a virtual -- rather than actual -- version of something, such as an operating system, a server, a storage device or network resources.
- Virtualization has become the fundamental building block of cloud
- Most of the confusion occurs because virtualization and cloud computing work together to provide different types of services
- The difference is that a true cloud provides self-service capability, elasticity, automated management, scalability and pay-as you go service that is not inherent in virtualization.

History of Cloud

- Key Role by Amazon -
- 2006 Amazon introduced the Amazon Web Services
- Microsoft Azure
- Google Cloud
- Rack space
- Sales Force

Open Stack

Vmware Vcloud

Why AWS ?

- Worldwide infra
- More number of services than any other cloud provider in the market
- Cost effective

AWS Global Infrastructure

Over 1 million active customers across 190 countries

2,000+ government agencies

5,000+ educational institutions

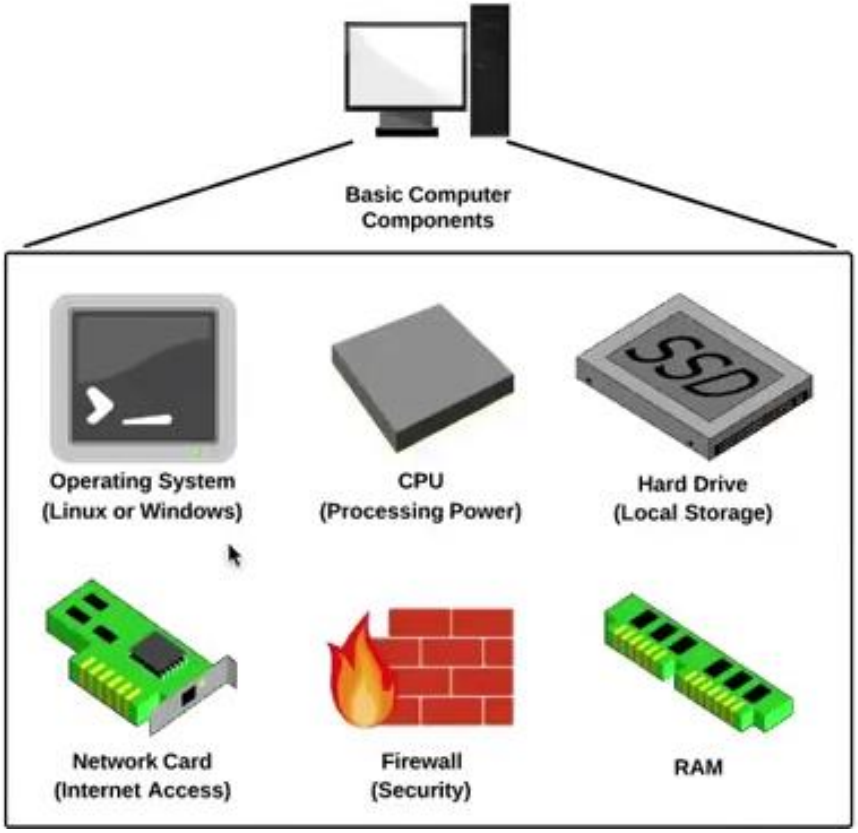
14 regions (+4)

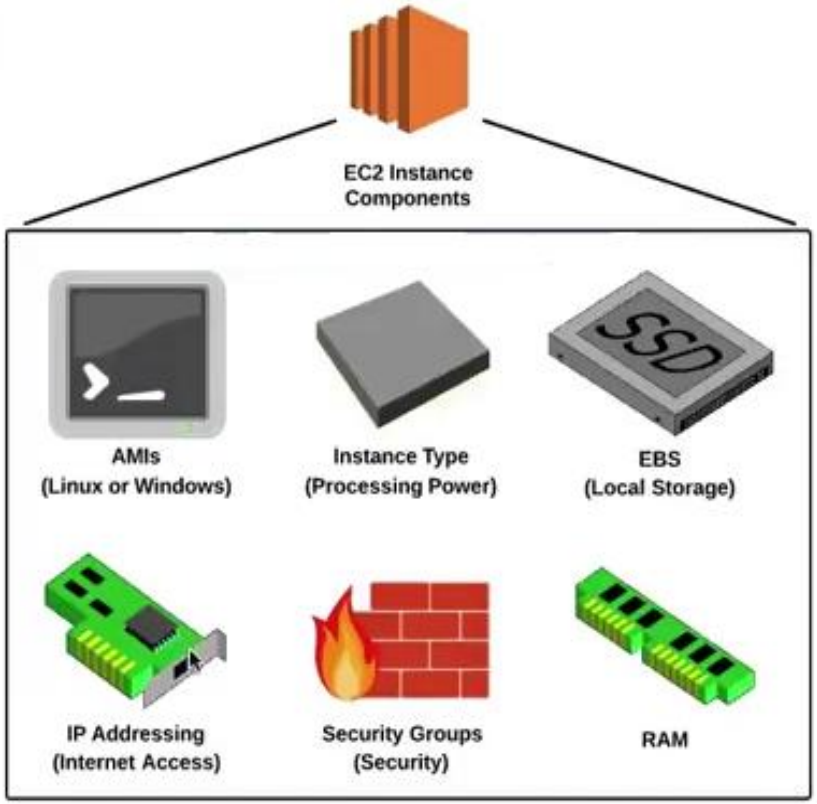
38 availability zones (+9)

63 edge locations

Amazon Cloud

Basic Understanding Amazon EC2





Amazon EC2

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers.
- Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction.
- It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment.
- Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change.
- Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use.
- Amazon EC2 provides developers the tools to build failure resilient applications and isolate them from common failure scenarios.

Benefits of EC2

- Elastic Web-Scale Computing

Amazon EC2 enables you to increase or decrease capacity within minutes, not hours or days. You can commission one, hundreds, or even thousands of server instances simultaneously.

- Completely Controlled

You have complete control of your instances including root access and the ability to interact with them as you would any machine.

- Flexible Cloud Hosting Services

You have the choice of multiple instance types, operating systems, and software packages. Amazon EC2 allows you to select a configuration of memory, CPU, instance storage, and the boot partition size that is optimal for your choice of operating system and application.

- Integrated

Amazon EC2 is integrated with most AWS services such as Amazon Simple Storage Service (Amazon S3), Amazon Relational Database Service (Amazon RDS), and Amazon Virtual Private Cloud (Amazon VPC) to provide a complete, secure solution for computing, query processing, and cloud storage across a wide range of applications.

Benefits of EC2

- Reliable

Amazon EC2 offers a highly reliable environment where replacement instances can be rapidly and predictably commissioned. The service runs within Amazon's proven network infrastructure and data centers. The Amazon EC2 Service Level Agreement commitment is 99.95% availability for each Amazon EC2 Region.

- Secure

Cloud security at AWS is the highest priority. As an AWS customer, you will benefit from a data center and network architecture built to meet the requirements of the most security-sensitive organizations.

- Inexpensive

Amazon EC2 passes on to you the financial benefits of Amazon's scale. You pay a very low rate for the compute capacity you actually consume.

EC2 Options

- On-Demand instances

Allow you to pay a fixed rate by the hour/seconds for the instances that you launch.

- Reserved Instances

Purchase, at a significant discount, instances that are always available, for a term from one to three years.

- Spot instances

Bid on unused instances, which can run as long as they are available and your bid is above the Spot price, at a significant discount. (user with urgent computing needs with large amount of data)

- Dedicated hosts

Pay for a physical host that is fully dedicated to running your instances, and bring your existing per-socket, per-core, or per-VM software licenses to reduce costs. (useful for regulatory requirements that may not support multi-tenant virtualization)

EC2 Instance Types

Family	Speciality	Use case
D2	Dense Storage	Fileservers/Data Warehousing/Hadoop
R4	Memory Optimized	Memory Intensive Apps/DBs
M4	General Purpose	Application Servers
C4	Compute Optimized	CPU Intensive Apps/DBs
G2	Graphics Intensive	Video Encoding/ 3D Application Streaming
I2	High Speed Storage	NoSQL DBs, Data Warehousing etc
F1	Field Programmable Gate Array	Hardware acceleration for your code.
T2	Lowest Cost, General Purpose	Web Servers/Small DBs
P2	Graphics/General Purpose GPU	Machine Learning, Bit Coin Mining etc
X1	Memory Optimized	SAP HANA/Apache Spark etc

EC2 Instance Types

How do I Remember them ??

- D for Density (Dense storage)
- R for RAM (Memory Optimized)
- M - main choice for general purpose apps
- C for Compute
- G – graphics intensive
- I for IOPS (high speed storage)
- F – FPGA (field programmable array)
- T – cheap general purpose(t2 micro)
- P – graphics/general purpose GPU
- X – Extreme memory

DR MC GIFT PX

EC2 Charges

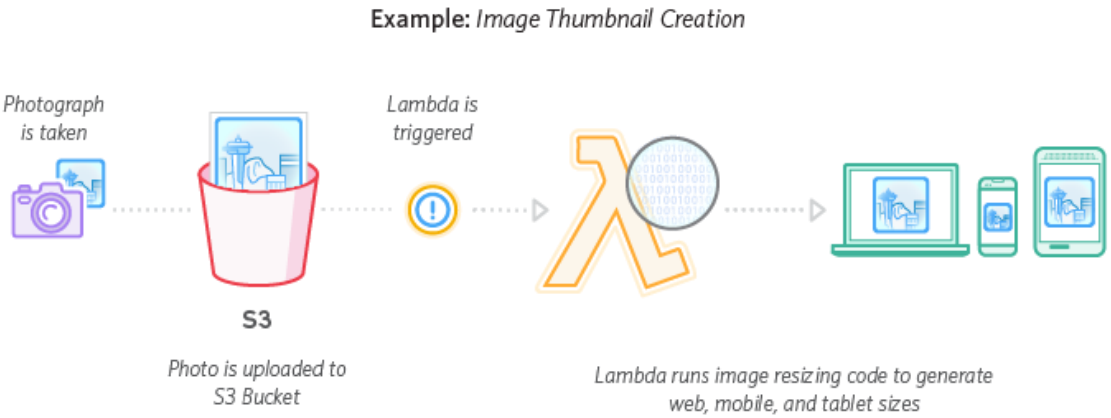
- Purchasing Option
- EC2 Instance Type
- AMI Type
- IOPS/Data transfer
- Region Specific

Amazon Lightsail

- Amazon Lightsail is the easiest way to get started with AWS for developers who just need virtual private servers.
- Lightsail includes everything you need to launch your project quickly – a virtual machine, SSD-based storage, data transfer, DNS management, and a static IP – for a low, predictable price.
- Lightsail is for developers. You can choose an image for your Lightsail instance that jumpstarts your dev project so you don't have to spend as much time installing software or frameworks.
- Price - $5 per month

Lambda

- With Lambda, you can run code for virtually any type of application or backend service with zero administration.
- Just upload your code and Lambda takes care of everything required to run and scale your code with high availability.
- You pay only for the compute time you consume - there is no charge when your code is not running.



AWS Elastic Beanstalk

- With Elastic Beanstalk, you can **deploy**, **monitor**, and **scale** an application quickly and easily.
- AWS Elastic Beanstalk reduces management complexity without restricting choice or control. You simply upload your application, and Elastic Beanstalk automatically handles the details of capacity provisioning, load balancing, scaling, and application health monitoring.
- Elastic Beanstalk supports applications developed in Java, PHP, .NET, Node.js, Python, and Ruby, atc.

Quiz

1. A company is hosting EC2 instances which focuses on work-loads are on non-production and non-priority batch loads. Also these processes can be interrupted at any time. What is the best pricing model which can be used for EC2 instances in this case?

A. Reserved Instances
B. On-Demand Instances
C. Spot Instances
D. Regular Instances

2. What is the minimum size of an EBS volume as per AWS?

A. 2TB
B. 1GiB
C. 1GB
D. 1Byte

3. All Amazon EC2 instances are assigned two IP addresses at launch, out of which one can only be reached from within the Amazon EC2 network?

A. Multiple IP address
B. Public IP address
C. Private IP address
D. Elastic IP Address

4. What is a Security Group?

A. None of these.
B. A list of users that can access Amazon EC2 instances.
C. An Access Control List (ACL) for AWS resources.
D. It acts as a virtual firewall that controls the traffic for one or more instances.

5. You have an application running in us-west-2 that requires six EC2 instances running at all times. With three AZs available in that region (us-west-2a, us-west-2b, and us-west-2c), which of the following deployments provides 100 percent fault tolerance if any single AZ in us-west-2 becomes unavailable?
Choose 2 answers

A. Us-west-2a with two EC2 instances, us-west-2b with two EC2 instances, and us-west-2c with two EC2 instances
B. Us-west-2a with three EC2 instances, us-west-2b with three EC2 instances, and us-west-2c with no EC2 instances
C. Us-west-2a with four EC2 instances, us-west-2b with two EC2 instances, and us-west-2c with two EC2 instances
D. Us-west-2a with six EC2 instances, us-west-2b with six EC2 instances, and us-west-2c with no EC2 instances
E. Us-west-2a with three EC2 instances, us-west-2b with three EC2 instances, and us-west-2c with three EC2 instances

6. Can an EBS volume be attached to more than one EC2 instance at the same time?

A. No

B. Yes.

C. Only EC2-optimized EBS volumes.

D. Only in read mode.

Amazon EBS

- Amazon Elastic Block Store (Amazon EBS) provides persistent block storage volumes for use with Amazon EC2 instances in the AWS Cloud.
- Each Amazon EBS volume is automatically replicated within its Availability Zone to protect you from component failure, offering high availability and durability.

Amazon EBS Features

- High Performance Volumes

Choose between SSD-backed or HDD-backed volumes that can deliver the performance you need for your most demanding applications.

- Availability

Each Amazon EBS volume is designed for 99.999% availability and automatically replicates within its Availability Zone to protect your applications from component failure.

- Encryption

Amazon EBS encryption provides seamless support for data-at-rest and data-in-transit between EC2 instances and EBS volumes.

- Access Management

Amazon’s flexible access control policies allow you to specify who can access which EBS volumes ensuring secure access to your data.

Amazon EBS Benefits

- Reliable, Secure Storage

Each Amazon EBS volume provides redundancies within its Availability Zone to protect against failures. Encryption and access control policies deliver a strong defense-in-depth security strategy for your data.

- Consistent, Low-latency Performance

Amazon EBS General Purpose (SSD) volumes and Amazon EBS Provisioned IOPS (SSD) volumes deliver low-latency through SSD technology and consistent I/O performance scaled to the needs of your application.

- Backup, Restore, Innovate

Protect your data by taking point-in-time snapshots of your Amazon EBS volumes providing long-term durability for your data.

- Optimized Performance

An Amazon EBS–optimized instance provides dedicated network capacity for Amazon EBS volumes. This provides the best performance for your EBS volumes by minimizing network contention between EBS and your instance.

Amazon EBS Volume Types

- Provisioned IOPS SSD (io1) Volumes

IO1 is backed by solid-state drives (SSDs) and is the highest performance EBS storage option designed for critical, I/O intensive database and application workloads, as well as throughput-intensive database and data warehouse workloads (Use if you need more than 10,000 IOPS)

- General Purpose SSD (gp2) Volumes

Balance both price and performance, deliver a consistent baseline performance of 3 IOPS/GB to a maximum of 10,000 IOPS

- Throughput Optimized HDD (st1) Volumes
  - Big data
  - Log Processing

- Cold HDD (sc1) Volumes

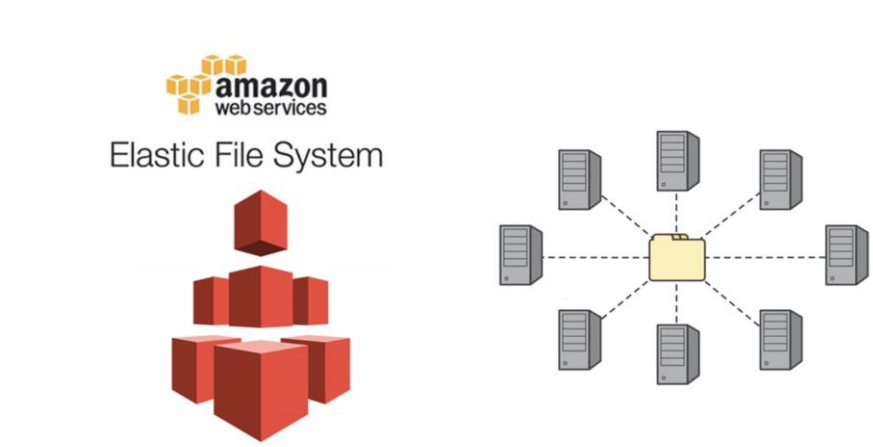
It is ideal for less frequently accessed workloads with large, cold datasets.(File Servers)

- Magnetic

Used in application where the lowest storage cost is important

Amazon EFS

- Amazon Elastic File System (Amazon EFS) provides simple, scalable file storage for use with Amazon EC2.
- With Amazon EFS, storage capacity is elastic, growing and shrinking automatically as you add and remove files, so your applications have the storage they need, when they need it.
- The service manages all the file storage infrastructure for you, avoiding the complexity of deploying and maintaining complex file system deployments.
- With Amazon EFS, you pay only for the storage used by your file system. You don't need to provision storage in advance and there is no minimum fee or setup cost.
- Multiple Amazon EC2 instances can access an Amazon EFS file system at the same time, allowing Amazon EFS to provide a common data source for workloads and applications running on more than one Amazon EC2 instance.



Amazon S3

- Companies today need the ability to simply and securely collect, store, and analyze their data at a massive scale.
- Amazon S3 is object storage built to store and retrieve any amount of data from anywhere – web sites and mobile apps, corporate applications, and data from IoT sensors or devices.
- It is designed to deliver 99.999999999% durability, and stores data for millions of applications used by market leaders in every industry.
- S3 provides comprehensive security and compliance capabilities that meet even the most stringent regulatory requirements.
- It gives customers flexibility in the way they manage data for cost optimization, access control, and compliance.

Key Points –

- S3 is Object based – it allows you to upload files
- Files can be from 0 bytes to 5TB
- There is unlimited storage
- Files are stored in buckets
- S3 is a universal namespace, that is – names must be unique globally
- https://s3-eu-west-1.amazonaws.com/bucketname
-

Amazon S3 Benefits

- Unmatched Durability, Reliability, & Scalability
  - ❑ Amazon S3 runs on the world's largest global cloud infrastructure
  - ❑ Data is automatically distributed across a minimum of three physical facilities that are geographically separated within an AWS Region, and Amazon S3 can also automatically replicate data to any other AWS Region.
- Most Comprehensive Security & Compliance Capabilities
- Flexible Management (metadata, categorization, activities log , define alerts)
- Query in Place (use this data for any analytics or data operation with in AWS platform)
- Easy, Flexible Data Transfer
  - ❑ You can choose from the widest range of options to transfer your data into (or out of) Amazon S3.
  - ❑ S3's simple and reliable APIs make it easy to transfer data over the Internet.
  - ❑ Amazon S3 Transfer Acceleration is ideal for larger objects that need to be uploaded across large geographical distances.

Storage Tiers:

Standard S3:

11-9's durability, 99.99% availability (Frequently accessed data)

Intelligent-Tiering :

Long-lived data with changing or unknown access patterns

S3-IA (Infrequently Accessed):

For data that is accessed less frequently, but requires rapid access when needed
Lower fee than S3, but you are charged a retrieval fee
11-9's durability, 99.99% availability

One Zone IA

Long-lived, infrequently accessed, non-critical data (single AZ)

Glacier

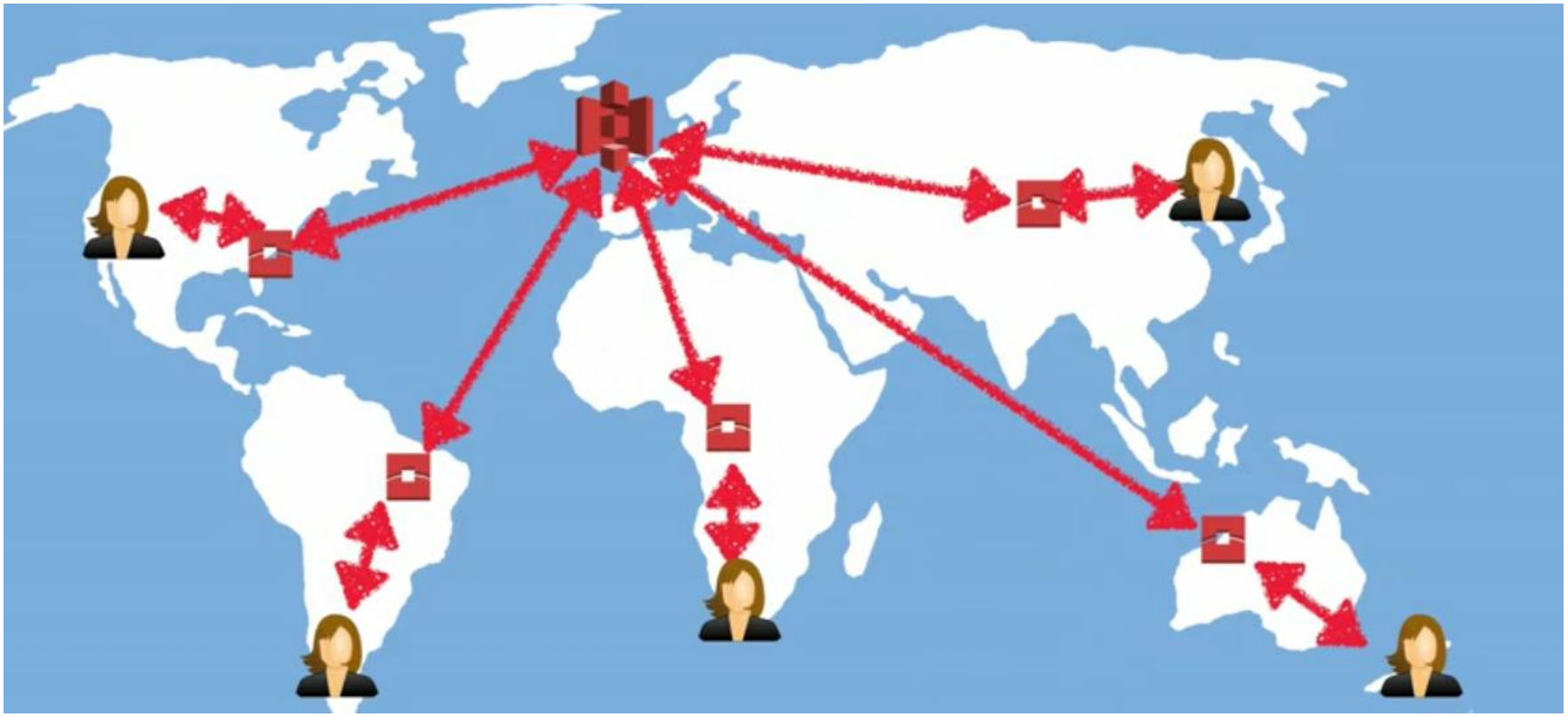
Data archiving with retrieval times ranging from minutes to hours

Reduced Redundancy Storage (RSS):

Use for data such as thumbnails or data that could be regenerated
Designed to provide 99.99% durability and 99.99% availability of objects over a year

Storage Class	Designed for	Durability (designed for)	Availability (designed for)	Availability Zones	Min storage duration
STANDARD	Frequently accessed data	99.999999999%	99.99%	>= 3	None
STANDARD_IA	Long-lived, infrequently accessed data	99.999999999%	99.9%	>= 3	30 days
INTELLIGENT_TIERING	Long-lived data with changing or unknown access patterns	99.999999999%	99.9%	>= 3	30 days
ONEZONE_IA	Long-lived, infrequently accessed, non-critical data	99.999999999%	99.5%	1	30 days
GLACIER	Long-term data archiving with retrieval times ranging from minutes to hours	99.999999999%	99.99% (after you restore objects)	>= 3	90 days
RRS (Not recommended)	Frequently accessed, non-critical data	99.99%	99.99%	>= 3	None

S3 Transfer Acceleration



Charged For –

- Storage
- Requests
- Storage Management Pricing
- Data transfer pricing
- Transfer acceleration

Amazon Glacier

- Amazon Glacier is an online file storage web service that provides storage for data archiving and backup.
- Amazon Glacier is a secure, durable, and extremely low-cost data archiving and long-term backup tool.
- Customers can reliably store large or small amounts of data for as little as $0.004 per gigabyte per month
- Data retrieval time is 3 to 5 hours

Benefits –

- Low Cost
- Secure
- Durable
- Flexible
- Integrated

1. What is the maximum size of a single S3 object?

A. There is no such limit

B. 5 TB

C. 5 GB

D. 100 GB

2. What is true for S3 buckets (select multiple if more than one is true)?

A. Bucket namespace is shared and is global among all AWS users.

B. Bucket names can contain alpha numeric characters

C. Bucket are associated with a region, and all data in a bucket resides in that region

D. Buckets can be transferred from one account to another through API

3. EBS can always tolerate an Availability Zone failure?

A. No, all EBS volume is stored in a single Availability Zone

B. Yes, EBS volume has multiple copies so it should be fine

C. Depends on how it is setup

D. Depends on the Region where EBS volume is initiated

4. You are designing a site for a new start up which generates cartoon images for people automatically. Customers will log on to the site, upload an image which is stored in S3. The application then passes a job to AWS SQS and a fleet of EC2 instances poll the queue to receive new processing jobs. These EC2 instances will then turn the picture in to a cartoon and will then need to store the processed job somewhere. Users will typically download the image once (immediately), and then never download the image again. What is the most commercially feasible method to store the processed images?

A. Rather than use S3, store the images inside a BLOB on RDS with Multi-AZ configured for redundancy.

B. Store the images on S3 RRS, and create a lifecycle policy to delete the image after 24 hours.

C. Store the images on glacier instead of S3.

D. Use elastic block storage volumes to store the images.

5. You are hosting a website in Ireland called NeoSkills and you decide to have a static DR site available on S3 in the event that your primary site would go down. Your bucket name is also called “NeoSkills”. What would be the S3 URL of the static website?

A. https://NeoSkills.s3-website-eu-west-1.amazonaws.com
B. https://s3-eu-east-1.amazonaws.com/NeoSkills
C. https://NeoSkills.s3-website-us-east-1.amazonaws.com
D. https://s3-eu-central-1.amazonaws.com/NeoSkills

6. Amazon S3 provides;

A. Unlimited File Size for Objects
B. Unlimited Storage
C. A great place to run a No SQL database from
D. The ability to act as a web server for dynamic content (i.e. can query a database)

AWS Identity and Access Management

What is it?

- AWS Identity and Access Management (IAM) is a web service for securely controlling access to AWS services.
- With IAM, you can centrally manage users, security credentials such as access keys, and permissions that control which AWS resources users and applications can access.

IAM Features

- Shared access to your AWS account
- Granular permissions
- Secure access to AWS resources for applications that run on Amazon EC2
- Multi-factor authentication (MFA)
- Integrates with many other aws services

1. Which of the following action can be authorized by IAM ? (choose 2 answer)

a. Installing ASP.NET on a windows server
b. Launching an Amazon Linux EC2 instance
c. Querying an Oracle database
d. Creating S3 bucket

2. Which of the following are IAM security features?

a. Password policies
b. Amazon dynamo DB global secondary indexes
c. MFA
d. Consolidated Billing

3. Your AWS account administrator left your company today. The administrator had an access to root user, which of the following should you do today to protect your AWS infrastructure?

a. Change the password and add MFA to the root user
b. Delete all IAM accounts
c. Relaunch all EC2 instance with new role

4. Using Amazon IAM, I can give permissions based on organizational groups?

A. True

B. False

Amazon CloudWatch

- Amazon CloudWatch is a monitoring service for AWS cloud resources and the applications you run on AWS.
- You can use Amazon CloudWatch to
  - ❑ collect and track metrics,
  - ❑ set alarms, and automatically react to changes in your AWS resources.
  - ❑ to monitor AWS resources such as Amazon EC2 instances, Amazon DynamoDB tables, and Amazon RDS DB instances

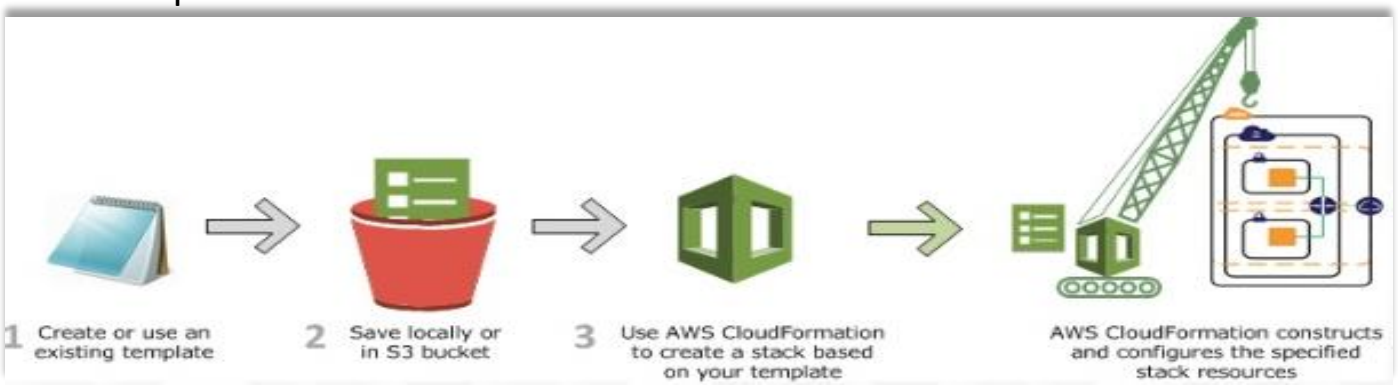
- You can use Amazon CloudWatch to gain system-wide visibility into resource utilization, application performance, and operational health.
- You can use these insights to react and keep your application running smoothly.

AWS CloudFormation

- AWS CloudFormation provides a common language for you to describe and provision all the infrastructure resources in your cloud environment.
- CloudFormation allows you to use a simple text file to model and provision, in an automated and secure manner.
- This file serves as the single source of truth for your cloud environment.
- AWS CloudFormation is available at no additional charge, and you pay only for the AWS resources needed to run your applications.

Benefits

- This helps you to standardize infrastructure components used across your organization
- rolls back changes automatically if errors are detected.
- AWS CloudFormation provisions your resources in a safe, repeatable manner, allowing you to build and rebuild your infrastructure and applications, without having to perform manual actions or write custom scripts.



AWS CloudTrail

- AWS CloudTrail is a service that enables governance, compliance, operational auditing, and risk auditing of your AWS account.
- With CloudTrail, you can log, continuously monitor, and retain account activity related to actions across your AWS infrastructure.
- CloudTrail provides event history of your AWS account activity

Benefits

- Visibility Into User and Resource Activity
- Security Analysis and Troubleshooting

AWS Config

- AWS Config is a service that enables you to assess, audit, and evaluate the configurations of your AWS resources.
- Config continuously monitors and records your AWS resource configurations
- you can review changes in configurations and relationships between AWS resources, dive into detailed resource configuration histories, and determine your overall compliance against the configurations specified in your internal guidelines.
- This enables you to simplify compliance auditing, security analysis, change management, and operational troubleshooting.

AWS GuardDuty

- Amazon GuardDuty is a threat detection service that continuously monitors for malicious activity and unauthorized behavior to protect your AWS accounts and workloads.
- The service uses machine learning, anomaly detection, and integrated threat intelligence to identify and prioritize potential threats.
- GuardDuty analyzes tens of billions of events across multiple AWS data sources, such as AWS CloudTrail, Amazon VPC Flow Logs, and DNS logs.

Amazon Inspector

- Amazon Inspector enables you to analyze the behavior of your AWS resources and helps you identify potential security issues.
- Amazon Inspector tests the network accessibility of your Amazon EC2 instances and the security state of your applications that run on those instances.
- This allows you to make security testing a regular part of development and IT operations.
- Amazon Inspector also offers predefined software called an *agent* that you can optionally install in the operating system of the EC2 instances that you want to assess.
- The agent monitors the behavior of the EC2 instances, including network, file system, and process activity. It also collects a wide set of behavior and configuration data (telemetry).

1. Your company has resources set up on the AWS Cloud. Your company is now going through a set of scheduled audits by an external auditing firm. Which of the following services can be utilized to help ensure the right information is present for auditing purposes.

A. AWS CloudTrail
B. AWS VPC
C. AWS EC2
D. AWS Cloudwatch

2. In the basic monitoring package for RDS, Amazon CloudWatch provides the following metrics. Choose three correct options.

A. Database visible metrics such as number of connections
B. Disk OPS metrics
C. Database memory usage
D. Web service visible metrics such as number failed transaction requests

3. What are some of the benefits of using the Cloudformation service? Choose 2 answers from the options given below

A. Can automatically increase instance capacity
B. A storage location for your applications code
C. Version control your infrastructure
D. A great disaster recovery option

4. A company has a requirement to provision test environments quickly. They want to have the ability to tear them down also easily to ensure cost is optimized. How can this be achieved.

A. Use Cloudformation templates to provision the resources accordingly.
B. Use a custom script to create and tear down the resources
C. Use IAM policies to have a policy to provision the resources and tear them down accordingly.
D. Use Autoscaling groups to provision the resources on demand.

5. Which of the following service evaluate the configurations of your AWS resources and continuously monitors and records your AWS resource configurations and allows you to automate the evaluation of recorded configurations against desired configurations.

A. Cloudformation
B. IAM
C. AWS Config
D. AWS CloudTrail

Amazon Relational Database Service (Amazon RDS)

- Amazon Relational Database Service (Amazon RDS) is a web service that makes it easier to set up, operate, and scale a relational database in the cloud.
- It provides cost-efficient, resizable capacity for an industry-standard relational database and manages common database administration tasks.
- Amazon RDS manages backups, software patching, automatic failure detection, and recovery.
- You can use the database products you are already familiar with
- Amazon Aurora, PostgreSQL, MySQL, MariaDB, Oracle, and Microsoft SQL Server

Benefits

- Easy to manage
- Highly Scalable
- Fast
- Inexpensive
- Automatic Software Patching
- Automated Backups
- you pay only for the resources you use

Amazon DynamoDB

- Amazon DynamoDB is a fast and flexible NoSQL database service for all applications that need consistent, single-digit millisecond latency at any scale.
- Its flexible data model and reliable performance make it a great fit for mobile, web, gaming, ad-tech, IoT, and many other applications.
- It is a fully managed cloud database and supports both document and key-value store models.

Benefits

- Fast, Consistent Performance
- Highly Scalable
- Fully Managed
- Flexible

ElastiCache

- ElastiCache is a web service that makes it easier to launch, manage, and scale a distributed in-memory cache in the cloud.
- It provides a high performance, resizeable, and cost-effective in-memory cache, while removing the complexity associated with deploying and managing a distributed cache environment.

- Launch Cluster
- Manage and configure/connect
- Load and query data(resource management)

Amazon Redshift

- Amazon Redshift is a fast and powerful, fully managed, petabyte-scale data warehouse service in the cloud.
- Amazon Redshift offers you fast query performance when analyzing virtually any size data set using the same SQL-based tools and business intelligence applications you use today.
- With a few clicks in the AWS Management Console, you can launch a Redshift cluster, starting with a few hundred gigabytes of data and scaling to a petabyte or more, for under $1,000 per terabyte per year.

1. A company is deploying a new two-tier web application in AWS. The company has limited staff and requires high availability, and the application requires complex queries and table joins. Which configuration provides the solution for the company's requirements?

A. MySQL Installed on two Amazon EC2 Instances in a single Availability Zone

B. Amazon RDS for MySQL with Multi-AZ

C. Amazon ElastiCache

D. Amazon DynamoDB

2. Organization XYZ is planning to build an online chat application for their enterprise level collaboration for their employees across the world. They are looking for a single digit latency fully managed database to store and retrieve conversations. What would AWS Database service you recommend?

A. AWS DynamoDB
B. AWS RDS
C. AWS Redshift
D. AWS Aurora

3. A company is generating large datasets with millions of rows that must be summarized by column. Existing business intelligence tools will be used to build daily reports. Which storage service meets the requirements?

A. Amazon Redshift
B. Amazon RDS
C. ElastiCache
D. DynamoDB

Amazon VPC

- Amazon Virtual Private Cloud (Amazon VPC) lets you provision a logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network that you define.
- You have complete control over your virtual networking environment, including selection of your own IP address range, creation of subnets, and configuration of route tables and network gateways.
- You can use both IPv4 and IPv6 in your VPC for secure and easy access to resources and applications.
- You can easily customize the network configuration for your VPC. For example, you can create a public-facing subnet for your web servers that has access to the Internet, and place your backend systems, such as databases or application servers, in a private-facing subnet with no Internet access.
- You can leverage multiple layers of security (including security groups and network access control lists) to help control access to EC2 instances in each subnet.
- Additionally, you can create a hardware virtual private network (VPN) connection between your corporate data center and your VPC and leverage the AWS Cloud as an extension of your corporate data center.

Amazon CloudFront

- Amazon CloudFront is a web service that speeds up distribution of your static and dynamic web content, such as .html, .css, .js, and image files, to your users.
- CloudFront delivers your content through a worldwide network of data centers called edge locations.
- When a user requests content that you're serving with CloudFront, the user is routed to the edge location that provides the lowest latency (time delay), so that content is delivered with the best possible performance.
- CloudFront speeds up the distribution of your content by routing each user request to the edge location that can best serve your content.
- This dramatically reduces the number of networks that your users' requests must pass through, which improves performance. Users get lower latency—the time it takes to load the first byte of the file—and higher data transfer rates.
- You also get increased reliability and availability because copies of your files (also known as *objects)* are now held in multiple edge locations around the world.

AWS Direct Connect

- AWS Direct Connect makes it easy to establish a dedicated network connection from your premises to AWS.
- Using AWS Direct Connect, you can establish private connectivity between AWS and your datacenter, office, or colocation environment
- Which will increase bandwidth throughput, and provide a more consistent network experience than Internet-based connections.

Benefits

- Consistent Network Performance
- Compatible with all AWS Services
- Elastic
- Reduces Your Bandwidth Costs - all data transferred over your dedicated connection is charged at the reduced AWS Direct Connect data transfer rate rather than Internet data transfer rates.

Amazon Route 53

- Amazon Route 53 is a highly available and scalable cloud Domain Name System (DNS) web service.
- You can use Amazon Route 53 to register new domains, transfer existing domains, route traffic for your domains to your AWS and external resources, and monitor the health of your resources.
- It is designed to give developers and businesses an extremely reliable and cost effective way to route end users to Internet applications by translating names like www.example.com into the numeric IP addresses like 192.0.2.1 that computers use to connect to each other.
- Amazon Route 53 effectively connects user requests to infrastructure running in AWS – such as Amazon EC2 instances, Elastic Load Balancing load balancers and can also be used to route users to infrastructure outside of AWS.
- You can use Amazon Route 53 to configure DNS health checks to route traffic to healthy endpoints or to independently monitor the health of your application and its endpoints.
- Amazon Route 53 Traffic Flow makes it easy for you to manage traffic globally through a variety of routing types, including Latency Based Routing, Geo DNS, Geoproximity, and Weighted Round Robin—all of which can be combined with DNS
- Amazon Route 53 also offers Domain Name Registration – you can purchase and manage domain names and Amazon Route 53 will automatically configure DNS settings for your domains.

1. Which service would you use to most effectively reduce the latency your end users experience when accessing your application resources over the Internet?

A. Amazon CloudFront

B. Amazon Route 53

C. Elastic Load Balancing

D. Amazon Glacier

2. You need to create two subnets in a VPC that has a CIDR of 10.0.0.0/16. Which of the following CIDRs can you assign to one of the subnets while leaving room for an additional subnet? (Choose all that apply.)

A. 10.0.0.0/24

B. 10.0.0.0/8

C. 10.0.0.0/16

D. 10.0.0.0/23

3.Which of the following are services provided by Amazon Route 53? (Choose three.)

A. Domain registration

B. Content delivery network

C. Health checks

D. DNS management