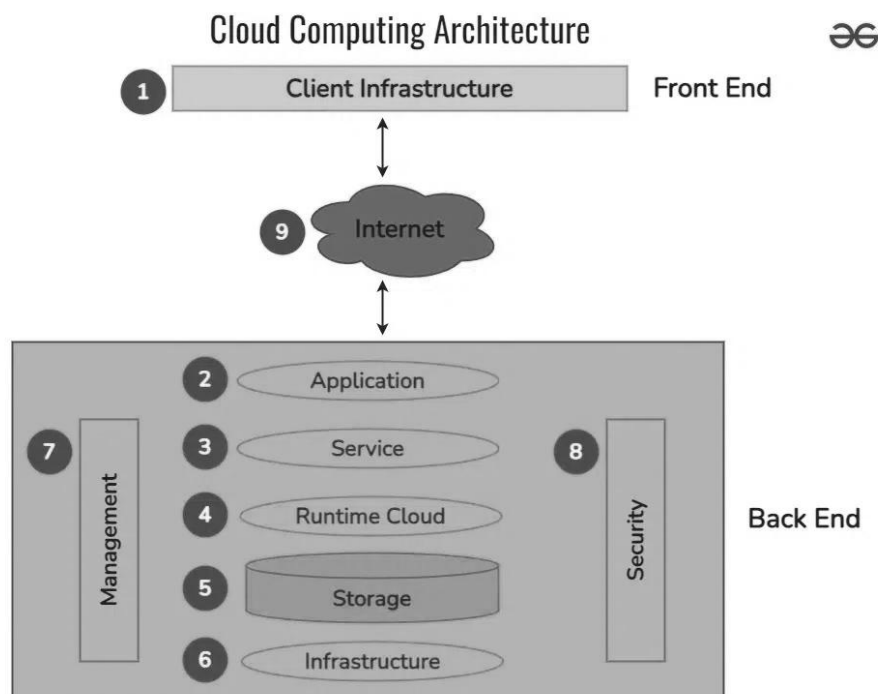


Basics of Cloud Computing

Cloud Computing is a technology that allows you to store and access data and applications over the internet instead of using your computer's hard drive or a local server.

In cloud computing, you can store different types of data such as files, images, videos, and documents on remote servers, and access them anytime from any device connected to the internet.

- **Infrastructure:** Cloud computing depends on remote network servers hosted on the Internet to store, manage, and process data.
- **On-Demand Access:** Users can access cloud services and resources on demand, scaling up or down without having to invest in physical hardware.
- **Types of Services:** Cloud computing offers various benefits such as cost saving, scalability, reliability, and accessibility. It reduces capital expenditures, and improves efficiency.



Architecture Of Cloud Computing

Cloud computing architecture refers to the components and sub-components required for cloud computing. These components typically refer to:

1. Front end (Fat client, Thin client)
2. Back-end platforms (Servers, Storage)
3. Cloud-based delivery and a network (Internet, Intranet, Intercloud)

1. Front End (User Interaction Enhancement)

The User Interface of Cloud Computing consists of 2 sections of clients. The Thin clients are the ones that use web browsers facilitating portable and lightweight accessibilities and others are known as Fat Clients that use many functionalities for offering a strong user experience.

2. Back-end Platforms (Cloud Computing Engine)

The core of cloud computing is made at back-end platforms with several servers for storage and processing computing. Management of Applications logic is managed through servers and effective data handling is provided by storage. The combination of these platforms at the backend offers the processing power, and capacity to manage and store data behind the cloud.

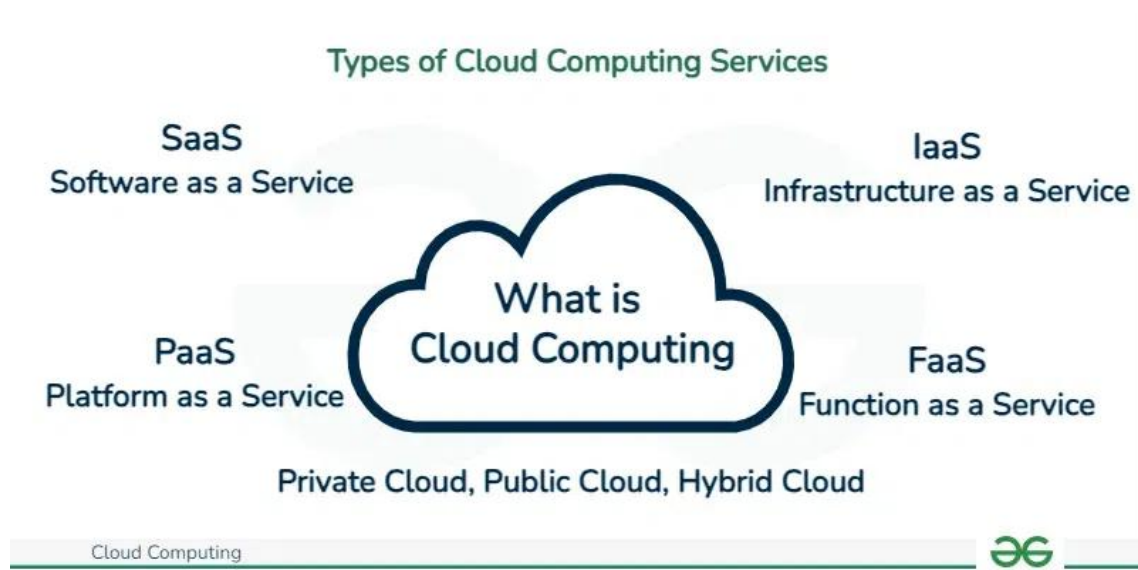
3. Cloud-Based Delivery and Network

On-demand access to the computer and resources is provided over the Internet, Intranet, and Intercloud. The Internet comes with global accessibility, the [Intranet](#) helps in internal communications of the services within the organization and the [Intercloud](#) enables interoperability across various cloud services. This dynamic network connectivity ensures an essential component of cloud computing architecture on guaranteeing easy access and data transfer.

Types of Cloud Computing Services

The following are the types of Cloud Computing:

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



1. Infrastructure as a Service (IaaS)

Infrastructure as a Service (IaaS) is a type of cloud computing that gives people access to IT tools like virtual computers, storage, and networks through the internet. You don't need to buy or manage physical hardware. Instead, you pay only for what you use.

Here are some key benefits of using IaaS:

- **Flexibility and Control:** IaaS comes up with providing virtualized computing resources such as VMs, Storage, and networks facilitating users with control over the Operating system and applications.
- **Reducing Expenses of Hardware:** IaaS provides business cost savings with the elimination of physical infrastructure investments making it cost-effective.
- **Scalability of Resources:** The cloud provides in scaling of hardware resources up or down as per demand facilitating optimal performance with cost efficiency.

2. Platform as a Service (PaaS)

Platform as a Service (PaaS) is a cloud computing model where a third-party provider offers the software and hardware tools needed to develop, test, and run applications. This allows users to focus on building their applications without worrying about managing servers or infrastructure.

For example, AWS Elastic Beanstalk is a PaaS offered by Amazon Web Services that helps developers quickly deploy and manage applications while AWS takes care of the needed resources like servers, load balancing, and scaling.

Here are some key benefits of using PaaS:

- **Simplifying the Development:** Platform as a Service offers application development by keeping the underlying Infrastructure as an Abstraction. It helps the developers to completely focus on application logic (Code) and background operations are completely managed by the AWS platform.
- **Enhancing Efficiency and Productivity:** PaaS lowers the Management of Infrastructure complexity, speeding up the Execution time and bringing the updates quickly to market by streamlining the development process.
- **Automation of Scaling:** Management of resource scaling, guaranteeing the program's workload efficiency is ensured by PaaS.

3. Software as a Service (SaaS)

Software as a Service (SaaS) is a way of using software over the internet instead of installing it on your computer. The software is hosted by a company, and you can use it just by logging in through a web browser. You don't need to worry about updates, maintenance, or storage the provider takes care of all that.

A common example is Google Docs. You can write and share documents online without downloading any software.

Here are some key benefits of using SaaS:

- **Collaboration And Accessibility:** Software as a Service (SaaS) helps users to easily access applications without having the requirement of local installations. It is fully managed by the AWS Software working as a service over the internet encouraging effortless cooperation and ease of access.
- **Automation of Updates:** SaaS providers manage the handling of software maintenance with automatic latest updates ensuring users gain experience with the latest features and security patches.
- **Cost Efficiency:** SaaS acts as a cost-effective solution by reducing the overhead of IT support by eliminating the need for individual software licenses.

4. Function as a Service (FaaS)

Function as a service (FaaS) is a cloud-computing service that allows customers to run code in response to events, without managing the complex infrastructure. You just write the code, upload it and the cloud provider runs it only when it's needed. You pay only for the time your code runs.

For example, with AWS Lambda, you can write a function that resizes images whenever someone uploads a photo to your website. You don't need to keep a server running all the time AWS runs your function only when a photo is uploaded.

Here are some key benefits of using SaaS:

- **Event-Driven Execution:** FaaS helps in the maintenance of servers and infrastructure making users worry about it. FaaS facilitates the developers to run code as a response to the events.
- **Cost Efficiency:** FaaS facilitates cost efficiency by coming up with the principle "Pay as per you Run" for the computing resources used.
- **Scalability and Agility:** Serverless Architectures scale effortlessly in handling the workloads promoting agility in development and deployment.

Company	Cloud Service Name	Key Offerings
1. Amazon	AWS (Amazon Web Services)	Compute, Storage, AI/ML, Databases, Networking
2. Microsoft	Azure	Cloud computing, AI, Analytics, Hybrid Cloud
3. Google	Google Cloud Platform (GCP)	AI/ML, Big Data, Kubernetes, Cloud Storage
4. Alibaba	Alibaba Cloud	IaaS, AI, Big Data, Cloud Security, CDN
5. Oracle	Oracle Cloud	Enterprise Cloud, Databases, SaaS, PaaS

Company	Cloud Service Name	Key Offerings
6. IBM	IBM Cloud	AI, Quantum Computing, Hybrid Cloud, Security
7. Salesforce	Salesforce Cloud	CRM, SaaS, AI, Analytics
8. Tencent	Tencent Cloud	AI, Gaming Cloud, IoT, Big Data

Amazon Web Services (AWS) - Free Tier Account Set up

Steps to Create an AWS Free Tier Account

Follow the below steps to create an AWS Free Tier Account:

Step 1: Visit the AWS Free Tier Sign-Up Page

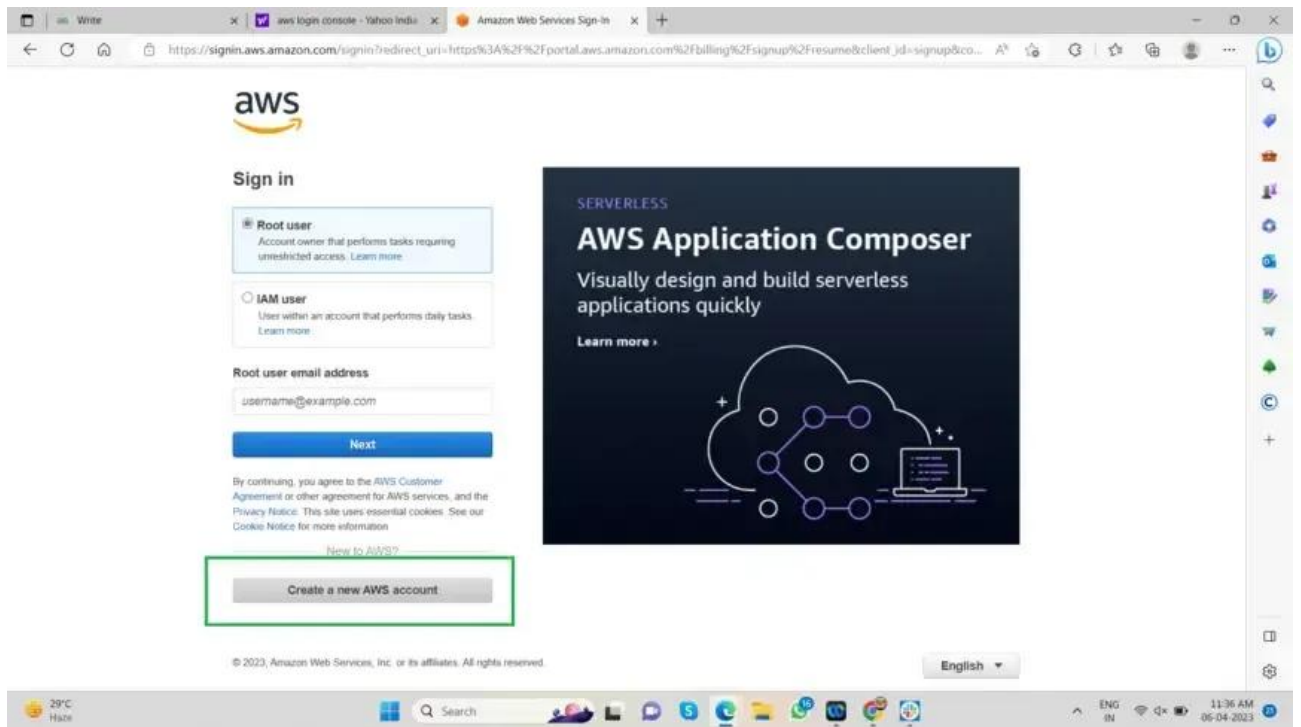
To get started, go to the official AWS website. Click on "Create Free Account" button to begin the sign-up process.

Step 2: Create an AWS Account

- **Enter Your Email and Account Name:** You'll need to provide your email address and choose a unique AWS account name.
- **Verify Your Email:** AWS will send a verification code to your email address. Enter this code on the sign-up page to confirm your email.
- **Click "Verify Email Address":** After entering the code, click on "Verify Email Address" to move to the next step.

Step 3: Set the Root User Password

- **Create a Password:** Choose a strong password for your root user account. This is the account with full access to all AWS resources.
- **Confirm the Password:** Re-enter the password to confirm.
- **Click "Continue (Step 1 of 5)":** Once you've set the password, click on "Continue" to proceed.



Free Tier offers

All AWS accounts can explore 3 different types of free offers, depending on the product used.



Always free
Never expires



12 months free
Start from initial sign-up date



Trials
Start from service activation date

Sign up for AWS

Contact Information

How do you plan to use AWS?

- ☐ Business - for your work, school, or organization
- ☐ Personal - for your own projects

Who should we contact about this account?

Full Name

Phone Number

Country or Region

Address

City

State, Province, or Region

Postal Code


☐ I have read and agree to the terms of the [AWS Customer Agreement](#).

Continue (step 2 of 5)





Secure verification

 We will not charge you for usage below AWS Free Tier limits. We may temporarily hold up to \$1 USD (or an equivalent amount in local currency) as a pending transaction for 3-5 days to verify your identity.



Sign up for AWS

Billing Information

Credit or Debit card number



AWS accepts all major credit and debit cards. To learn more about payment options, review our [FAQ](#).

Expiration date

February

2024

Cardholder's name

CVV

Billing address

☒ Use my contact address

Noida
NCR UP 201305
IN

☐ Use a new address

Do you have a PAN?

Permanent Account Number (PAN) is a ten-digit alphanumeric number issued by the Indian Income Tax Department. This 10-digit number is printed on the front of your PAN card.

☐ Yes

☒ No

You can go on the [Tax Settings Page](#) on Billing and Cost Management Console to update your PAN information.

Verify and Continue (step 3 of 5)

You might be redirected to your bank's website to authorize the verification charge.



Sign up for AWS

Confirm your identity

Before you can use your AWS account, you must verify your phone number. When you continue, the AWS automated system will contact you with a verification code.

How should we send you the verification code?

- ☒ Text message (SMS)
- ☐ Voice call

Country or region code

India (+91)

Mobile phone number

Security check



Type the characters as shown above

b5c8x6d3c0x0

Send SMS (step 4 of 5)



Sign up for AWS

Select a support plan

Choose a support plan for your business or personal account. [Compare plans and pricing examples](#). You can change your plan anytime in the AWS Management Console.

☒ Basic support - Free

- Recommended for new users just getting started with AWS
- 24x7 self-service access to AWS resources
- For account and billing issues only
- Access to Personal Health Dashboard & Trusted Advisor



☐ Developer support - From \$29/month

- Recommended for developers experimenting with AWS
- Email access to AWS Support during business hours
- 12 (business)-hour response times



☐ Business support - From \$100/month

- Recommended for running production workloads on AWS
- 24x7 tech support via email, phone, and chat
- 1-hour response times
- Full set of Trusted Advisor best-practice recommendations



Need Enterprise level support?

From \$15,000 a month you will receive 15-minute response times and concierge-style experience with an assigned Technical Account Manager. [Learn more](#)

Complete sign up



Congratulations

Thank you for signing up for AWS.
We are activating your account, which should only take a few minutes. You will receive an email when this is complete.

[Go to the AWS Management Console](#)

[Sign up for another account](#) or [contact sales](#).

[Privacy Policy](#) | [Terms of Use](#) | [Cookie Preferences](#) | [Sign Out](#)

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aws

Sign in

☒ **Root user**
Account owner that performs tasks requiring unrestricted access. [Learn more](#)

☐ **IAM user**
User within an account that performs daily tasks. [Learn more](#)

Root user email address

Next

By continuing, you agree to the [AWS Customer Agreement](#) or other agreement for AWS services, and the [Privacy Notice](#). This site uses essential cookies. See our [Cookie Notice](#) for more information.

[New to AWS?](#)

Create a new AWS account

THE OFFICIAL AWS Merch Store

Buy your favorite AWS branded apparel, accessories, and more at our online store.

Shop now »

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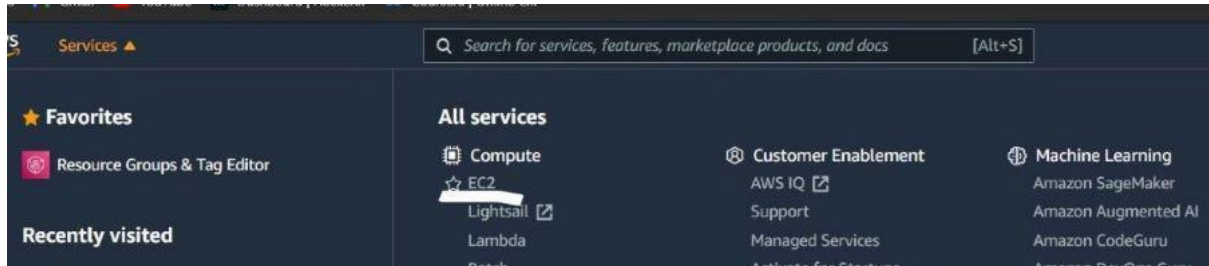
English

Elastic Compute Cloud (EC2)

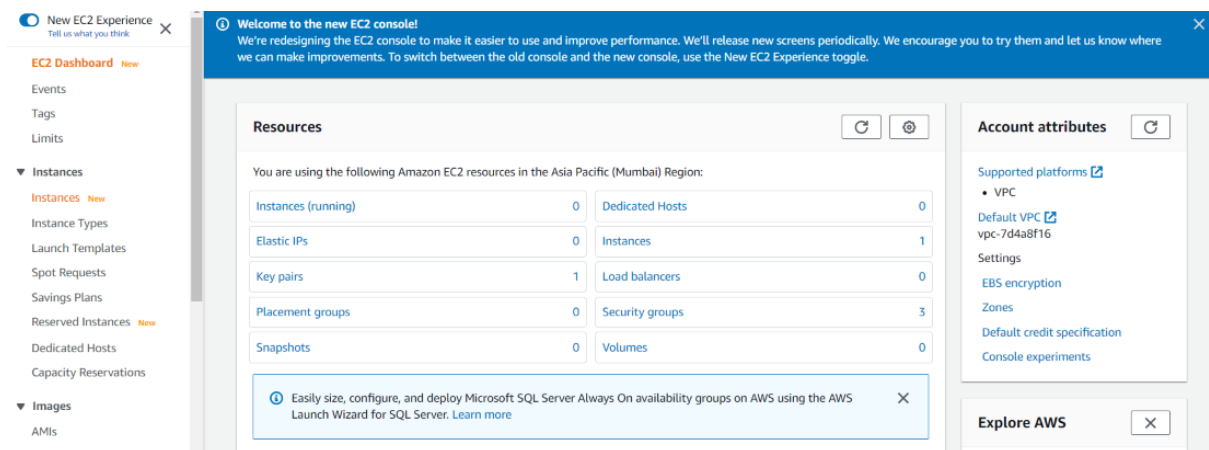
EC2 stands for Elastic Compute Cloud is a service from [Amazon Web Services \(AWS\)](#). EC2 is an on-demand computing service on the AWS cloud platform called instances. It lets you rent virtual computers to run your applications. You pay only for what you use.

Amazon EC2 (Elastic Compute Cloud) Linux Instances

Step 1: First login into your AWS account. Once you are directed to the management console. From the left click on **"Services"** and from the listed options click on **EC2**.



Step 2: Afterward, you will be redirected to the EC2 console. Here is the image attached to refer to various features in EC2.

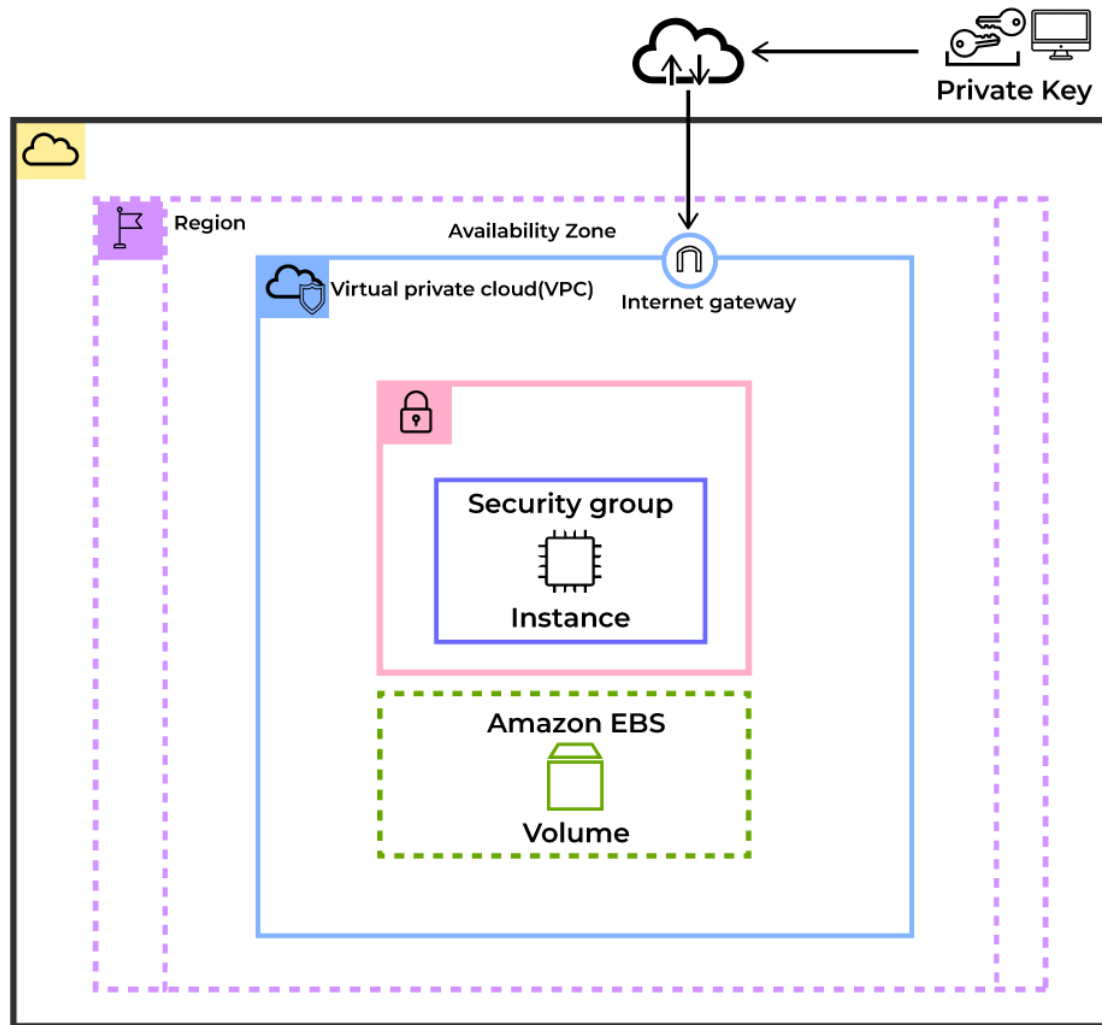


Working of AWS EC2

Instead of buying and managing your own servers, EC2 gives you a virtual machine, where you can run websites, apps, or even big data tasks.

- Choose the memory, storage, and CPU you need, and stop the instance when done.
- EC2 offers secure, reliable, high-performance, and cost-effective infrastructure.
- Deploy applications without managing physical hardware.
- Secure your instance using VPC, Subnets, and Security Groups.
- Attach Auto Scaling to scale EC2 based on demand.
- Automatically scale up or down based on traffic.

The following figure shows the EC2-Instance which is deployed in [VPC \(Virtual Private Cloud\)](#).



Features of AWS EC2 (Elastic Compute Cloud)

The following are the features of AWS EC2:

1. AWS EC2 Functionality

EC2 Offers a virtual computing platform where users can run operations and launch additional EC2 instances. It enhances security and allows full customization of the virtual environment at any time. EC2 provides default [AMI\(Amazon Machine Image\)](#) with pre-configured settings for various operating systems and resources. Users can also create custom AMIs with their preferred configurations and save them for future use, avoiding the need to reconfigure each time.

2. AWS EC2 Operating Systems

Amazon EC2 includes a wide range of operating systems to choose from while selecting your AMI. Not only are these selected options, but users are also even given the privilege to upload their own operating systems and opt for that while selecting AMI during launching an EC2 instance. Currently, AWS has the following most preferred set of operating systems available on the EC2 console.

Select an Operating System



- [Amazon Linux](#)
- Windows Server
- Ubuntu Server
- SUSE Linux
- Red Hat Linux

3. AWS EC2 Software

Amazon is single-handedly ruling the cloud computing market, because of the variety of options available on EC2 for its users. It allows its users to choose from various software present to run on their EC2 machines. This whole service is allocated to AWS Marketplace on the AWS platform. Numerous software like SAP, LAMP, Drupal, etc are available on AWS to use.

4. AWS EC2 Scalability and Reliability

EC2 provides us the facility to scale up or scale down as per the needs. All dynamic scenarios can be easily tackled by EC2 with the help of this feature. And because of the flexibility of volumes and snapshots, it is highly reliable for its users. Due to the scalable nature of the machine, many organizations like Flipkart, and Amazon rely on these days whenever humongous traffic occurs on their portals.

Amazon S3

What is Amazon S3?

Amazon S3 is a Simple Storage Service in [AWS](#) that stores files of different types like Photos, Audio, and Videos as Objects providing more scalability and security to. It allows the users to store and retrieve any amount of data at any point in time from anywhere on the web. It facilitates features such as extremely high availability, security, and simple connection to [other AWS Services](#).

What is Amazon S3 Used for?

Amazon S3 is used for various purposes in the Cloud because of its robust features with scaling and Securing of data. It helps people with all kinds of use cases from fields such as Mobile/Web applications, [Big data](#), [Machine Learning](#) and many more. The following are a few Wide Usage of Amazon S3 service.

- **Data Storage:** Amazon s3 acts as the best option for scaling both small and large storage applications. It helps in storing and retrieving the data-intensive applications as per needs in ideal time.

- **Backup and Recovery:** Many Organizations are using Amazon S3 to backup their critical data and maintain the data durability and availability for recovery needs.
- **Hosting Static Websites:** Amazon S3 facilitates in storing HTML, CSS and other web content from Users/developers allowing them for hosting Static Websites benefiting with low-latency access and cost-effectiveness. To know more detailing refer this Article - [How to host static websites using Amazon S3](#)
- **Data Archiving:** [Amazon S3 Glacier](#) service integration helps as a cost-effective solution for long-term data storing which are less frequently accessed applications.
- **Big Data Analytics:** Amazon S3 is often considered as data lake because of its capacity to store large amounts of both structured and unstructured data offering seamless integration with other AWS Analytics and AWS Machine Learning Services.

What is an Amazon S3 bucket?

Amazon S3 bucket is a fundamental Storage Container feature in AWS S3 Service. It provides a secure and scalable repository for storing of Objects such as Text data, Images, Audio and Video files over AWS Cloud. Each S3 bucket name should be named globally unique and should be configured with ACL (Access Control List).

How Does Amazon S3 works?

Amazon S3 works on organizing the data into unique S3 Buckets, customizing the buckets with Access controls. It allows the users to store objects inside the S3 buckets with facilitating features like versioning and lifecycle management of data storage with scaling. The following are a few main features of Amazon s3:

1. Amazon S3 Buckets and Objects

Amazon S3 Bucket: Data, in S3, is stored in containers called *buckets*. Each bucket will have its own set of policies and configurations. This enables users to have more control over their data. Bucket Names must be unique. Can be thought of as a parent folder of data. There is a limit of 100 buckets per AWS account. But it can be increased if requested by AWS support.

Amazon S3 Objects: Fundamental entity type stored in AWS S3. You can store as many objects as you want to store. The maximum size of an AWS S3 bucket is 5TB. It consists of the following:

- Key
- Version ID
- Value
- Metadata
- Subresources
- Access control information
- Tags

2. Amazon S3 Versioning and Access Control

S3 Versioning: Versioning means always keeping a record of previously uploaded files in S3. Points to Versioning are not enabled by default. Once enabled, it is enabled for all objects in a bucket. Versioning keeps all the copies of your file, so, it adds cost for storing multiple copies of your data. For example, 10 copies of a file of size 1GB will have you charged for using 10GBs for S3 space. Versioning is helpful to prevent unintended overwrites and deletions. Objects with the same key can be stored in a bucket if versioning is enabled (since they have a unique version ID). To know more about versioning refer this article - [Amazon S3 Versioning](#)

Access control lists (ACLs): A document for verifying access to S3 buckets from outside your AWS account. An [ACL](#) is specific to each bucket. You can utilize S3 Object Ownership, an Amazon S3 bucket-level feature, to manage who owns the objects you upload to your bucket and to enable or disable ACLs.

3. Bucket policies and Life Cycles

Bucket Policies: A document for verifying the access to S3 buckets from within your AWS account, controls which services and users have what kind of access to your S3 bucket. Each bucket has its own Bucket Policies.

Lifecycle Rules: This is a cost-saving practice that can move your files to AWS Glacier (The AWS Data Archive Service) or to some other S3 storage class for cheaper storage of old data or completely delete the data after the specified time. To know more about refer this article - [Amazon S3 Life Cycle Management](#)

4. Keys and Null Objects

Keys: The key, in S3, is a unique identifier for an object in a bucket. For example in a bucket 'ABC' your GFG.java file is stored at javaPrograms/GFG.java then 'javaPrograms/GFG.java' is your object key for GFG.java.

Null Object: Version ID for objects in a bucket where versioning is suspended is null. Such objects may be referred to as null objects. List) and Other settings for managing data efficiently.

How To Use an Amazon S3 Bucket?

You can use the Amazon S3 buckets by following the simple steps which are mentioned below. To know more how to configure about Amazon S3 refer to the [Amazon S3 – Creating a S3 Bucket](#).

Step 1: Login into the Amazon account with your credentials and search for S3 and click on the S3. Now click on the option which is "Create bucket" and configure all the options which are shown while configuring.

Step 2: After configuring the AWS bucket now upload the objects into the buckets based upon your requirement. By using the AWS console or by using AWS CLI following is the command to upload the object into the AWS S3 bucket.

```
aws s3 cp <local-file-path> s3://<bucket-name>/
```

Step 3: You can control the permissions of the objects which was uploaded into the S3 buckets and also who can access the bucket. You can make the bucket public or private by default the S3 buckets will be in private mode.

Step 4: You can manage the [S3 bucket lifecycle management](#) by transitioning. Based upon the rules that you defined S3 bucket will be transitioning into different storage classes based on the age of the object which is uploaded into the S3 bucket.

Step 5: You need to turn on to enable the services to monitor and analyze S3. You need to enable the S3 access logging to record who was requesting the objects which are in the S3 buckets.

What are the types of S3 Storage Classes?

AWS S3 provides multiple storage types that offer different performance and features and different cost structures.

- **Standard:** Suitable for frequently accessed data, that needs to be highly available and durable.
- **Standard Infrequent Access (Standard IA):** This is a cheaper data-storage class and as the name suggests, this class is best suited for storing infrequently accessed data like log files or data archives. Note that there may be a per GB data retrieval fee associated with the Standard IA class.
- **Intelligent Tiering:** This service class classifies your files automatically into frequently accessed and infrequently accessed and stores the infrequently accessed data in infrequent access storage to save costs. This is useful for unpredictable data access to an S3 bucket.
- **One Zone Infrequent Access (One Zone IA):** All the files on your S3 have their copies stored in a minimum of 3 Availability Zones. One Zone IA stores this data in a single availability zone. It is only recommended to use this storage class for infrequently accessed, non-essential data. There may be a per GB cost for data retrieval.
- **Reduced Redundancy Storage (RRS):** All the other S3 classes ensure the durability of 99.999999999%. RRS only ensures 99.99% durability. AWS no longer recommends RRS due to its less durability. However, it can be used to store non-essential data.

To know more about , refer this article - [Amazon S3 Storage Classes](#)

How to Upload and Manage Files on Amazon S3?

Firstly you have to Amazon s3 bucket for uploading and managing the files on Amazon S3. Try to create the S3 Bucket as discussed above. Once the S3 Bucket is created, you can upload the files through various ways such as AWS SDKs, AWS CLI, and Amazon S3 Management Console. Try managing the files by organizing them into folders within the S3 Bucket and applying access controls to secure the access. Features like Versioning and Lifecycle policies provide the management of data efficiently with optimization of storage classes.

To know more detailing refer this article - [How to Store and Download Objects in Amazon S3?](#)

How to Access Amazon S3 Bucket?

You can work and access the Amazon S3 bucket by using any one of the following methods

1. AWS Management Console
2. AWS CLI Commands
3. Programming Scripts (Using boto3 library of Python)

1. AWS Management Console

You can access the AWS S3 bucket using the AWS management console which is a web-based user interface. Firstly you need to create an AWS account and login to the Web console and from there you can choose the S3 bucket option from Amazon S3 service. (AWS Console >> Amazon S3 >> S3 Buckets)

2. AWS CLI Commands

In this methods firstly you have to install the aws cli software in the terminal and try on configuring the aws account with access key, secret key and the default region. Then on taking the ``aws --help`` , you can figure out the s3 service usage. For example , To view try on running following command:

```
aws s3 ls
```

3. Programming scripts

You can configure the Amazon S3 bucket by using a scripting programming languages like Python and with using libraries such as **boto3 library** you can perform the AWS S3 tasks. To know more about refer this article - [How to access Amazon S3 using python script.](#)

AWS S3 Bucket Permissions

You can manage the permission of S3 buckets by using several methods following are a few of them.

1. **Bucket Policies:** Bucket policies can be attached directly to the S3 bucket and they are in JSON format which can perform the bucket level operations. With the help of bucket policies, you can grant permissions to the users who can access the objects present in the bucket. If you grant permissions to any user he can download, and upload the objects to the bucket. You can create the [bucket policy by using Python](#).
2. **Access Control Lists (ACLs):** ACLs are legacy access control mechanisms for S3 buckets instead of ACLs we are using the bucket policies to control the permissions of the S3 bucket. By using ACL you can grant the read, and access to the S3 bucket or you can make the objects public based on the requirements.
3. **IAM Policies:** IAM policies are mostly used to manage the permissions to the users and groups and resources available in the AWS by using the IAM roles options. You can attach an IAM policy to an IAM entity (user, group, or role) granting them access to specific S3 buckets and operations.

The most effective way to control the permissions to the S3 buckets is by using bucket policies.

Features of Amazon S3

- **Durability:** AWS claims Amazon S3 to have a 99.999999999% of durability (11 9's). This means the possibility of losing your data stored on S3 is one in a billion.
- **Availability:** AWS ensures that the up-time of AWS S3 is 99.99% for standard access.
 - Note that availability is related to being able to access data and durability is related to losing data altogether.
- **Server-Side-Encryption (SSE):** AWS S3 supports three types of SSE models:
 - **SSE-S3:** AWS S3 manages encryption keys.

- **SSE-C:** The customer manages encryption keys.
- **SSE-KMS:** The AWS Key Management Service (KMS) manages the encryption keys.
- **File Size support:** AWS S3 can hold files of size ranging from 0 bytes to 5 terabytes. A 5TB limit on file size should not be a blocker for most of the applications in the world.
- **Infinite storage space:** Theoretically AWS S3 is supposed to have infinite storage space. This makes S3 infinitely scalable for all kinds of use cases.
- **Pay as you use:** The users are charged according to the S3 storage they hold.

Advantages of Amazon S3

1. **Scalability:** Amazon S3 can be scalable horizontally which makes it handle a large amount of data. It can be scaled automatically without human intervention.
2. **High availability:** AmazonS3 bucket is famous for its high availability nature you can access the data whenever you required it from any region. It offers a Service Level Agreement (SLA) guaranteeing 99.9% uptime.
3. **Data Lifecycle Management:** You can manage the data which is stored in the S3 bucket by automating the transition and expiration of objects based on predefined rules. You can automatically move the data to the Standard-IA or Glacier, after a specified period.
4. **Integration with Other AWS Services:** You can integrate the S3 bucket service with different services in the AWS like you can integrate with the AWS lambda function where the lambda will be triggered based upon the files or objects added to the S3 bucket.