Difference between cloud and traditional computing

1. Cloud Computing :

Cloud Computing, as name suggests, is collective combination of configurable system resources and advanced service that can be delivered quickly using internet. It simply provides lower power expenses, no capital costs, no redundancy, lower employee costs, increased collaboration, etc. It makes us more efficient, more secure, and provide greater flexibility.

- It refers to delivery of different services such as data and programs through internet on different servers.
- It takes place on third-party servers that is hosted by third-party hosting companies.
- It is ability to access data anywhere at any time by user.
- It is more cost effective as compared to tradition computing as operation and maintenance of server is shared among several parties that in turn reduce cost of public services.
- It is more user-friendly as compared to traditional computing because user can have access to data anytime anywhere using internet.
- It requires fast, reliable and stable internet connection to access information anywhere at any time.
- It provides more storage space and servers as well as more computing power so that applications and software run must faster and effectively.
- It also provides scalability and elasticity i.e., one can increase or decrease storage capacity, server resources, etc., according to business needs.
- Cloud service is served by provider's support team.
- Software is offered as an on-demand service (SaaS) that can be accessed through subscription service.

2. Traditional Computing :

Traditional Computing, as name suggests, is a possess of using physical data centers for storing digital assets and running complete networking system for daily operations. In this, access to data, or software, or storage by users is limited to device or official network they are connected with. In this computing, user can have access to data only on system in which data is stored.

- It refers to delivery of different services on local server.
- It takes place on physical hard drives and website servers.
- User can access data only on system in which data is stored.
- It is less cost effective as compared to cloud computing because one has to buy expensive equipment's to operate and maintain server.
- It is less user-friendly as compared to cloud computing because data cannot be accessed anywhere and if user has to access data in another system, then he need to save it in external storage medium.
- It does not require any internet connection to access data or information.
- It provides less storage as compared to cloud computing.
- It does not provide any scalability and elasticity.

- It requires own team to maintain and monitor system that will need a lot of time and efforts.
- Software in purchased individually for every user and requires to be updated periodically.

Cloud in real life

The most popular apps

- Office 365 that is the mail gateway to enable users or companies use the services of Microsoft office online from the friendly interface to add or remove email boxing .
- ZS caler that enables the admin to manage the sites and apps which the employees can open that is dependent on the policies that admin add it .

Examples of Cloud Storage : Dropbox, Gmail, Facebook .

Dropbox is the clear leader in streamlined cloud storage allowing users to access files on any device through its application or website with up to 1 terabyte of free storage.

Google's email service provider Gmail, on the other hand, provides unlimited storage on the cloud. Gmail has revolutionized the way we send emails and largely responsible for the increased usage of email worldwide.

Facebook is a mix of the two, in that it can store an infinite amount of information, images, and videos on your profile. They can then be easily accessed on multiple devices. Facebook goes a step further with their Messenger app, which allows for profiles to exchange data.

Examples of Cloud Computing in Education : SlideRocket, Ratatype, Amazon Web Services .

Education is increasingly adopting advanced technology because students already are. So, in an effort to modernize classrooms, educators have introduced e-learning software like SlideRocket.

SlideRocket is a platform that students can use to build presentations and submit them. Students can even present them through web conferencing all on the cloud. Another tool teachers use is Ratatype, which helps students learn to type faster and offers online typing tests to track their progress.

For school administration, Amazon's AWS Cloud for K12 and Primary Education features a virtual desktop infrastructure (VDI) solution. Through the cloud, allows instructors and students to access teaching and learning software on multiple devices.

Examples of Cloud Computing in Healthcare : ClearDATA, Dell's Secure Healthcare Cloud, IBM Cloud .

Cloud computing lets nurses, physicians, and administrators share information quickly from anywhere. It also saves on costs by allowing large data files to be shared instantly for maximum convenience. This is a major boost for efficiency.

Ultimately, cloud technology ensures patients receive the best possible care without unnecessary delay. The patient's condition can also be updated in seconds through remote conferencing.

However, many modern hospitals have yet to implement cloud computing but are forecasted to do so in the near future.

Characteristics of cloud computing

- Agility .
- High availability & DR .
- Fault tolerance .
- Scalability & elasticity .
- Global access .
- Security .

Cloud Deployment models

The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. Relationships between the infrastructure and your users are also defined by cloud deployment types.

Different types of cloud computing deployment models are:

- Public cloud
- Private cloud
- Hybrid cloud
- Community cloud

Public Cloud

The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open for everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups. The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services. This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers. In this arrangement, storage backup and retrieval services are given for free, as a subscription, or on a per-use basis. Example: Google App Engine etc.

Advantages of the public cloud model:

- Minimal Investment: Because it is a pay-per-use service, there is no substantial upfront fee, making it excellent for enterprises that require immediate access to resources.
- No setup cost: The entire infrastructure is fully subsidized by the cloud service providers, thus there is no need to set up any hardware.

- Infrastructure Management is not required: Using the public cloud does not necessitate infrastructure management.
- No maintenance: The maintenance work is done by the service provider (Not users).
- Dynamic Scalability: To fulfill your company's needs, on-demand resources are accessible.

Private Cloud

The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer). There is no need to share your hardware with anyone else. The distinction between private and public cloud is in how you handle all of the hardware. It is also called the "internal cloud" & it refers to the ability to access systems and services within a given border or organization. The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organization's IT department. The private cloud gives the greater flexibility of control over cloud resources.

Advantages of the private cloud model:

- Better Control: You are the sole owner of the property. You gain complete command over service integration, IT operations, policies, and user behavior.
- Data Security and Privacy: It's suitable for storing corporate information to which only authorized staff have access. By segmenting resources within the same infrastructure, improved access and security can be achieved.
- Supports Legacy Systems: This approach is designed to work with legacy systems that are unable to access the public cloud.
- Customization: Unlike a public cloud deployment, a private cloud allows a company to tailor its solution to meet its specific needs.

Hybrid cloud

By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.

Advantages of the hybrid cloud model:

- Flexibility and control: Businesses with more flexibility can design personalized solutions that meet their particular needs.
- Cost: Because public clouds provide for scalability, you'll only be responsible for paying for the extra capacity if you require it.
- Security: Because data is properly separated, the chances of data theft by attackers are considerably reduced.

Community cloud

It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific

needs of a community, industry, or business. The infrastructure of the community could be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.

Advantages of the community cloud model:

- Cost Effective: It is cost-effective because the cloud is shared by multiple organizations or communities.
- Security: Community cloud provides better security.
- Shared resources: It allows you to share resources, infrastructure, etc. with multiple organizations.
- Collaboration and data sharing: It is suitable for both collaboration and data sharing.

Cloud Services Models

IaaS

This is Infrastructure as a service . In IaaS model , Customer rent servers , storage , networks and other computing resources from the cloud service provider with consumption – based model – (pay as you go . The customer is able to instantly deploy computing infrastructure , provisioned and managed over the internet . We don't need capex. The customer is responsible for OS and apps . The cloud services providers are responsible for managing underlying infra .

PaaS

Platform as a service . In PaaS , Customer rent platform that enabled him to deploy , run apps as quickly , customer doesn't manage the underlying cloud infra . Customer runs his apps with consumption – based model – (pay as you go) . Cloud provider takes the responsibility of maintaining OS and webserver . . We don't need capex . Customer cares about developing his apps . CSP is responsible for managing underlying Infra , OS , and platform .

SaaS

Software as a service . In SaaS model , Customer rent a ready SW which is hosted and managed by the cloud service provider . Customer can use SaaS with different pricing model (per month , per year , per user, per capacity , and so on) . We don't need capex . CSP is responsible for managing and upgrading underlying Infra , OS , platform , and SW .

AWS Interfaces

User can create or manage resources in three ways:

- **AWS management console**
  Provide GUI to create and manage resources through web, but in the mobile app the user can view the services only
- **AWS CLI**
  Enables you to manage, automate, and repeat resources deployment via commands

- **SDKs**
  Enables you to manage AWS resources using programming, customize AWS features, integrate with your own tools, and apps.

Cloud watch

Enables you to monitor services to send alarm if you exceeds a certain price limit

Cloud Trial

Tracks and records user activity and API usage

IAM

- AWS Identity and Access Management (IAM) is a web service that helps you securely control access to AWS resources. You use IAM to control who is authenticated (signed in) and authorized (has permissions) to use resources.
- When you first create an AWS account, you begin with a single sign-in identity that has complete access to all AWS services and resources in the account. This identity is called the AWS account root user and is accessed by signing in with the email address and password that you used to create the account. We strongly recommend that you do not use the root user for your everyday tasks, even the administrative ones. Instead, adhere to the best practice of using the root user only to create your first IAM user. Then securely lock away the root user credentials and use them to perform only a few account and service management tasks.

IAM Features

- **Shared access to your AWS account**
  You can grant other people permission to administer and use resources in your AWS account without having to share your password or access key.
- **Granular permissions**
  You can grant different permissions to different people for different resources. For example, you might allow some users complete access to Amazon Elastic Compute Cloud (Amazon EC2), Amazon Simple Storage Service (Amazon S3), Amazon DynamoDB, Amazon Redshift, and other AWS services. For other users, you can allow read-only access to just some S3 buckets, or permission to administer just some EC2 instances, or to access your billing information but nothing else.
- **Secure access to AWS resources for applications that run on Amazon EC2**
  You can use IAM features to securely provide credentials for applications that run on EC2 instances. These credentials provide permissions for your application to access other AWS resources. Examples include S3 buckets and DynamoDB tables.

- **Multi-factor authentication (MFA)**

You can add two-factor authentication to your account and to individual users for extra security. With MFA you or your users must provide not only a password or access key to work with your account, but also a code from a specially configured device.

- **Identity federation**
  You can allow users who already have passwords elsewhere—for example, in your corporate network or with an internet identity provider—to get temporary access to your AWS account.
- **Identity information for assurance**
  If you use AWS CloudTrail, you receive log records that include information about those who made requests for resources in your account. That information is based on IAM identities.
- **PCI DSS Compliance**
  IAM supports the processing, storage, and transmission of credit card data by a merchant or service provider, and has been validated as being compliant with Payment Card Industry (PCI) Data Security Standard (DSS). For more information about PCI DSS, including how to request a copy of the AWS PCI Compliance Package, see PCI DSS Level1.
- **Integrated with many AWS services**
  For a list of AWS services that work with IAM, see AWS services that work with IAM.
- **Eventually Consistent**
  IAM, like many other AWS services, is eventually consistent. IAM achieves high availability by replicating data across multiple servers within Amazon's data centers around the world. If a request to change some data is successful, the change is committed and safely stored. However, the change must be replicated across IAM, which can take some time. Such changes include creating or updating users, groups, roles, or policies. We recommend that you do not include such IAM changes in the critical, high-availability code paths of your application. Instead, make IAM changes in a separate initialization or setup routine that you run less frequently. Also, be sure to verify that the changes have been propagated before production workflows depend on them. For more information, see Changes that I make are not always immediately visible.
- **Free to use**
  AWS Identity and Access Management (IAM) and AWS Security Token Service (AWS STS) are features of your AWS account offered at no additional charge. You are charged only when you access other AWS services using your IAM users or AWS STS temporary security credentials. For information about the pricing of other AWS products, see the Amazon Web Services pricing page.

EC2

Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud. Using Amazon EC2 eliminates your need to invest in hardware up front, so you can develop and deploy applications faster. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

Characteristics of EC2

- Pay as you go
- Broad selection of hardware
- OSs [Windows, and Linux]
- Global hosting

EC2 Instances (Families, Types, Sizes)

- **General purpose .**
  General purpose instances provide a balance of compute, memory and networking resources, and can be used for a variety of diverse workloads. These instances are ideal for applications that use these resources in equal proportions such as web servers and code repositories.
- **Compute Optimized**
  Compute Optimized instances are ideal for compute bound applications that benefit from high performance processors. Instances belonging to this family are well suited for batch processing workloads, media transcoding, high performance web servers, high performance computing (HPC), scientific modeling, dedicated gaming servers and ad server engines, machine learning inference and other compute intensive applications.
- **Memory Optimized**
  Memory optimized instances are designed to deliver fast performance for workloads that process large data sets in memory.
- **Storage Optimized**
  Storage optimized instances are designed for workloads that require high, sequential read and write access to very large data sets on local storage. They are optimized to deliver tens of thousands of low-latency, random I/O operations per second (IOPS) to applications.
- **Accelerated Computing**
  Accelerated computing instances use hardware accelerators, or co-processors, to perform functions, such as floating point number calculations, graphics processing, or data pattern matching, more efficiently than is possible in software running on CPUs.

EC2 instance purchasing options

Amazon EC2 provides the following purchasing options to enable you to optimize your costs based on your needs:

- **On-Demand Instances** – Pay, by the second, for the instances that you launch.
- **Savings Plans** – Reduce your Amazon EC2 costs by making a commitment to a consistent amount of usage, in USD per hour, for a term of 1 or 3 years.
- **Reserved Instances** – Reduce your Amazon EC2 costs by making a commitment to a consistent instance configuration, including instance type and Region, for a term of 1 or 3 years.

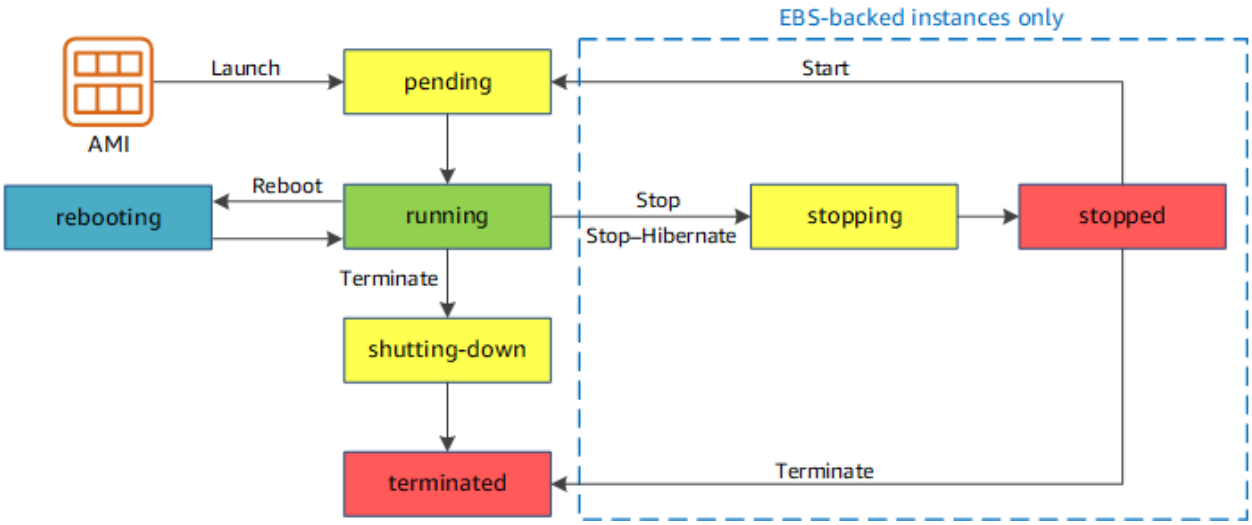
- **Spot Instances** – Request unused EC2 instances, which can reduce your Amazon EC2 costs significantly.
- **Dedicated Hosts** – Pay for a physical host that is fully dedicated to running your instances, and bring your existing per-socket, per-core, or per-VM software licenses to reduce costs.
- **Dedicated Instances** – Pay, by the hour, for instances that run on single-tenant hardware.
- **Capacity Reservations** – Reserve capacity for your EC2 instances in a specific Availability Zone for any duration.

If you require a capacity reservation, purchase Reserved Instances or Capacity Reservations for a specific Availability Zone. Spot Instances are a cost-effective choice if you can be flexible about when your applications run and if they can be interrupted. Dedicated Hosts or Dedicated Instances can help you address compliance requirements and reduce costs by using your existing server-bound software licenses.

EC2 Instance lifecycle

An Amazon EC2 instance transitions through different states from the moment you launch it through to its termination .

Instance state	Description	Instance usage billing
`pending`	The instance is preparing to enter the `running` state. An instance enters the `pending` state when it launches for the first time, or when it is started after being in the `stopped` state.	Not billed
`running`	The instance is running and ready for use.	Billed
`stopping`	The instance is preparing to be stopped or stop-hibernated.	Not billed if preparing to stop Billed if preparing to hibernate
`stopped`	The instance is shut down and cannot be used. The instance can be started at any time.	Not billed
`shutting-down`	The instance is preparing to be terminated.	Not billed
`terminated`	The instance has been permanently deleted and cannot be started.	Not billed **Note** Reserved Instances that applied to terminated instances are billed until the end of their term according to their payment option. For more information, see Reserved Instances


EBS-backed instances only
AMI
Launch
pending
Start
rebooting
Reboot
running
Stop
Stop–Hibernate
stopping
stopped
Terminate
shutting-down
terminated
Terminate