Cloud Computing Syllabus

Syllabus to be covered in Cloud Computing Course

Cloud Computing Introduction:-

Client Side History - Server Side History - Why cloud computing - Why Cloud computing in IOT - Cloud Computing Types - Advantages and Disadvantages of Cloud Computing - Cloud Computing Uses - Cloud Computing Tech wise History Cloud Computing Introduction, Advantages and Disadvantages of Cloud Computing, History of Cloud Computing, Web hosting Vs Cloud Hosting

History of the Cloud Computing:-

Why the word Cloud Computing - What's there in the Cloud - Cloud Computing vs Cost - Cloud Computing Types - Cloud Computing Benefits - Cloud Computing Classification - Private Cloud vs Public Cloud - What is Private Cloud - What is Public Cloud - What is Hybrid Cloud-Cloud in the real time world - PAAS vs IAAS vs SAAS- On-premise Infrastructure vs Infrastructure as a service - Top Cloud providers - AWS Intro - What is Web Service?-How Web Service works? - Real time web service examples – Web services Vs REST API - AWS Services Intro - How to create account and access account in cloud server

AWS:-

AWS Overview - Why AWS - AWS Services - Storage based services - Static Website Hosting based services - Dynamic Website Hosting based services – Relational databases - NoSQL Databases - Network Creation based services - AWS Resource manage services

AWS Storage & CDN Services:-

AWS Storage and CDN - Aws S3 bucket - Elastic Block Store - Amazon cloud front - AWS Glacier - AWS Storage Gateway - AWS Import Export

Networking Services:-

Auto Scaling-Elastic Load Balancing - Amazon WorkSpace - Amazon virtual private cloud (amazon vpc) - AWS Route 53 - Amazon Direct Connect - Computation Services - AWS EC2

AWS Database:-

What is NoSQL Database - What is JSON - Dynamodb - AWS Nosql Database – AWS ElastiCache - What is Relational Database - AWS RDS - Amazon Redshift – Amazon Snowball / Amazon Migration services - rds proxy - Rds Mirroring and replication

AWS AppServices:-

AWS cloudSearch - aws Elastic Transcoder - Amazon email sending services - AWS SES - AWS SNS - Push notification services - AWS SQS - Message Queue Service – AWS SWF Workflow Service - AWS AppStream

AWS Deployment and Management:-

AWS CloudFormation - AWS CloudWatch - AWS Elastic Beanstalk - AWS IAM - AWS Cloud Trail - AWS OpsWorks - AWS CloudHSM

Cloud Computing Introduction

Cloud computing is a virtualization-based technology that allows us to create, configure, and customize applications via an internet connection. The cloud technology includes a development platform, hard disk, software application, and database.

What is Cloud Computing:-

The term cloud refers to a network or the internet. It is a technology that uses remote servers on the internet to store, manage, and access data online rather than local drives. The data can be anything such as files, images, documents, audio, video, and more.Cloud computing is the delivery of on-demand computing services -- from applications to storage and processing power -- typically over the internet and on a pay-as-you-go basis.Cloud Computing is often far more secure than traditional computing, because companies like Google and Amazon can attract and retain cyber-security personnel of a higher quality than many governmental agencies.

There are the following operations that we can do using cloud computing:

- Developing new applications and services

- Storage, back up, and recovery of data

- Hosting blogs and websites

- Delivery of software on demand

- Analysis of data

- Streaming videos and audios

Why Cloud Computing?:-

Small as well as large IT companies, follow the traditional methods to provide the IT infrastructure. That means **for any IT company, we need a Server Room that is the basic need of IT companies**.

A fundamental concept behind cloud computing is that the location of the service, and many of the details such as the hardware or operating system on which it is running, are largely irrelevant to the user.

It's with this in mind that the metaphor of the cloud was borrowed from old telecoms network schematics, in which the public telephone network (and later the internet) was often represented as a cloud to denote that the just didn't matter -- it was just a cloud of stuff. This is an over-simplification of course; for many customers location of their services and data remains a key issue.

In that server room, there should be a database server, mail server, networking, firewalls, routers, modem, switches, QPS (Query Per Second means how much queries or load will be handled by the server), configurable system, high net speed, and the maintenance engineers.

To establish such IT infrastructure, we need to spend lots of money. To overcome all these problems and to reduce the IT infrastructure cost, Cloud Computing comes into existence.
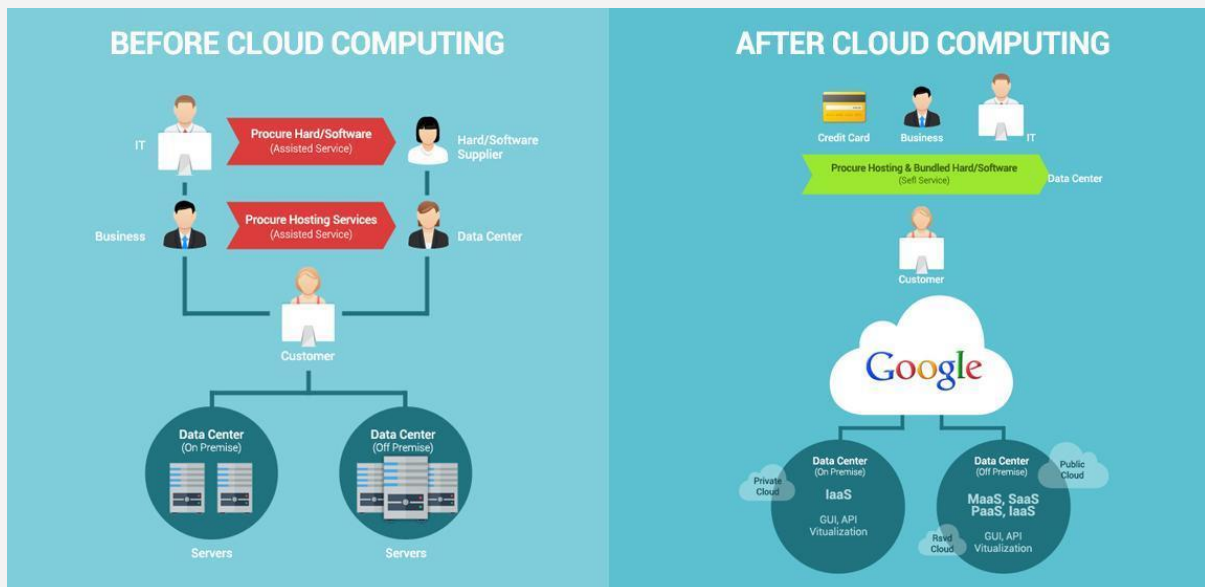
Characteristics of Cloud Computing

The characteristics of cloud computing are given below:

1) Agility:-

- The cloud **works in a distributed computing environment**. It shares resources among users and works very fast. Cloud Agility means rapid provisioning of computer resources using cloud computing. I always believe the two major purposes of cloud computing are: it helps you get started immediately, and you can pay only for what you use

2) High availability and reliability:-

- The availability of servers is high and more reliable because the **chances of infrastructure failure are minimum**.

3) High Scalability:-

- Cloud offers **"on-demand" provisioning of resources on a large scale**, without having engineers for peak loads.

4) Multi-Sharing:-

- With the help of cloud computing, **multiple users and applications can work more**

- **efficiently** with cost reductions by sharing common infrastructure.

5) Device and Location Independence:-

- Cloud computing enables the users to access systems using a web browser regardless of their location or what device they use e.g. PC, mobile phone, etc. **As infrastructure is off-site** (typically provided by a third-party) **and accessed via the Internet, users can connect from anywhere**.

6) Maintenance:-

- Maintenance of cloud computing applications is easier, since they **do not need to be installed on each user's computer and can be accessed from different places**. So, it reduces the cost also.

7) Low Cost:-

- By using cloud computing, the cost will be reduced because to take the services of cloud computing, **IT company need not to set its own infrastructure** and pay-as-per usage of resources.

8) Services in the pay-per-use mode:-

- Application Programming Interfaces **(APIs) are provided to the users so that they can access services on the cloud** by using these APIs **and pay the charges as per the usage of services**.

9) Rapid Elasticity:-

Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

10) On-Demand Self-Service:-

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Advantages and Disadvantages

Advantages of Cloud Computing:-

As we all know that Cloud computing is trending technology. Almost every company switched their services on the cloud to rise the company growth.

Here, we are going to discuss some important advantages of Cloud Computing-
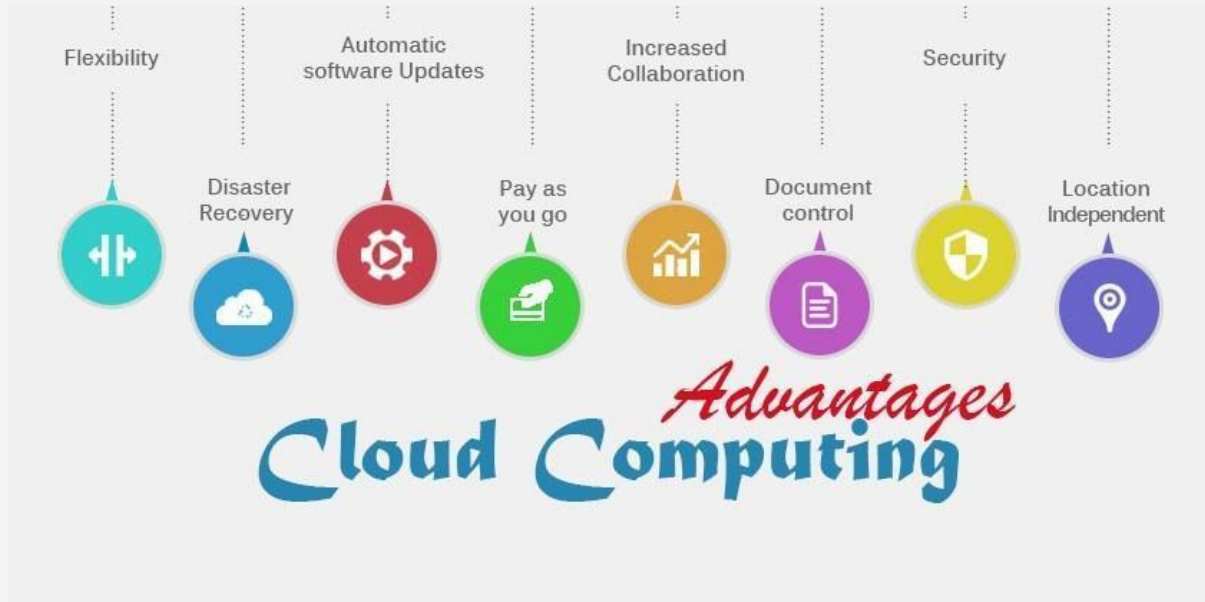
1) Back-up and restore data:-

- Once the data is stored in the cloud, it is easier to get back-up and restore that data using the cloud.

2) Improved collaboration:-

- Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage.

- If your business has two employees or more, then you should be making collaboration a top priority. After all, there isn't much point to having a team if it is unable to work like a team. Cloud computing makes collaboration a simple process.

- Team members can view and share information easily and securely across a cloud-based platform.

- Some cloud-based services even provide collaborative social spaces to connect employees across your organization, therefore increasing interest and engagement. Collaboration may be possible without a cloud-computing solution, but it will never be as easy, nor as effective.

3) Excellent accessibility:-

- Cloud allows us to quickly and easily access store information anywhere, anytime in the whole world, using an internet connection.

- An internet cloud infrastructure increases organization productivity and efficiency by ensuring that our data is always accessible.

- Cloud computing offers simplified and enhanced IT maintenance and management capacities by agreements backed by SLA, central resource administration and managed infrastructure.

- You get to enjoy a basic user interface without any requirement for installation.

- Plus you are assured guaranteed and timely management, maintenance, and delivery of the IT services.

4) Low maintenance cost:-

- Cloud computing reduces both hardware and software maintenance costs for organizations.The services are free from capital expenditure. There are no huge costs of hardware in cloud computing. You just have to pay as you operate it and enjoy the model based on your subscription plan.

5) Mobility:-

- Cloud computing allows us to easily access all cloud data via mobile.

- Cloud computing allows mobile access to corporate data via smartphones and devices, which, considering over 2.6 billion smartphones are being used globally today, is a great way to ensure that no one is ever left out of the loop.

- Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up to date with clients and co-worker.
Through the cloud, you can offer conveniently accessible information to sales staff who travel, freelance employees, or remote employees, for better work-life balance.

- Therefore, it's not surprising to see that organizations with employee satisfaction listed as a priority are up to 24% more likely to expand cloud usage.

6) IServices in the pay-per-use model:-

- Cloud computing offers Application Programming Interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

7) Unlimited storage capacity:-

- Cloud offers us a huge amount of storing capacity for storing our important data such as documents, images, audio, video, etc. in one place.

8) Data security:-

- Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled

- .A cloud host's full-time job is to carefully monitor security, which is significantly more efficient than a conventional in-house system, where an organization must divide its efforts between a myriad of IT concerns, with security being only one of them.

- And while most businesses don't like to openly consider the possibility of internal data theft, the truth is that a staggeringly high percentage of data thefts occur internally and are perpetrated by employees.

Disadvantages of Cloud Computing:-

A list of the disadvantage of cloud computing is given below -

1) Internet Connectivity:-

- As you know, in cloud computing, every data (image, audio, video, etc.) is stored on the cloud, and we access these data through the cloud by using the internet connection. If you do not have good internet connectivity, you cannot access these data. However, we have no any other way to access data from the cloud.

2) Vendor lock-in:-

- Vendor lock-in is the biggest disadvantage of cloud computing. Organizations may face problems when transferring their services from one vendor to another. As different vendors provide different platforms, that can cause difficulty moving from one cloud to another.

3) Vulnerability to attacks:-

- Storing data in the cloud may pose serious challenges of information theft since in the cloud every data of a company is online. Security breach is something that even the best organizations have suffered from and it's a potential risk in the cloud as well. Although advanced security measures are deployed on the cloud, still storing confidential data in the cloud can be a risky affair.

4) Network connectivity dependency:-

Cloud Computing is entirely dependent on the Internet. This direct tie-up with the Internet means that a company needs to have reliable and consistent Internet service as well as a fast connection and bandwidth to reap the benefits of Cloud Computing.

5) Downtime:-

- Downtime is considered as one of the biggest potential downsides of using Cloud Computing. The cloud providers may sometimes face technical outages that can happen due to various reasons, such as loss of power, low Internet connectivity, data centers going out of

6) Limited Control:-

- As we know, cloud infrastructure is completely owned, managed, and monitored by the service provider, so the cloud users have less control over the function and execution of services within a cloud infrastructure.

7) Security:-

- Although cloud service providers implement the best security standards to store important information. But, before adopting cloud technology, you should be aware that you will be sending all your organization's sensitive information to a third party, i.e., a cloud computing service provider. While sending the data on the cloud, there may be a chance that your organization's information is hacked by Hackers.

History of Cloud Computing

Before emerging the cloud computing, there was Client/Server computing which is basically a centralized storage in which all the software applications, all the data and all the controls are resided on the server side.

If a single user wants to access specific data or run a program, he/she need to connect to the server and then gain appropriate access, and then he/she can do his/her business.

Then after, distributed computing came into picture, where all the computers are networked together and share their resources when needed.

Cloud Computing is not a latest technology. Cloud computing has evolved (develop gradually) through a number of phases which includes Grid Computing, Utility Computing, Application Service Provision, and Software as a Service etc.
But the overarching (overall) concept of delivering Computing resource through a global network is started in the sixties.

By 2020 The Cloud computing market is forecast to exceed $241 Billion. But how did we get here and where did all this started is the history of Cloud computing.

The actual history of Cloud computing is not that old, the first business and consumer Cloud Computing services website (Salesforce.com and Google) were launched in 1999. Cloud computing is tied directly to the development of the Internet and Business technology since Cloud computing is the solution to the problem of how the Internet can help improve Business Technology.

Business technology has long and fascinating history, one that is almost as long as business itself, but the development that most directly influenced the history of Cloud computing start with the emergence of computers as providers of real business solutions.

On the basis of above computing, there was emerged of cloud computing concepts that later implemented.

At around in 1961, John MacCharty suggested in a speech at MIT that computing can be sold like a utility, just like a water or electricity. It was a brilliant idea, but like all brilliant ideas, it was ahead if its time, as for the next few decades, despite interest in the model, the technology simply was not ready for it.

But of course time has passed and the technology caught that idea and after few years we mentioned that:

- In 1963, **DARPA** (the Defense Advanced Research Projects Agency), presented MIT with $2 million for Project MAC.

- In 1969, J. C. R. Licklider helped develop the ARPANET (Advanced Research Projects Agency Network), a "very" primitive version of the Internet. JCR, or "Lick" was both a psychologist and a computer scientist, and promoted a vision called the "***Intergalactic Computer Network,***" in which everyone on the planet would be interconnected by way of computers, and able to access information from anywhere.

- The meaning of Virtualization began shifting in the 1970s, and now describes the creation of a virtual machine, that acts like a real computer, with a fully functional

operating system. The concept of Virtualization has evolved with the Internet, as businesses began offering "virtual" private networks as a rentable service.

- In its early stages, the Cloud was used to express the empty space between the end user and the provider. In 1997, Professor Ramnath Chellapa of Emory University defined Cloud Computing as the new "computing paradigm, where the boundaries of computing will be determined by economic rationale, rather than technical limits alone."

- *In 1999,* **Salesforce.com** *started delivering of applications to users using a simple website*. The applications were delivered to enterprises over the Internet, and this way the dream of computing sold as utility were true.

- *In 2002,* **Amazon** *started Amazon Web Services*, providing services like storage, computation and even human intelligence. However, only starting with the launch of the Elastic Compute Cloud in 2006 a truly commercial service open to everybody existed.

- In 2006, Amazon launched **Amazon Web Services**, which offers online services to other websites, or clients. One of Amazon Web Services' sites, called Amazon Mechanical Turk, provides a variety of Cloud-based services including storage, computation and "human intelligence." Another of Amazon Web Services' sites is the Elastic Compute Cloud (EC2), allowing individuals to rent virtual computers and use their own programs and applications.

- In 2007, IBM, Google, and several universities joined forces to develop a server farm for research projects needing both fast processors and huge data sets. The University of Washington was the first to sign up and use resources provided by IBM and Google. Carnegie Mellon University, MIT, Stanford University, the University of Maryland, and the University of California at Berkeley, quickly followed suit. The universities immediately realized computer experiments can be done faster and for less money, if IBM and Google were supporting their research

- Eucalyptus offered the first AWS API compatible platform, which was used for distributing private Clouds, in 2008. In the same year, NASA's **OpenNebula** provided the first open-source software for deploying Private and Hybrid Clouds. Many of its most innovative features focused on the needs of major businesses.

- *In 2009,* **Google Apps** *also started to provide cloud computing enterprise applications.*

- In 2011, IBM introduced the **IBM SmartCloud framework**, in support of Smarter Planet (a cultural thinking project). Then, Apple launched the ICloud, which focuses on storing more personal information (photos, music, videos, etc.). Also, during this year, Microsoft began advertising the Cloud on television, making the general public aware of its ability to store photos, or video, with easy access.

- Oracle introduced the **Oracle Cloud** in 2012, offering the three basics for business, IaaS (Infrastructure-as-a-Service), PaaS (Platform-as-a-Service), and SAAS (Software-as-a-Service).

Of course, all the big players are present in the cloud computing evolution, some were earlier, some were later. *In 2009,* **Microsoft** *launched Windows Azure*, and companies like Oracle and HP have all joined the game. This proves that today, cloud computing has become mainstream.

Cloud Computing Architecture

As we know, cloud computing technology is used by both small and large organizations to **store the information** in cloud and **access** it from anywhere at anytime using the internet connection.

Cloud computing architecture is a combination of **service-oriented architecture** and **event-driven architecture**.

Cloud computing architecture refers to the components and subcomponents required for cloud computing. These components typically consist of a front end platform (fat client, thin client, mobile device), back end platforms (servers, storage), a cloud based delivery, and a network (Internet, Intranet, Intercloud). Combined, these components make up cloud computing architecture.

Cloud computing architecture is divided into the following two parts -

- Front End

- Back End

The below diagram shows the architecture of cloud computing -

Client Infrastructure
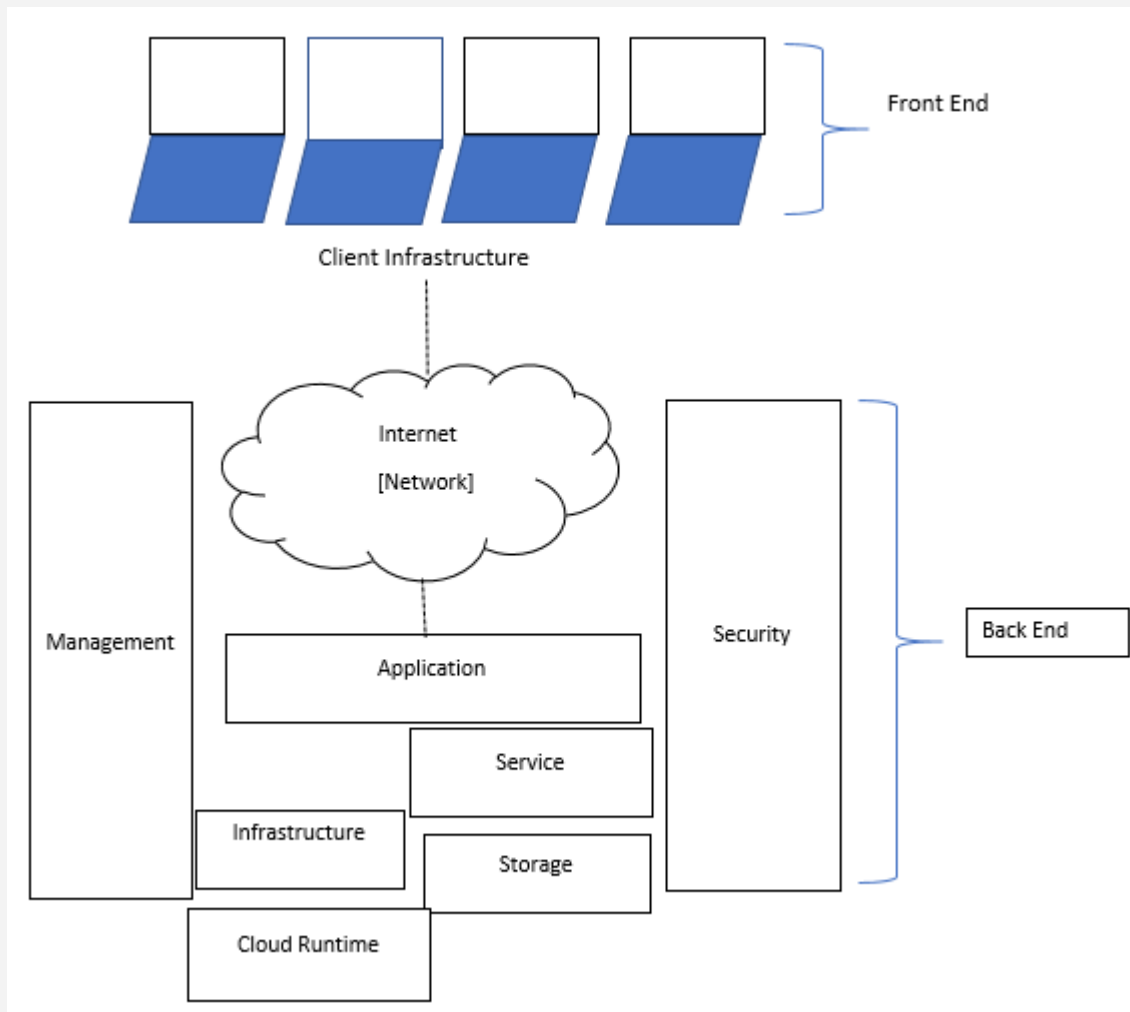
Front End:-

- The front end is used by the client. It contains client-side interfaces and applications that are required to access the cloud computing platforms. The front end includes web servers (including Chrome, Firefox, internet explorer, etc.), thin & fat clients, tablets, and mobile devices

- .Front-end is the side that is visible to the client, customer, or user. Front-end pieces include the user interface and the client's computer system or network that is used for accessing the cloud system. You have probably noticed that different cloud computing systems use different user interfaces—for example, not only can you choose from a variety of web browsers (including Chrome, Safari, Firefox, etc.), but the Google Docs user interface is different than that of Salesforce.

Back End:-

- The back end is used by the service provider. It manages all the resources that are required to provide cloud computing services. It includes a huge amount of data storage, security mechanism, virtual machines, deploying models, servers, traffic control mechanisms, etc.

- On the other hand, the back-end pieces are on the side used by the service provider. These include various servers, computers, data storage systems, virtual machines, and programs that together constitute the cloud of computing services. The back-end side also is responsible for providing security mechanisms, traffic control, and protocols that connect networked computers for communication.

Note: Both front end and back end are connected to others through a network, generally using the internet connection.

Components of Cloud Computing Architecture:-

There are the following components of cloud computing architecture -

1. Client Infrastructure:-

- Client Infrastructure is a Front end component. It provides GUI (Graphical User Interface) to interact with the cloud.

2. Application:-

- The application may be any software or platform that a client wants to access.

3. Service:-

- A Cloud Services manages that which type of service you access according to the client's requirement.

Cloud computing offers the following three type of services:

i. Software as a Service (SaaS) :-

- It is also known as **cloud application services**. Mostly, SaaS applications run directly through the web browser means we do not require to download and install these applications.

- Consumers interact with the top layer of the cloud, Saas.

- Whereas users view IaaS and PaaS as raw infrastructure and platform building tools/environments, the SaaS layer of the cloud is the finished product as seen through mobile applications, enterprise level business solutions and every single app held within the Apple App Store and the Google Play store.Some important example of SaaS is given below –

Example: Google Apps, Salesforce Dropbox, Slack, Hubspot, Cisco WebEx.

ii. Platform as a Service (PaaS) :-

- It is also known as **cloud platform services**. It is quite similar to SaaS, but the difference is that PaaS provides a platform for software creation, but using SaaS, we can access software over the internet without the need of any platform.

- PaaS is the secondary layer of the cloud providing developers with the tools needed to build applications/software and the development environment required to build, stage, edit and launch applications. Much like the IaaS layer of the cloud, PaaS answers a specific need, dev tools, and environments, enabling companies and individual developers to build the products and services they eventually bring to market. PaaS is built on top of the IaaS layer as it requires RAM, bandwidth, CPU to operate.

- Traditional providers of PaaS are Amazon, Cloud Foundry, Long Jump, Rackspace, and Google. PaaS is the middle layer of the cloud which leverages IaaS resources to build SaaS applications.

Example: Windows Azure, Force.com, Magento Commerce Cloud, OpenShift.

iii. Infrastructure as a Service (IaaS) :-

- It is also known as **cloud infrastructure services**. It is responsible for managing applications data, middleware, and runtime environments.

- IaaS is the primary layer of the cloud providing data center hardware (e.g. servers, nodes, hypervisors) to consumers and companies for a low monthly price. IaaS enables companies to lease servers packed with computing resources like RAM, bandwidth, CPU and IP, hosted in a remote data center.

- Traditional providers of IaaS are Digital Ocean, Amazon, Google, Microsoft, and Rackspace. IaaS is the foundation for PaaS and SaaS.

Example: Amazon Web Services (AWS) EC2, Google Compute Engine (GCE), Cisco Metapod.

4. Runtime Cloud:-

- Runtime Cloud provides the **execution and runtime environment** to the virtual machines.

5. Storage:-

- Storage is one of the most important components of cloud computing. It provides a huge amount of storage capacity in the cloud to store and manage data.

6. Infrastructure:-

- It provides services on the **host level**, **application level**, and **network level**. Cloud infrastructure includes hardware and software components such as servers, storage, network devices, virtualization software, and other storage resources that are needed to support the cloud computing model.

7. Management:-

- Management is used to manage components such as application, service, runtime cloud, storage, infrastructure, and other security issues in the backend and establish coordination between them.

8. Security:-

- Security is an in-built back end component of cloud computing. It implements a security mechanism in the back end.

9. Internet:-

- The Internet is medium through which front end and back end can interact and communicate with each other.

Cloud Computing Technologies

A list of cloud computing technologies are given below -

- Virtualization
- Service-Oriented Architecture (SOA)
- Grid Computing
- Utility Computing

Virtualization:-

Virtualization is the process of creating a virtual environment to run multiple applications and operating systems on the same server..Virtualization is the creation of virtual servers,infrastructures,devices and computing resources Virtualization changes the hardware-software relations and is one of the foundational elements of cloud computing technology that helps utilize the capabilities of cloud computing to the full.

Virtualization techniques allow companies to turn virtual their network,storage.

The virtual environment can be anything, such as a single instance or a combination of many operating systems, storage devices, network application servers, and other environments.

The concept of Virtualization in cloud computing increases the use of virtual machines. A virtual machine is a software computer or software program that not only works as a physical computer but can also function as a physical machine and perform tasks such as running applications or programs as per the user's demand.

Types of Virtualization:-

A list of types of Virtualization is given below -

1. Hardware virtualization

2. Server virtualization

3. Storage virtualization

4. Operating system virtualization

5. Data Virtualization

Service-Oriented Architecture (SOA):-

Service-Oriented Architecture (SOA) allows organizations to access **on-demand** cloud-based computing solutions according to the change of business needs. It can work without or with cloud computing. Service-Oriented Architecture (SOA) is an architectural approach in which applications make use of services available in the network. In this architecture, services are provided to form applications, through a communication call over the internet.The advantages of using SOA is that it is easy to maintain, platform independent, and highly scalable.

Service Provider and Service consumer are the two major roles within SOA.

Characteristics Of Service-Oriented Architecture:-

While the defining concepts of Service-Oriented Architecture vary from company to company, there are six key tenets that overarch the broad concept of Service-Oriented Architecture. These core values include:

1. Business value

2. Strategic goals

3. Intrinsic inter-operability

4. Shared services

5. Flexibility

6. Evolutionary refinement

Applications of Service-Oriented Architecture:-

There are the following applications of Service-Oriented Architecture -

- It is used in the healthcare industry.

- It is used to create many mobile applications and games.

- In the air force, SOA infrastructure is used to deploy situational awareness systems.

The service-oriented architecture is shown below:
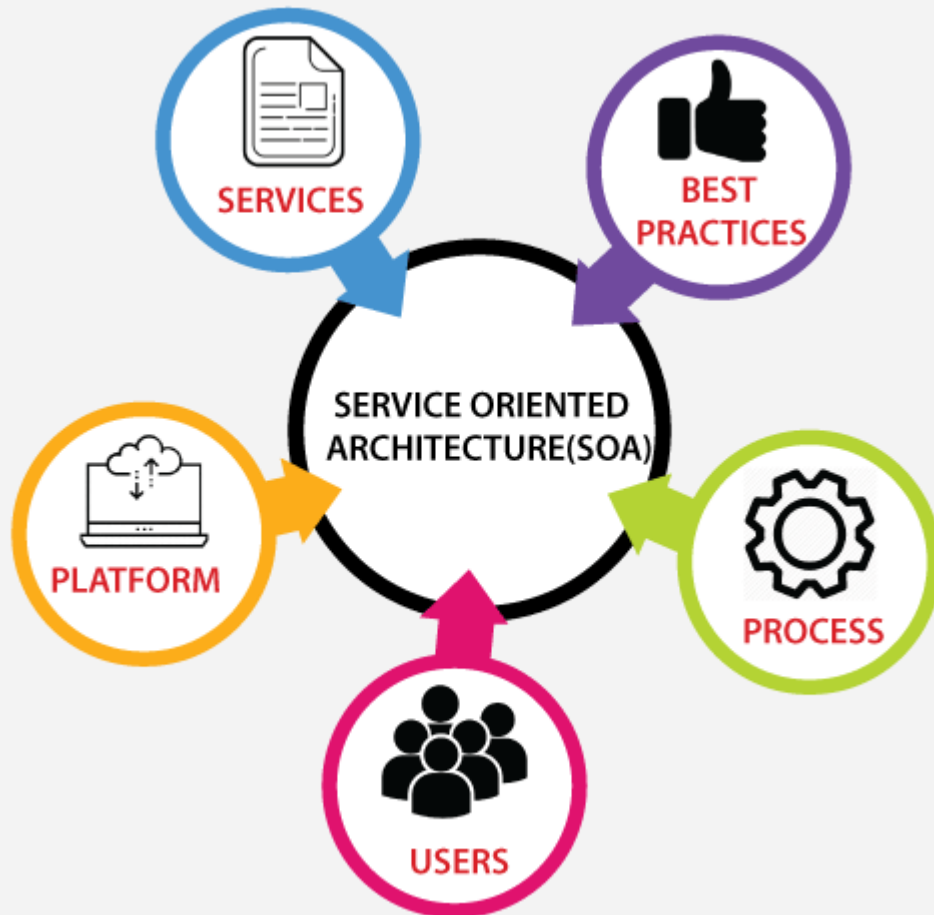
Grid Computing:-

Grid computing is also known as **distributed computing**. It is a processor architecture that combines various different computing resources from multiple locations to achieve a common goal. Grid computing is a processor architecture that combines computer resources from various domains to reach a main objective. In grid computing, the computers on the network can work on a task together, thus functioning as a supercomputerIn grid computing, the grid is connected by parallel nodes to form a computer cluster. These computer clusters are in different sizes and can run on any operating system.
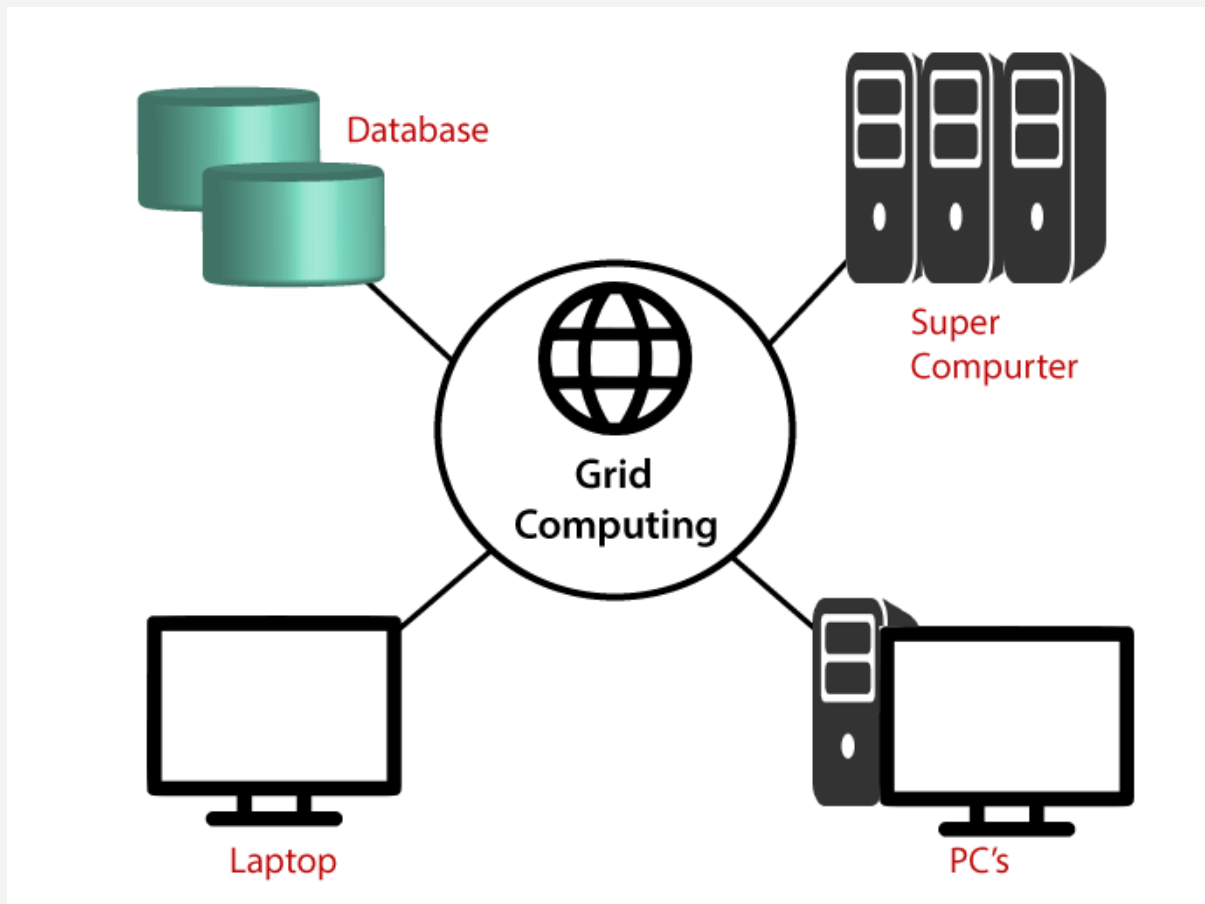
Grid computing contains the following three types of machines -

1. **Control Node:**

   o   It is a group of server which administrates the whole network.

2. **Provider:**

   o   It is a computer which contributes its resources in the network resource pool.

3. **User:**

   o   It is a computer which uses the resources on the network.

Mainly, grid computing is used in the **ATMs, back-end infrastructures,** and **marketing research**.

Utility Computing:-

Utility computing is the most trending IT service model. It provides on-demand computing resources (computation, storage, and programming services via API) and infrastructure based on the **pay per use** method. It minimizes the associated costs and maximizes the efficient use of resources. The term Utility Computing refers to utility computing technologies and business models, which provides a service provider to its customers IT services, and they charge you by consumption. Examples of such IT services are computing

power, storage or applications. As a service provider to the computer center of a company comes into question, in which case the customer would be the individual divisions of the company.The advantage of utility computing is that it reduced the IT cost, provides greater flexibility, and easier to manage.

Large organizations such as **Google** and **Amazon** established their own utility services for computing storage and application.

Note: Grid computing, Cloud computing, as well as managed IT services follow the concept of utility computing.

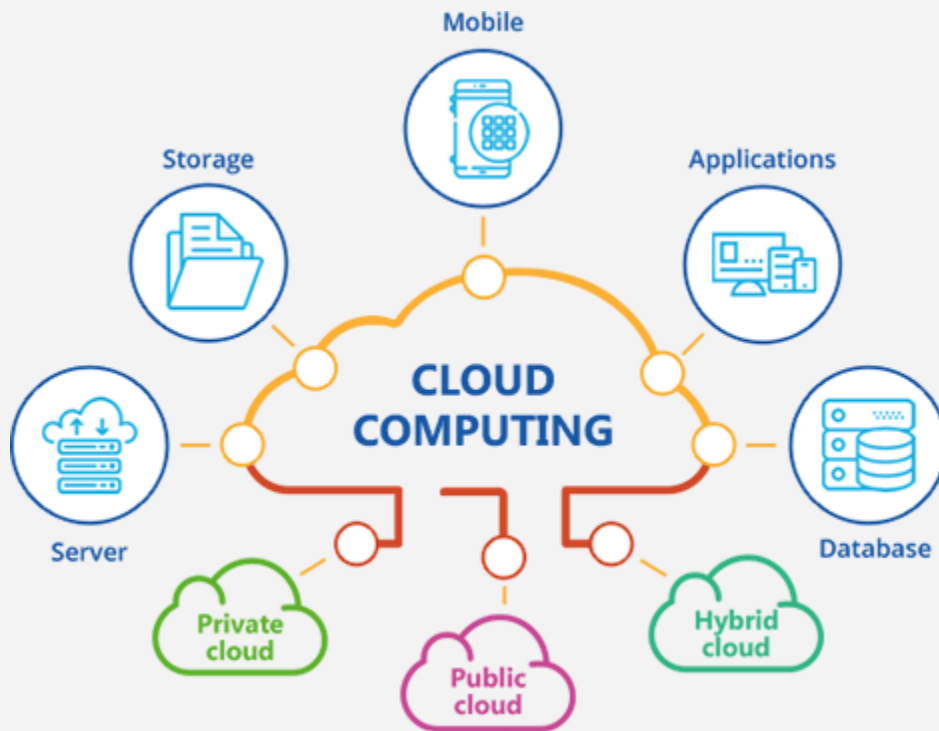# Cloud Computing VS Grid Computing

Cloud Computing:-

Cloud computing uses a **client-server** architecture to deliver computing resources such as servers, storage, databases, and software over the cloud (Internet) with pay-as-you-go pricing.

Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and

servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like Amazon Web Services (AWS).

Cloud computing becomes a very popular option for organizations by providing various advantages, including cost-saving, increased productivity, efficiency, performance, data back-ups, disaster recovery, and security.

Grid Computing:-

Grid computing is also called as "**distributed computing**." It links multiple computing resources (PC's, workstations, servers, and storage elements) together and provides a mechanism to access them.

Grid computing consists of a large number of computers which are connected parallel and forms a computer cluster.

This combination of connected computers uses to solve a complex problem.

In grid computing, this service of the computer is connected and run independent tasks. We often construct these grades with general purpose grade middleware software libraries.

Grid computing uses a wide range of applications, for instance, mathematical, scientific, and educational tasks through several computing resources.

The main advantages of grid computing are that it increases user productivity by providing transparent access to resources, and work can be completed more quickly.
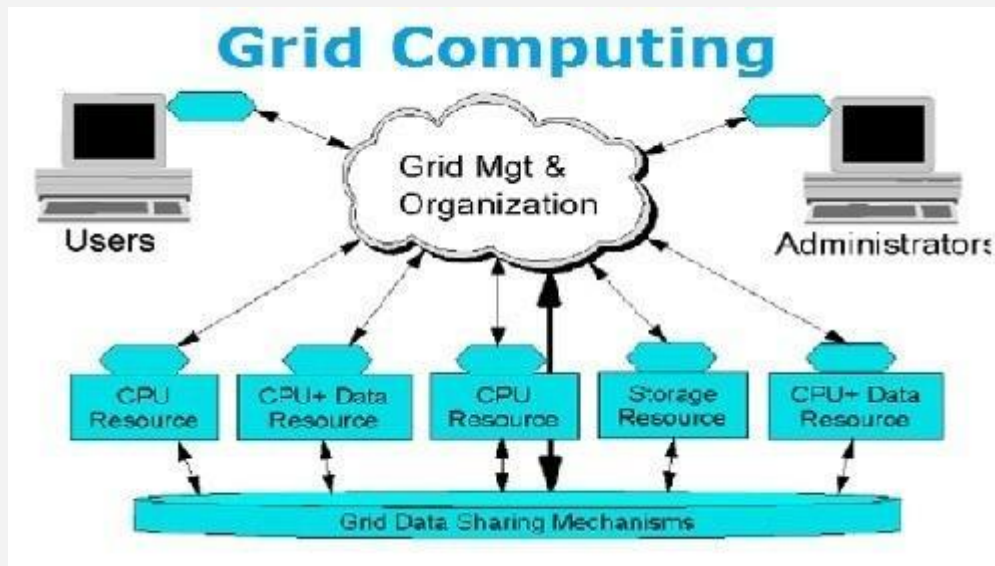
Difference between Cloud Computing and Grid Computing

Cloud Computing	Grid Computing
Cloud Computing follows client-server computing architecture.	Grid computing follows a distributed computing architecture.
Scalability is high.	Scalability is normal.
Cloud Computing is totally dependent on the internet through the data center. The cloud provides maximum security along with maximum performance	Grid computing works even if a computer stops or failure occurs. The other computer will pick up the work making the system more reliable and efficient.
Cloud Computing is more flexible than grid computing.	Grid Computing is less flexible than cloud computing.
Cloud operates as a centralized management system.	Grid operates as a decentralized management system.
The cloud computing deployment has been changed into public clouds, private clouds, **community clouds**, and hybrid clouds	Grid computing has a distributed computing system, a distributed information system, and distributed pervasive systems.
In cloud computing, cloud servers are owned by infrastructure providers.	In Grid computing, grids are owned and managed by the organization.
It is easy in the cloud to backup and restores the data as it has fast data processors. The new updates in cloud computing are efficient and automatic.	In a grid, computing space is saved and access to additional resources can be done.
In cloud computing, the computing resources manage within a single location which locates at a different place.	In grid computing, there is a distributed system where the resources are

	distributed at different locations and can be located from different sites.
Cloud computing uses services like Iaas, PaaS, and SaaS.	Grid computing uses systems like distributed computing, distributed information, and distributed pervasive.
Cloud Computing is Service-oriented.	Grid Computing is Application-oriented.
It is accessible through standard web protocols.	It is accessible through grid middleware.

How Dose Cloud Computing Works

Introduction :-

- Cloud computing has revolutionized the way businesses and individuals manage and store their data.

- It offers flexible, scalable, and cost-effective solutions that eliminate the need for physical hardware and on-site data centers.

- In this article, we will explore how cloud computing works and the key components that make it possible

Definition of Cloud Computing :-

- Cloud computing is a technology that enables users to access and use computing resources and services over the internet.

- These resources include data storage, processing power, software applications, and more.

- The "**cloud**" refers to a network of remote servers hosted on the internet, and users can access these resources on-demand, anytime and from anywhere.

Key Components of Cloud Computing :-

Data Centers :-

- Data centers are the heart of cloud computing.

- These are large facilities that house thousands of servers and storage devices.

- These servers are interconnected and work together to provide computing power and storage capacity to handle various tasks and applications.

Virtualization :-

- Virtualization is a crucial technology that allows a single physical server to be divided into multiple virtual servers.

- This enables the efficient use of resources as multiple virtual machines (VMs) can run on a single physical server simultaneously.

Internet Connectivity :-

- Cloud computing relies on internet connectivity to provide access to resources and services.

- Users can access applications and data hosted in the cloud through web browsers or dedicated applications on their devices.

Types of Cloud Services :-

Cloud Service Models
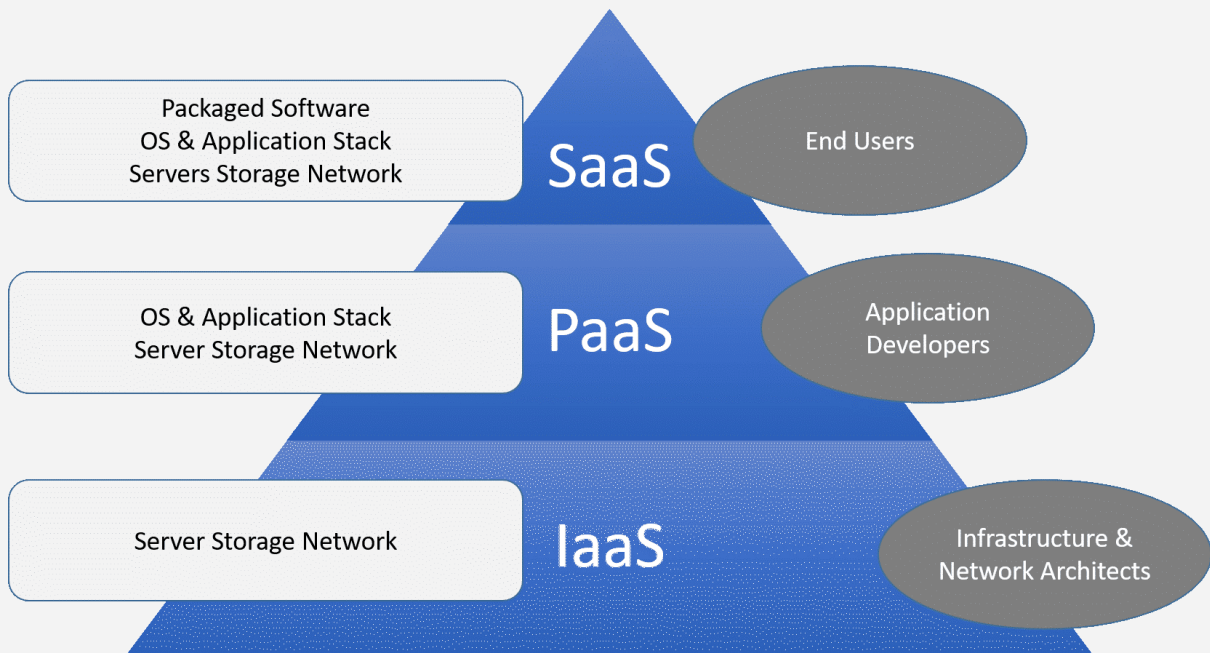
Infrastructure as a Service (IaaS) :-

- IaaS provides virtualized computing resources over the internet.

- Users can rent virtual machines, storage, and networking components, giving them the flexibility to scale up or down based on their needs without the burden of managing physical hardware.

Platform as a Service (PaaS) :-

- PaaS offers a platform that allows developers to build, deploy, and manage applications without worrying about infrastructure complexities.

- Developers can focus solely on writing code, while the cloud platform handles the underlying infrastructure.

Software as a Service (SaaS) :-

- SaaS delivers software applications over the internet on a subscription basis.

- Users can access these applications through a web browser without having to install or maintain the software locally.

Cloud Deployment Models :-
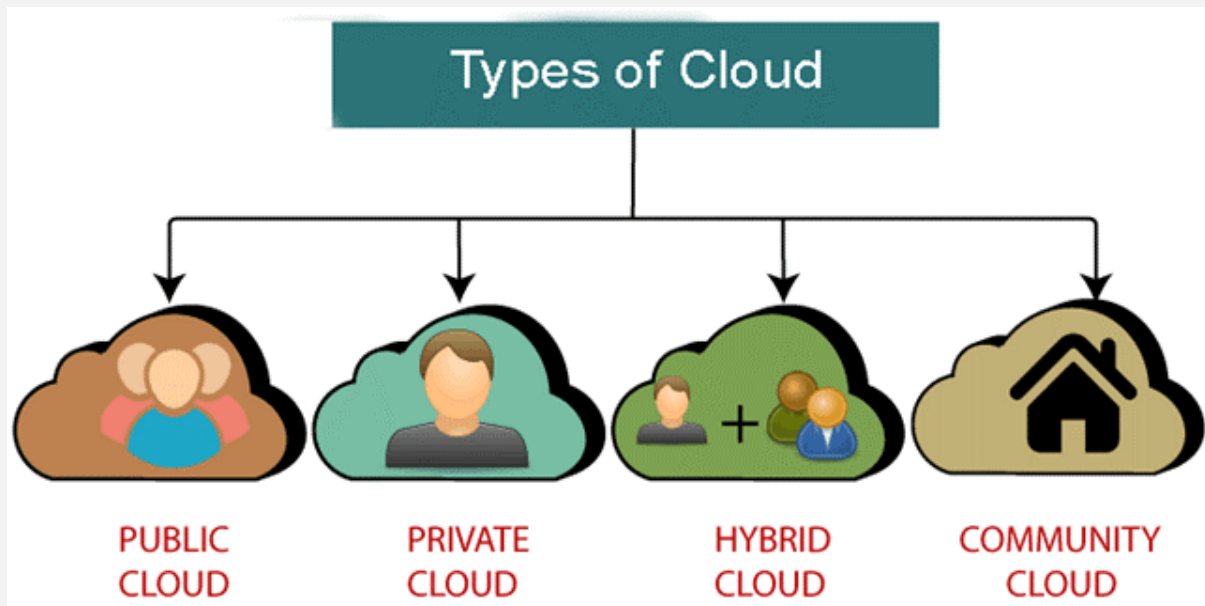
Public Cloud:-

- Public clouds are operated by third-party providers and offer resources and services to multiple organizations and individuals over the internet.

- They are cost-effective and suitable for businesses with varying computing needs.

Private Cloud:-

- Private clouds are dedicated to a single organization and are hosted either on-site or by a third-party provider.

- They offer greater control, security, and customization options but may require a higher initial investment.

Hybrid Cloud:-

- Hybrid clouds combine both public and private cloud infrastructures, allowing data and applications to move between them.

- This approach provides more flexibility, especially for organizations with specific security or compliance requirements.

Benefits of Cloud Computing:-
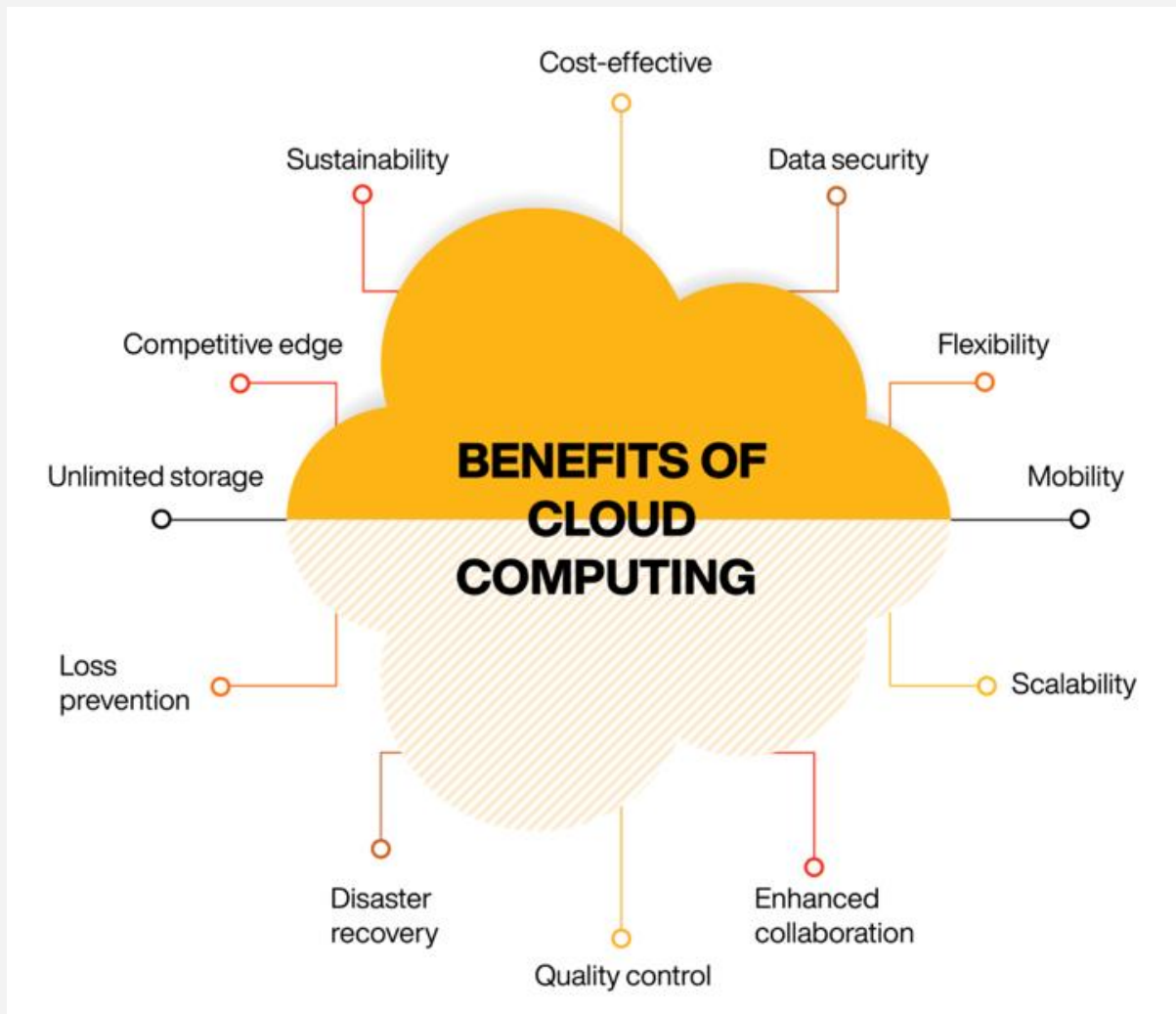
Cost Efficiency :-

- Cloud computing eliminates the need for upfront hardware investments and reduces ongoing maintenance costs.

- Users pay for the resources they consume, making it a cost-effective option for businesses of all sizes.

Scalability :-

- Cloud resources can be easily scaled up or down based on demand, providing the flexibility to adapt to changing requirements without manual intervention.

Accessibility and Collaboration :-

- Cloud services enable users to access data and applications from any device with an internet connection, promoting collaboration and remote work capabilities.

Reliability and Redundancy :-

- Cloud providers offer robust infrastructure with data redundancy and backup systems, ensuring high availability and disaster recovery options.

Conclusion :-

- Cloud computing has become an integral part of modern businesses and personal computing, offering a wide array of services and benefits.

- By understanding how cloud computing works and its various deployment models, organizations can make informed decisions about integrating cloud solutions into their operations, driving efficiency, and staying ahead in today's digital world.

Cloud Computing Applications

Cloud service providers provide various applications in the field of art, business, data storage and backup services, education, entertainment, management, social networking, etc.

The most widely used cloud computing applications are given below -

1. Art Applications:

Cloud computing offers various art applications for quickly and easily design **attractive cards, booklets,** and **images**.The purpose of art is not to produce a product. The purpose of art is to produce thinking. The secret is not the mechanics or technical skill that create art – but the process of introspection and different levels of contemplation that generate it. Once you learn to embrace this process, your creative potential is limitless. Some most commonly used cloud art applications are given below:

Moo

- Moo is one of the best cloud art applications. It is used for designing and printing business cards, postcards, and mini cards.

Vistaprint

- Vistaprint allows us to easily design various printed marketing products such as business cards, Postcards, Booklets, and wedding invitations cards.

Adobe Creative Cloud

- Adobe creative cloud is made for designers, artists, filmmakers, and other creative professionals. It is a suite of apps which includes PhotoShop image editing programming, Illustrator, InDesign, TypeKit, Dreamweaver, XD, and Audition.

2. Business Applications:

Business applications are based on cloud service providers. Today, every organization requires the cloud business application to grow their business. A business application is a collection of components that provides a business functionality that you can use internally, externally, or with other business applications. You can create business applications of individual components, which are related to each other.It also ensures that business applications are 24*7 available to users.

There are the following business applications of cloud computing -

MailChimp

- MailChimp is an **email publishing platform** which provides various options to **design, send,** and **save** templates for emails.

Salesforce

- Salesforce platform provides tools for sales, service, marketing, e-commerce, and more. It also provides a cloud development platform.

Chatter

- Chatter helps us to **share important information** about the organization in real time.

Bitrix24

- Bitrix24 is a **collaboration** platform which provides communication, management, and social collaboration tools.

Paypal

- Paypal offers the simplest and easiest **online payment** mode using a secure internet account. Paypal accepts the payment through debit cards, credit cards, and also from Paypal account holders.

Slack

- Slack stands for **Searchable Log of all Conversation and Knowledge**. It provides a **user-friendly** interface that helps us to create public and private channels for communication.

Quickbooks

- Quickbooks works on the terminology "**Run Enterprise anytime, anywhere, on any device**." It provides online accounting solutions for the business. It allows more than 20 users to work simultaneously on the same system.

3. Data Storage and Backup Applications:

Cloud computing allows us to store information (data, files, images, audios, and videos) on the cloud and access this information using an internet connection. As the cloud provider is responsible for providing security, so they offer various backup recovery application for retrieving the lost data.Users often invest significant time and effort creating an identity, adding data, and customizing settings and preferences within your app. Preserving this data and personalization for users when they upgrade to a new device or re-install your app is an important part of ensuring a great user experience

A list of data storage and backup applications in the cloud are given below -

Box.com

- Box provides an online environment for **secure content management, workflow,** and **collaboration**. It allows us to store different files such as Excel, Word, PDF, and images on the cloud. The main advantage of using box is that it provides drag & drop service for files and easily integrates with Office 365, G Suite, Salesforce, and more than 1400 tools.

Mozy

- Mozy provides powerful **online backup solutions** for our personal and business data. It schedules automatically back up for each day at a specific time.

Joukuu

- Joukuu provides the simplest way to **share** and **track cloud-based backup files**. Many users use joukuu to search files, folders, and collaborate on documents.

Google G Suite

- Google G Suite is one of the best **cloud storage** and **backup** application. It includes Google Calendar, Docs, Forms, Google+, Hangouts, as well as cloud storage and tools for managing cloud apps. The most popular app in the Google G Suite is Gmail. Gmail offers free email services to users.

4. Education Applications:

Cloud computing in the education sector becomes very popular. It offers various **online distance learning platforms** and **student information portals** to the students. The advantage of using cloud in the field of education is that it offers strong virtual classroom environments,Demographically, university students are one of the most highly-networked and connected populations.

According to a recent study, university students bring 3-4 devices to campus and expect to be able to use them all seamlessly across the university's IT backbone in order to access content and collaborate. In most cases, the cloud is making it possible to meet those expectations.

Cloud services allow universities to cost-effectively upgrade communication and learning systems without massive capital investments in infrastructure. In the US, such savings are crucial in the face of shrinking government support for institutions of higher learning. Ease of accessibility, secure data storage, scalability, greater reach for the students, and minimal hardware requirements for the applications.

There are the following education applications offered by the cloud -

Google Apps for Education

- Google Apps for Education is the most widely used platform for free web-based email, calendar, documents, and collaborative study.

Chromebooks for Education

- Chromebook for Education is one of the most important Google's projects. It is designed for the purpose that it enhances education innovation.

Tablets with Google Play for Education

- It allows educators to quickly implement the latest technology solutions into the classroom and make it available to their students.

AWS in Education

- AWS cloud provides an education-friendly environment to universities, community colleges, and schools.

5. Entertainment Applications:

Entertainment industries use a **multi-cloud strategy** to interact with the target audience. Today's consumers of media and entertainment content expect flexibility and choices. In addition, consumer demand is unpredictable, with spikes and surges in viewership that have to be dealt with in real time. The on-demand characteristics of cloud computing provide the levels of scalability and flexibility that the M&E sector needs to cost-effectively meet volatile demand, automatically spinning servers up and down as demand ebbs and flows.Cloud computing offers various entertainment applications such as online games and video conferencing.

Online games

- Today, cloud gaming becomes one of the most important entertainment media. It offers various online games that run remotely from the cloud. The best cloud gaming services are Shaow, GeForce Now, Vortex, Project xCloud, and PlayStation Now.

Video Conferencing Apps

- Video conferencing apps provides a simple and instant connected experience. It allows us to communicate with our business partners, friends, and relatives using a cloud-based video conferencing. The benefits of using video conferencing are that it reduces cost, increases efficiency, and removes interoperability.

6. Management Applications:

Cloud computing offers various cloud management tools which help admins to manage all types of cloud activities, such as resource deployment, data integration, and disaster recovery. **Cloud Application Management for Platforms** (**CAMP**) is a specification for managing applications in the context of a [platform as a service](#) (PaaS) system. CAMP is designed to address the needs of a high-level PaaS system; one in which the consumer (generally a developer or application administrator) provides application artifacts (code, data, graphics, etc.) and specifies which provider-supplied services are required to realize these

artifacts as an application. The details of the infrastructure (compute, storage, and networking) used to support these services are hidden from the consumer by the provider of the PaaS system.These management tools also provide administrative control over the platforms, applications, and infrastructure.

Some important management applications are -

Toggl

- Toggl helps users to track allocated time period for a particular project.

Evernote

- Evernote allows you to sync and save your recorded notes, typed notes, and other notes in one convenient place. It is available for both free as well as a paid version.

- It uses platforms like Windows, macOS, Android, iOS, Browser, and Unix.

Outright

- Outright is used by management users for the purpose of accounts. It helps to track income, expenses, profits, and losses in real-time environment.

GoToMeeting

- GoToMeeting provides **Video Conferencing** and **online meeting apps**, which allows you to start a meeting with your business partners from anytime, anywhere using mobile phones or tablets. Using GoToMeeting app, you can perform the tasks related to the management such as join meetings in seconds, view presentations on the shared screen, get alerts for upcoming meetings, etc.

7. Social Applications:

Social cloud applications allow a large number of users to connect with each other using social networking applications such as **Facebook, Twitter, Linkedln,** etc.**Social cloud computing**, also **peer-to-peer social cloud computing**, is an area of computer science that generalizes cloud computing to include the sharing, bartering and renting of computing resources across peers whose owners and operators are verified through a social network or reputation system. It expands cloud computing past the confines of formal commercial data centers operated by cloud providers to include anyone interested in participating within the cloud services sharing economy.

There are the following cloud based social applications -

Facebook

- Facebook is a **social networking website** which allows active users to share files, photos, videos, status, more to their friends, relatives, and business partners using the cloud storage system. On Facebook, we will always get notifications when our friends like and comment on the posts.

Twitter

- Twitter is a **social networking** site. It is a **microblogging** system. It allows users to follow high profile celebrities, friends, relatives, and receive news. It sends and receives short posts called tweets.

Yammer

- Yammer is the **best team collaboration** tool that allows a team of employees to chat, share images, documents, and videos.

LinkedIn

- LinkedIn is a **social network** for students, freshers, and professionals.

Security and Risk of Cloud Computing

Introduction:

- Cloud computing has revolutionized the way we store, process, and access data.

- While it offers numerous benefits, such as cost-efficiency and scalability, it also introduces unique security challenges.

- Understanding the potential risks associated with cloud computing is crucial for businesses and individuals to make informed decisions about their data protection strategies.
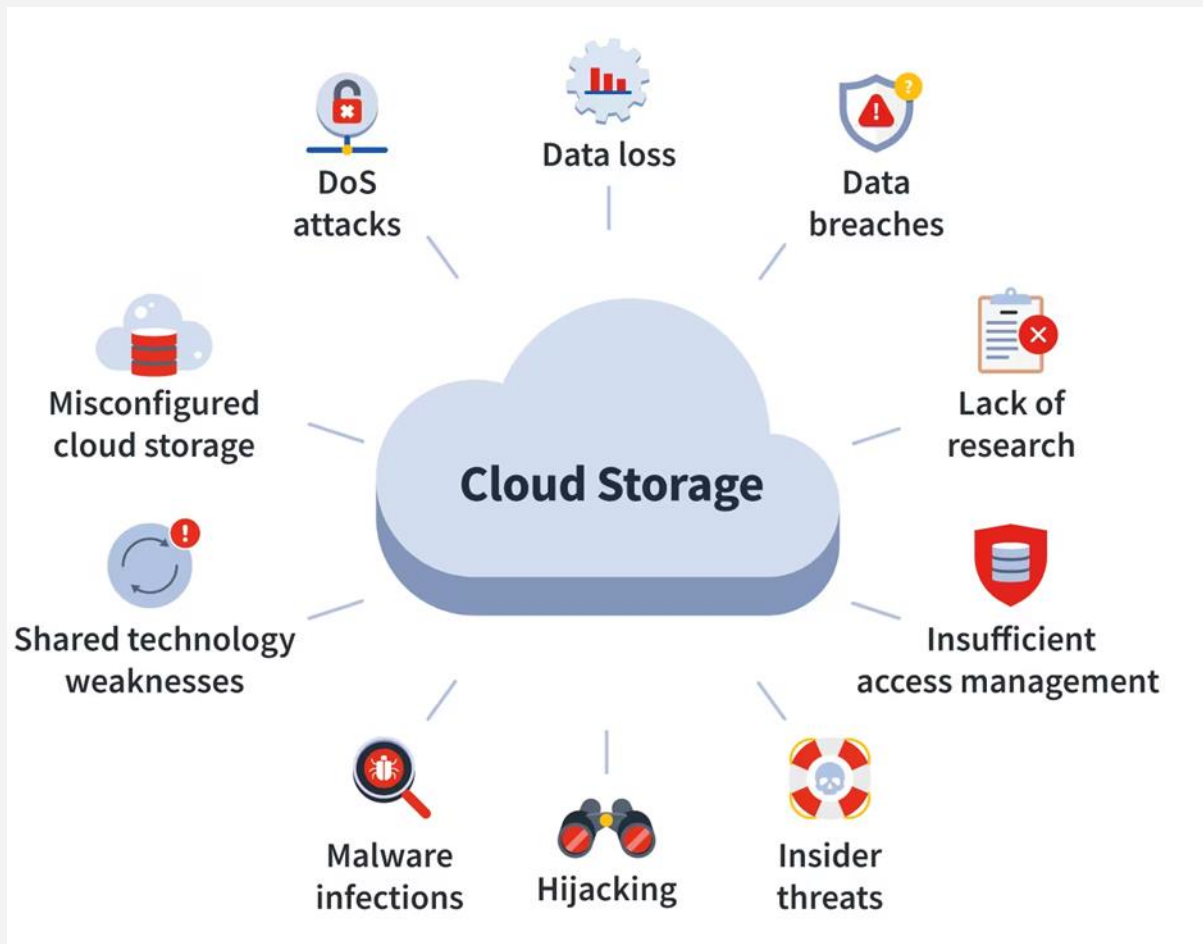
Data Breaches:

- Data breaches represent one of the most significant security concerns for cloud computing users.

- Cloud service providers store vast amounts of sensitive data from multiple clients on shared infrastructure.

- A breach in the provider's security could result in unauthorized access to confidential information, including financial records, intellectual property, and personal data.

- To reduce the risk of data breaches, users must carefully choose reputable cloud providers with robust security measures and encryption protocols.

Inadequate Identity and Access Management (IAM):

- Weak identity and access management practices can lead to unauthorized access to cloud resources.

- If user accounts are not properly secured with strong passwords or multifactor authentication (MFA), malicious actors may gain unauthorized access to critical data and services.

- Implementing strict IAM policies, regularly reviewing access permissions, and limiting privileges to only those necessary are essential to safeguarding cloud resources.

Insider Threats:

- While cloud service providers invest heavily in their security infrastructure, insider threats remain a concern.

- Insider threats can arise from employees or contractors with access to the cloud environment.

- Malicious insiders or those with unintentional lapses in security practices could compromise sensitive data or disrupt cloud services.

- Businesses must implement proper monitoring and auditing mechanisms to detect and prevent insider threats.

Data Loss:

- Data loss in the cloud can occur due to various factors, such as accidental deletion, system failures, or provider outages.

- While cloud providers implement redundancy and backup strategies, users must also take responsibility for their data.

- Regularly backing up critical information and adopting data loss prevention measures can mitigate the risk of permanent data loss.

Lack of Physical Control:

- With cloud computing, users relinquish physical control over their data and infrastructure.

- This may create concerns for businesses that handle sensitive data subject to strict regulatory requirements.

- Before adopting cloud solutions, organizations should evaluate the cloud provider's data center security measures, compliance certifications, and geographical locations to ensure they align with their specific security needs.

Shared Tenancy Risks:

- Public clouds often follow a multi-tenant model, where multiple customers share the same underlying infrastructure.

- While cloud providers implement strict isolation mechanisms, vulnerabilities in one customer's environment could potentially impact others sharing the same resources.

- Conducting due diligence and understanding the provider's isolation measures is essential for evaluating shared tenancy risks.

Compliance and Legal Issues:

- Cloud computing users must comply with various regulations, depending on the industry and geographical location.

- Transferring data to third-party cloud servers may raise concerns about data sovereignty and compliance with privacy laws.

- Understanding the legal implications and ensuring the cloud provider meets relevant compliance standards is crucial for avoiding legal consequences.

Conclusion:

- Cloud computing offers unparalleled advantages in terms of flexibility, cost-efficiency, and accessibility.

- However, security risks associated with cloud computing demand careful consideration and proactive measures.

- By partnering with reputable cloud service providers, implementing robust security practices, and staying informed about the evolving threat landscape, businesses and individuals can harness the power of the cloud while safeguarding their data and digital assets from potential security breaches.

AWS

Introduction:

- **Amazon Web Services (AWS)** is a comprehensive and widely adopted cloud computing platform offered by Amazon, one of the world's largest and most prominent technology companies.

- It provides over **170 AWS services** to the developers so they can access them from anywhere at the time of need.

- **AWS** provides a vast array of cloud services that empower businesses, organizations, and individuals to access and utilize computing power, storage, and other resources on-demand, without the need for upfront hardware investments or complex infrastructure management .

What is AWS? :

- **AWS** is a secure and scalable cloud services platform that offers a diverse range of solutions, including computing power, storage, databases, analytics, machine learning, and more.

- It enables customers to deploy applications and services quickly and efficiently, with the ability to scale resources up or down based on demand, paying only for what they use.

- **AWS operates** on a pay-as-you-go model, making it cost-effective for businesses of all sizes.

Key Features and Services :

AWS boasts an extensive catalog of services designed to meet various cloud computing needs. Some of the key services and features include:

Compute Services :

- AWS offers elastic compute capacity through services like Amazon EC2 (Elastic Compute Cloud) and AWS Lambda, allowing users to run applications and workloads of any scale.

Storage Solutions :

- AWS provides reliable and scalable storage options, such as Amazon S3 (**Simple Storage Service**) for object storage, Amazon EBS (**Elastic Block Store**) for block storage, and Amazon Glacier for long-term archival storage.

Databases :

- AWS offers a variety of managed database services, including **Amazon RDS** (**Relational Database Service**), **Amazon DynamoDB (NoSQL database)**, and Amazon **Aurora (MySQL and PostgreSQL-compatible database).**

Networking :

- AWS provides virtual private clouds (**VPC**), content delivery through Amazon CloudFront, and load balancing through Amazon ELB (**Elastic Load Balancer**) for efficient and secure network infrastructure.

Machine Learning and AI :

- AWS offers services like Amazon SageMaker for building, training, and deploying machine learning models, Amazon Rekognition for image and video analysis, and Amazon Polly for text-to-speech capabilities.

Global Reach and Reliability :

- AWS operates in multiple geographic regions worldwide, comprising availability zones within each region.

- This global infrastructure ensures low-latency access and redundancy for improved reliability and disaster recovery options.

- AWS maintains a robust network and security architecture, providing customers with a high level of data protection and compliance with various industry standards.

Use Cases and Adoption :

- AWS is widely adopted across various industries, including technology, finance, healthcare, government, education, and more.

- Its scalability and flexibility make it ideal for startups looking to grow rapidly, as well as large enterprises seeking to optimize their operations.

- AWS use cases span from hosting websites and mobile applications to running complex analytics, machine learning, and artificial intelligence workloads.

AWS Certification and Training :

- To enhance the skills and knowledge of cloud professionals, **AWS** offers a comprehensive certification program.

- **AWS certifications** validate expertise in different cloud roles and services, and the training resources provided by **AWS** help individuals prepare for these certifications.

Conclusion :

- **Amazon Web Services** (**AWS**) has emerged as a leading cloud computing platform, empowering businesses and individuals with a wide range of cloud services to innovate, scale, and transform their operations.

- With its global reach, reliability, and continuous innovation, AWS continues to shape the landscape of cloud computing, making it a pivotal player in the digital era.

- Whether you're a startup, a government agency, or an established enterprise, AWS provides the tools and infrastructure to accelerate growth and stay ahead in today's fast-paced, digital world.

AWS Architecture

Introduction to AWS Architecture:

- Amazon Web Services (AWS) is a leading cloud computing platform that offers a wide array of cloud services and solutions to individuals, businesses, and organizations worldwide.

- AWS provides a flexible, scalable, and cost-effective infrastructure, enabling users to build and deploy applications without the complexity of managing physical hardware.

Advantages of AWS Architecture :

Scalability :

- AWS allows you to scale your infrastructure up or down based on demand.

- This elasticity ensures that your applications can handle sudden traffic spikes or adjust to varying workloads.

Reliability :

- With multiple Availability Zones within each AWS Region, you can achieve high availability and fault tolerance.

- AWS's infrastructure is designed to minimize downtime and ensure the continuity of your services.

Global Reach :

- AWS has a vast global network of data centers, making it easier to reach users and customers around the world.

- This global infrastructure ensures low-latency access to your applications from different geographic locations.

Security:

- AWS prioritizes security and provides various tools and features to help you secure your applications and data.

- From identity and access management to encryption and network security, AWS takes multiple measures to protect your assets.

Cost-Effectiveness:

- AWS offers a pay-as-you-go pricing model, allowing you to pay only for the resources you consume.

- This cost-effective approach eliminates the need for upfront capital investments in hardware and infrastructure.

Key AWS Services for Architecture :
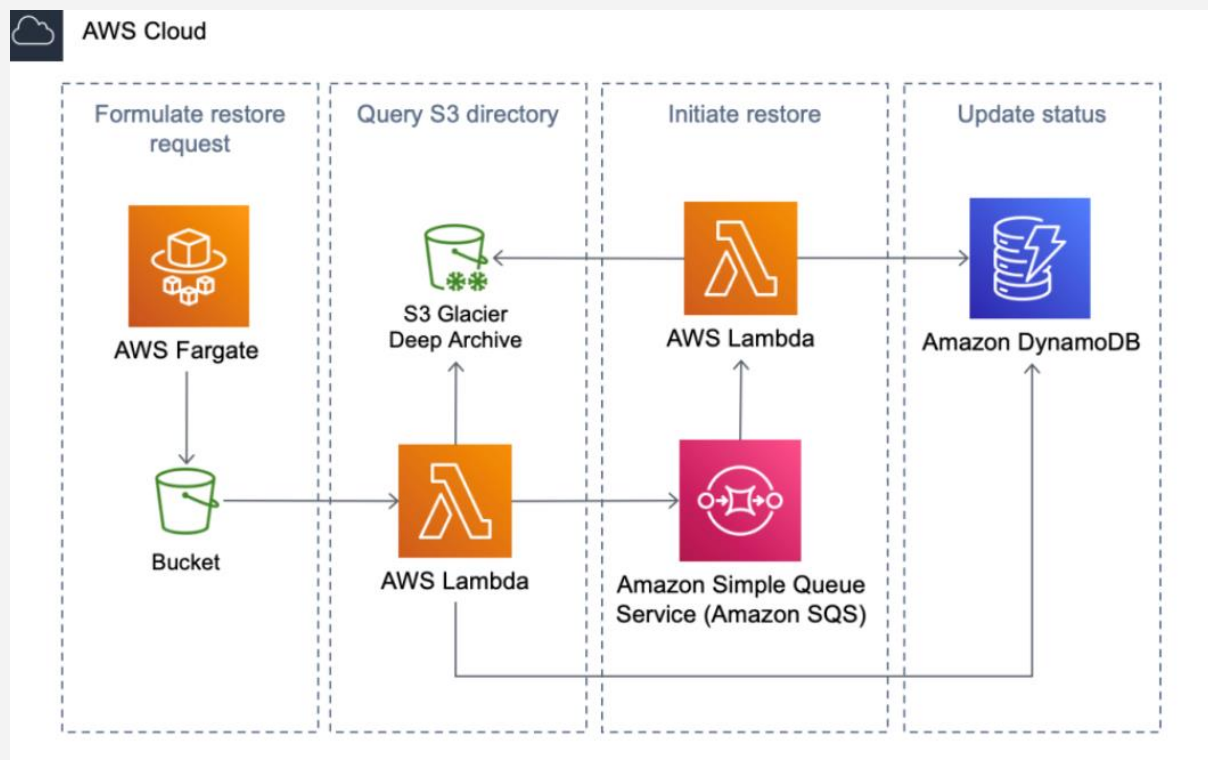
Amazon EC2 (Elastic Compute Cloud):

- EC2 provides resizable compute capacity in the cloud.

- It allows you to create and manage virtual machines, known as instances, with different configurations to meet your specific application requirements.

Amazon S3 (Simple Storage Service):

- S3 is a highly scalable object storage service that enables you to store and retrieve any amount of data at any time.

- It is ideal for hosting static website content, media files, backups, and more.

Amazon RDS (Relational Database Service):

- RDS is a managed database service that simplifies database administration tasks.

- It supports various database engines, such as MySQL, PostgreSQL, and Microsoft SQL Server.

Amazon VPC (Virtual Private Cloud):

- VPC allows you to create an isolated network environment within the AWS cloud.

- You can define your subnets, route tables, and network gateways to ensure secure communication between resources.

Amazon IAM (Identity and Access Management):

- IAM provides robust access control and user management for your AWS resources.

- You can create users, groups, and roles with granular permissions to enhance the security of your infrastructure.

Best Practices for AWS Architecture :

Well-Architected Framework :

- AWS encourages users to follow its Well-Architected Framework, which outlines best practices for designing reliable, efficient, and secure cloud solutions.

- The framework covers five pillars: Operational Excellence, Security, Reliability, Performance Efficiency, and Cost Optimization.

Multi-Region Deployment :

- To achieve maximum availability, consider deploying your application across multiple AWS Regions.

- This setup ensures redundancy and fault tolerance in case of failures in a specific region.

Auto Scaling :

- Utilize AWS Auto Scaling to automatically adjust the number of EC2 instances based on demand.

- This approach optimizes resource utilization and maintains application performance.

Managed Services :

- Whenever possible, use managed services like Amazon RDS and Amazon DynamoDB to offload administrative tasks and focus on building your application's core logic.

Backup and Disaster Recovery :

- Implement regular backups and establish disaster recovery plans to protect your data and ensure business continuity.

Case Studies :

Here are some real-world examples of companies leveraging AWS Architecture:

Netflix :

- The popular streaming service utilizes AWS to deliver content to millions of users globally.
- AWS's scalability and performance efficiency help Netflix provide a seamless streaming experience.

Airbnb :

- Airbnb relies on AWS to handle its massive data storage and processing needs.
- AWS's flexibility allows Airbnb to scale resources based on varying booking demands.

NASA :

- NASA uses AWS to process and store vast amounts of satellite data for scientific research and exploration.

Conclusion :

- AWS Architecture empowers businesses to build reliable, scalable, and secure applications in the cloud.
- With a rich set of services and a global infrastructure, AWS continues to be the platform of choice for organizations of all sizes.

- Embrace AWS's best practices and leverage its managed services to focus on innovation and growth.

AWS Features

Amazon EC2 (Elastic Compute Cloud):

- Amazon EC2 provides resizable compute capacity in the cloud, allowing you to launch and manage virtual machines (instances) on the AWS infrastructure.

- It enables you to quickly scale computing resources based on demand and choose from a wide range of instance types to meet specific requirements.

Amazon S3 (Simple Storage Service):

- Amazon S3 is a highly scalable object storage service that allows you to store and retrieve any amount of data at any time.

- It's commonly used for data backup, archiving, content distribution, and serving static assets for websites and applications.

Amazon RDS (Relational Database Service):

- **Amazon RDS** offers managed relational databases, supporting popular database engines such as **MySQL**, **PostgreSQL**, **Oracle**, **SQL Server**, and more.
- It takes care of database provisioning, backups, and maintenance, making it easier to set up, operate, and scale databases.

AWS Lambda:

- AWS Lambda is a serverless compute service that enables you to run code without managing servers.
- You can use it to execute code in response to events, such as changes to data in S3, updates to DynamoDB, or API calls.

Amazon DynamoDB:

- Amazon DynamoDB is a fully managed NoSQL database service that provides single-digit millisecond performance at any scale.
- It's designed to handle massive workloads and offers flexible data models for various types of applications.

Amazon VPC (Virtual Private Cloud):

- Amazon VPC allows you to create isolated virtual networks within AWS.
- You can define subnets, route tables, and network gateways to have complete control over your network infrastructure in the cloud.

AWS IAM (Identity and Access Management):

- AWS IAM is a service for managing user access and permissions to AWS resources.
- It enables you to create and manage users, groups, and roles, providing granular control over who can access specific services and actions.

Amazon CloudFront:

- Amazon CloudFront is a global content delivery network (CDN) that helps distribute content (e.g., website data, videos, images) to users with low latency and high data transfer speeds from various AWS edge locations.

Amazon Route 53:

- Amazon Route 53 is a scalable and highly available domain name system (DNS) web service.
- It allows you to register and manage domain names, as well as route incoming traffic to AWS resources or other external endpoints.

AWS CloudFormation:

- AWS CloudFormation is a service that allows you to provision and manage AWS infrastructure as code.
- You can use templates to define resources and their dependencies, making it easier to deploy and update infrastructure in a consistent and repeatable manner.

c

AWS Pros & Cons

AWS Advantages & Disadvantages | Advantages of Cloud Computing:

After exploring **AWS features**, we move towards AWS Advantages and Disadvantages. This **AWS Tutorial**, states the advantages of cloud computing. After analyzing this AWS Benefits and Limitations we will use AWS in an effective way.

So, let's Start AWS Advantages and Disadvantages.

Amazon Web Services:

AWS benefits their user by providing services at the low cost, which do not have any upfront cost. Amazon Web Service is easy to use and the user should not worry about the servers, security, and databases.

AWS has several advantages which make users rely on them. However, AWS has several limitations but that doesn't affect user much.

Do you know the Architecture & Components of AWS?

AWS Advantages & Disadvantages:

a. AWS Advantages:

Following are some AWS benefits, let's discuss them one by one:

i. Easy to Use

AWS's platform is clearly expressed and even a neophyte can use it. There won't be any problem for a new applicant as well as for an existing applicant. This is possible due to the **AWS Management Console** or well-documented web services.

ii. No Capacity Limits

Organizations launch different projects and the guess what capacity they will need. AWS helps them by providing this capacity at a minimum cost. Through this benefit, their workload is decreased and they can focus and built different ideas.

The customers predict the capacity and they pay higher prices than that but AWS provide them capacity at low-cost. The moment you feel like you should increase your capacity you can do it freely.

Moreover, if you realize that you are not in need of so much storage you can get back to the previous storage and all you have to pay for what you use.

iii. Provides Speed and Agility

In the old world if we talk to an engineer, Enterpriser or a company about how long will it take to hire a server, the answer we will get is 1 week. But AWS provides us within minutes. All you have to do is select your requirement and you can proceed without talking to anyone as it is easy and flexible.

With this, you can quickly deploy your application. AWS provides us with tools which helps us to reduce the time we spend on a task such as **Auto Scaling**, AWS Tools and **Elastic Load Balancing** you can select them n the basis of your demand. These applications can be accessed any time you need them.

Read about AWS Application – Utilities of Cloud Computing

The storage provided by them which works with a great speed is-

- Amazon Glacier
- Amazon Simple Storage Service
- AWS EBS

Amazon also has high-performance databases such as-

- Amazon Redshift
- AWS RDS
- Amazon Elasticache
- Amazon Dynamo Db

iv. Secure and Reliable

Amazon allows you to innovate and scale while keeping a secure environment and all you have to pay only for the services you use. AWS provides an end-to-end approach which secures and hardens your infrastructure.

Amazon Web Service provide you with the security you need at a lower cost than in an on-premises environment.

AWS provides security and also helps to protect the privacy as it is stored in AWS data centres. AWS infrastructure is designed to keep your data safe no matter what size of your data is.

It just scales with your AWS cloud usage. AWS manages the highest standard of security and this is the reason users rely on AWS.

Let's read about working of Amazon ElastiCache

b. Disadvantages of AWS:

These are the limitations of Amazon Web Services:

i. Limitations OF Amazon EC2

AWS sets default limits on resources which vary from region to region. These resources consist of images, volumes, and snapshots. You can launch the limited number of instance per area.

It also provides limited information for the resources managed by Amazon EC2and **Amazon VPC** console. However, you can request to increase the limit.

Let's Learn 5 Best AWS Books 2018

ii. Security Limitations

As security is one of the main features so AWS limits some of its features which cannot be changed at all are-

- **EC-2 classic-** Maximum of 500 per instance and each Security Group can have a maximum of 100 permissions.
- **EC2-VPC-** Up to 100 security groups per VPC.

iii. Technical Support Fee

AWS charges you for immediate support and you can opt for any packages among 3 which are-

- Developer
- Business
- Enterprise

AWS pricing list is mentioned below-

- **Developer:** $29/month

- **Business:** Greater of $100 – or –
  10% of monthly AWS usage for the first $0–$10K
  7% of monthly AWS usage from $10K–$80K
  5% of monthly AWS usage from $80K–$250K
  3% of monthly AWS usage over $250K

- **Enterprise:** Greater of $15,000 – or –
  10% of monthly AWS usage for the first $0–$150K
  7% of monthly AWS usage from $150K–$500K
  5% of monthly AWS usage from $500K–$1M
  3% of monthly AWS usage over $1M

iv. General cloud Computing Issues

AWS does have general cloud computing issues when you move to a cloud such as a downtime, limited control, and backup protection. However, these flaws can be overcome after some time. This makes them the temporary issue.

So, this was all about AWS Advantages and Disadvantages. Hope you like our explanation.

AWS Application

Amazon S3 (Simple Storage Service) :

- **Amazon S3** is a secure and highly scalable object storage service, ideal for hosting static website content.

- You can use **S3** to store **HTML, CSS, JavaScript** files, images, videos, and other static assets that make up your website.

- It provides high availability and low-latency access to your content, ensuring a smooth user experience.

Amazon CloudFront :
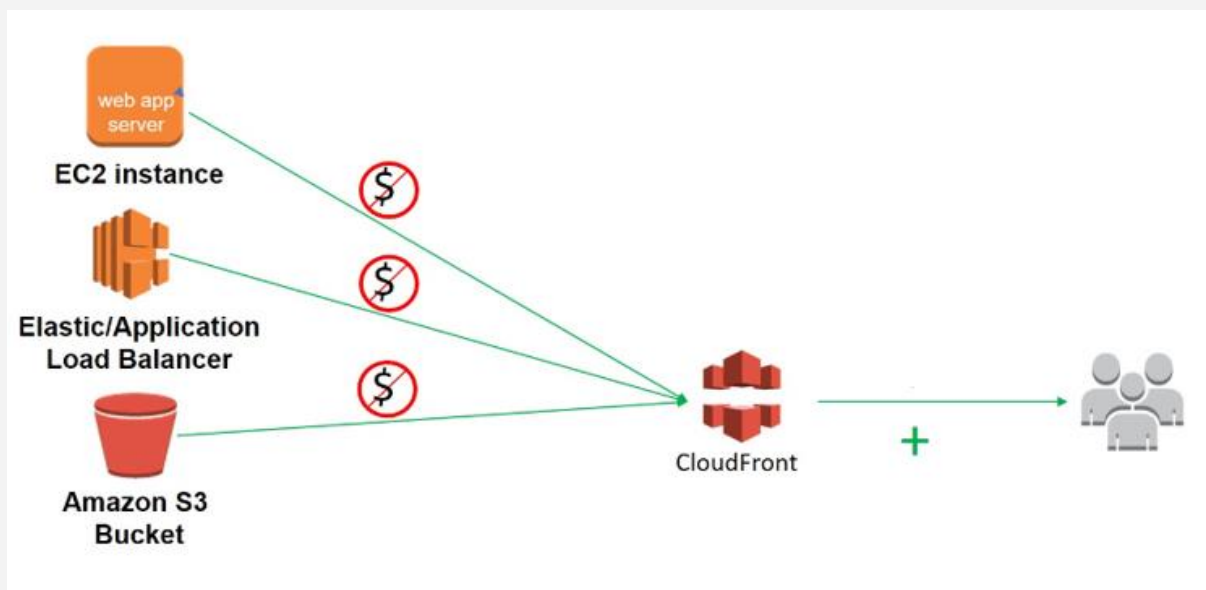
- Amazon CloudFront is a content delivery network (CDN) service that accelerates the delivery of your website's content to users worldwide.

- By caching and distributing content across a global network of edge locations, CloudFront reduces latency and improves website performance.

- You can integrate CloudFront with Amazon S3 to serve static content with high efficiency.

Amazon Route 53 :

- **Amazon Route 53** is a highly scalable and reliable Domain Name System (**DNS**) web service.

- It allows you to register domain names and route incoming web traffic to your **AWS resources**, such as your S3 bucket or CloudFront distribution.

- Route 53 also offers health checks and failover capabilities to enhance the availability of your website.

AWS Lambda :

- AWS Lambda is a serverless computing service that lets you run code without managing servers.

- You can use Lambda to build backend functions and APIs for your website.

- For example, you can create Lambda functions to process form submissions, handle user authentication, or interact with databases, all without worrying about infrastructure provisioning.

Amazon API Gateway :
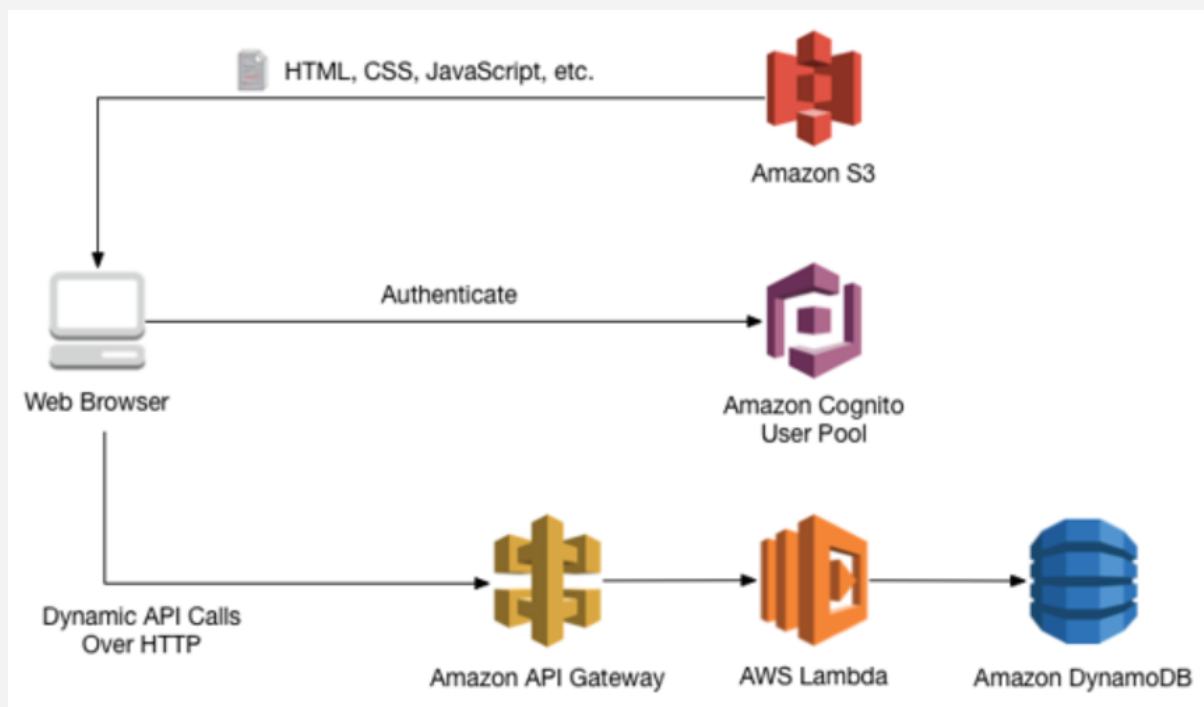
- Amazon API Gateway enables you to create, publish, and manage APIs that can securely integrate with your backend Lambda functions or other AWS services.

- It acts as a front-door for your application, allowing you to expose specific functionalities as RESTful APIs, making it easier for developers to interact with your website programmatically.

Amazon RDS (Relational Database Service):

- Amazon RDS is a managed database service that simplifies the deployment and management of relational databases.

- You can use RDS to host databases like MySQL, PostgreSQL, or SQL Server, enabling you to store and retrieve dynamic data for your website.

AWS Elastic Beanstalk:

- AWS Elastic Beanstalk is a platform-as-a-service (PaaS) offering that simplifies the deployment of web applications.

- It automatically handles the underlying infrastructure, such as load balancing, auto-scaling, and monitoring, allowing you to focus on your application code.

- Elastic Beanstalk supports various programming languages and frameworks, making it easy to deploy your website quickly

AWS Identity and Access Management (IAM):

- AWS IAM is a security service that helps you control access to your AWS resources.

- With IAM, you can create users, groups, and roles, defining specific permissions and policies to restrict access to sensitive resources.

- This ensures that only authorized individuals or services can interact with your application and data.

AWS Console Mobile App

Explore its Features, Working:

In our last AWS tutorial, we studied the **Amazon Management Console**. Today, we will talk about AWS Console Mobile App. Here, we will discuss how to use **Amazon Web Service** Mobile App with its benefits.

Moreover, we will study the requirements & recommendations of the AWS Console Mobile App. At last, we will cover the features of AWS which should be added in the app.

Through this AWS Mobile application, a user can monitor resources with a dedicated dashboard and view configure details, metrics and alarm. We can signed in to multiple identities at once.

So, let's start the AWS Console Mobile App.

Amazon Web Service Console Mobile App:

AWS Management Console helps you to manage and monitor your activity within AWS. It also helps you to manage the existing **AWS EC2 instances**, load balancers, Route-53 and many more applications.

The app performs relevant tasks that are the good companion to the full web experience. AWS Mobile app gives you the tools to rapidly configure and integrate the **cloud** backend your mobile app needs.

How to Use AWS Console Mobile App:

Through this following steps, we can use the AWS Mobile App:

- **Creating the App-** AWS provides you with a kit through which you can build your own app with a pre-configured frontend and backend. Else, you can start with your own app.

- **Setting up Backend-** AWS provides you with a single place to configure AWs services. AWS generates a cloud configuration file, which stores information about configured services.

- **Getting connected to the Backend-** SDK is a toolkit which helps you to access the rage of AWS services. From the mobile hub, you can select a cloud configuration file to configure the **SDK** in the app.

Benefits of AWS Mobile App:

Following are the advantages of Amazon Web Services App, let's discuss them one by one:

- **AWS Relational Database** helps us to view configuration, browse, cloud watch metrics and alarm and manage security and network settings.

- **Amazon Dynamo DB** helps us to view table and index details, to watch table metrics and alarm and it allows us to modify throughputs.

- **Amazon Cloud Formation** allows us to observe output tags, parameters, resources, and parameters.

- The auto-scaling feature provides us with group details, policies, and alarms. Editing minimum, maximum and desired number of instances

- **AWS Elastic Beanstalk** helps us to view applications and environment configuration. Moreover, it provides a facility to restart app servers and deploy app aversions.

- **AWS Ops** Works helps us to view configuration details about your stacks, layers, instances, and applications. View instance logs, reboot instances, and get the status of deployments.

Requirements of AWS Mobile App:

Let's discuss the requirement for AWS Console Mobile App:

- An **AWS account** is must to perform an operation on the mobile app.

- Account number or account alias is needed which was provided in the e-mail.

- For a higher level of protection, either a hardware MFA device or a virtual MFA on a separate mobile device is recommended.

Recommendation:

These are the recommendation for AWS Console Mobile App:

- For security reasons, one should secure the device with a passcode.

- Use **IAM** user's credentials to log in to the app as you lose device the IAM user can be deactivated to prevent unauthorized access.

- For the greatest level of protection, you can use **AWS Multi-Factor Authentication** which can be either a hardware MFA device or a virtual MFA on a separate mobile device.

Troubleshooting Problem:

AWS management console can cause problems with internet explorer 11 such as browser might fail to load some pages of the console. It can be overcome by disabling display intranet sites in compatibility view in settings.

Multiple Device Functioning:

AWS Mobile console is compatible with both tablets and mobile phones. It's benefits are-

- Fewer bezels are provided so that you can see maximum on the screen.

- Buttons and selectors are larger for a better touch experience.

It is easy to view and manage your existing Amazon EC2 instances and Amazon CloudWatch alarms from your phone.

AWS Console Mobile app helps us to add cloud service faster by creating amazing cloud-enabled apps in minutes. It uses serverless technology to run the code without monitoring or managing servers.

It delivers an app which has the quality to develop the pipeline and build, test and deploy services for Android or IOS platform.

You can build your app for free in AWS and you will only charge for the services you use beyond the free tier. You can engage your audience with the help of a mobile app into a meaningful conversation using email, SMS, and mobile push.

Features which can be Added in AWS App:

Following features should add to the AWS Console Mobile App:

- Serverless Functions

- Secure Authentication

- Fast and flexible Database

- Storage

- **Deep learning** conversational interfaces for your app.

So, this was all about AWS Mobile App Tutorial. Hope you like our explanation.

AWS Account

AWS Account | AWS Sign-in Process & Known Issues:

In our last **AWS tutorial**, we discussed the **AWS Mobile App**. Here, we will learn how to create AWS Account and how to use. Moreover, we will study AWS Account Activities like mobile number verification, troubleshooting problems, and Precautions during payments.

So, let's AWS Account Tutorial.

Amazon Web Service Account

AWS helps a lot to integrate business as the flexibility it provides us to work with a great precision. AWS account is a basic step after which one can successfully handle their work. After the creation of the account, **AWS provides many features** and tools to manage your account.

Do you Know about Amazon Elastic Block Store (AWS EBS)

AWS Account Activity:

Following are the step-by-step activities for AWS Account:

- Create your AWS account by providing a valid email address and also set a password for that.

- Provide the contact information and to set your preferences.

- The next step is the payment method in which you have to add the information about the payment method.

- Next step will be verification of the phone number. In this, you have to provide a phone number which AWs will verify and it should be a permanent one.

- There is various AWS support plan available and you have to choose one among them.

When a person is creating a new AWS account and creates a new account is not visible then one should first choose sign into a different account, and then choose to create a new AWS account. There are two types of account that are Personal and Professional which are identical in functionality.

After reading the AWS customer agreement and checking the box you can choose to create the account. After creation of your AWS account, you will get email verification that your account has been created. However, you must continue with the activation process before you can use AWS services.

Let's explore the Unbelievable Benefits of AWS Workspace

Precaution During the Payment in AWS Accounts:

You can check the requested information associated with your payment on the information page. You have to choose the option secure and submit when your payment method is same as the address you've provided for the account.

Mobile Number Verification:

These steps are followed when you try to verify the mobile number for AWS Account.

- The number provided should be active and accept incoming calls

- A captcha is providing to enter the code.

- After this, you will choose to call me now option and will receive a call which is system generated.

- After you will provide the pin the verification will be complete.

Choosing Support Plans for Account:

AWS charges you for immediate support and hence, you have to choose a plan you are comfortable with. The support plan can choose by observing the benefit it provides. A confirmation page is shown which indicates that the account has been activated and the post process might take 24hrs.

Please keep in mind that the AWS home page might continue to display a button that shows "Complete Sign Up" during this time, even if you've completed all the steps in the sign-up process.

Follow this link to know about Integration of Amazon Lambda with SQs

AWS Account – Troubleshooting Problems:

Following are the problems we face at the time of creating AWS Account:

- If you accidentally close the window for the sign-up process before you've added all the necessary information, your account will not activate.

- If there are errors in the information associated with your payment method, your payment method might not validate. In the payment method page, you can check the information related to the payment method.

- AWS validates payment methods by sending an authorization request and costs you a small amount. Financial institutions sometimes reject these authorizations for various reasons. If this rejects then you can contact your payment method's issuing institution and ask that they approve authorization requests from AWS.

- Sometimes there may be browser issues so you can change your browser.

AWS Management Console

Introduction:

- The **AWS Management Console** is a powerful web-based interface provided by **Amazon Web Services (AWS)** that enables users to manage and control their cloud infrastructure and services with ease.

- As the primary hub for AWS management, the console offers a user-friendly and intuitive interface that allows both beginners and experienced users to interact with AWS resources seamlessly.

Key Features:

Unified Management:

- The AWS Management Console serves as a unified dashboard where users can access and control various AWS services and resources from a single interface.

- Whether it's computing, storage, databases, networking, or security, everything can be managed conveniently from one place.

Service Integration:

- With AWS constantly expanding its offerings, the console keeps pace by integrating new services as they are released.

- This ensures that users can take advantage of the latest AWS tools and features without the need for complex setups or installations.

Security and Access Control:

- The console provides robust security features, allowing users to define access permissions, manage **IAM (Identity and Access Management)** policies, and set up **Multi-Factor Authentication (MFA)** to secure their **AWS accounts and resources effectively.**

Resource Monitoring and Logging:

- Users can monitor the performance of their **AWS** resources using the console's monitoring features, which include CloudWatch metrics and logs.

- This helps in optimizing resource usage, identifying bottlenecks, and ensuring the overall health of the cloud infrastructure.

Cost Management:

- The **AWS Management Console** offers cost management tools, enabling users to monitor their spending, set budgets, and receive cost alerts to avoid unexpected expenses and optimize resource utilization.

How to Use AWS Management Console:

Login and Dashboard Overview:

- Users can log in to the **AWS Management Console** using their AWS credentials.

- Upon logging in, they are greeted with a customizable dashboard that provides an overview of their AWS resources, service health, and recent activities.

Navigation and Service Selection:

- The console's intuitive navigation allows users to easily browse through different AWS services.

- They can either use the search bar to find specific services or access them through categorized menus.

Creating and Managing Resources:

- Users can create and manage various AWS resources directly from the console, such as launching EC2 instances, setting up S3 buckets, creating RDS databases, configuring load balancers, and more.

Monitoring and Alerts:

- The console enables users to set up monitoring for their AWS resources, configure CloudWatch alarms, and receive notifications via email or SMS when specific thresholds are breached.

Security and IAM Management:

- Users can manage access to their AWS resources by creating IAM users, groups, and roles.

- Additionally, they can enforce security best practices through IAM policies and access control lists.

Billing and Cost Optimization:

- The console provides insights into AWS billing and cost allocation.

- Users can analyze cost reports, set up budgets, and access tools to identify cost optimization opportunities.

Conclusion:

- The AWS Management Console is an indispensable tool for anyone leveraging Amazon Web Services.

- Its user-friendly interface, extensive features, and seamless integration with various AWS services empower users to manage, monitor, and optimize their cloud infrastructure efficiently.

- By providing a centralized and intuitive platform, AWS continues to simplify cloud management and accelerate the journey to the cloud for businesses of all sizes.

AWS Developer Tools

AWS Developer Tools :
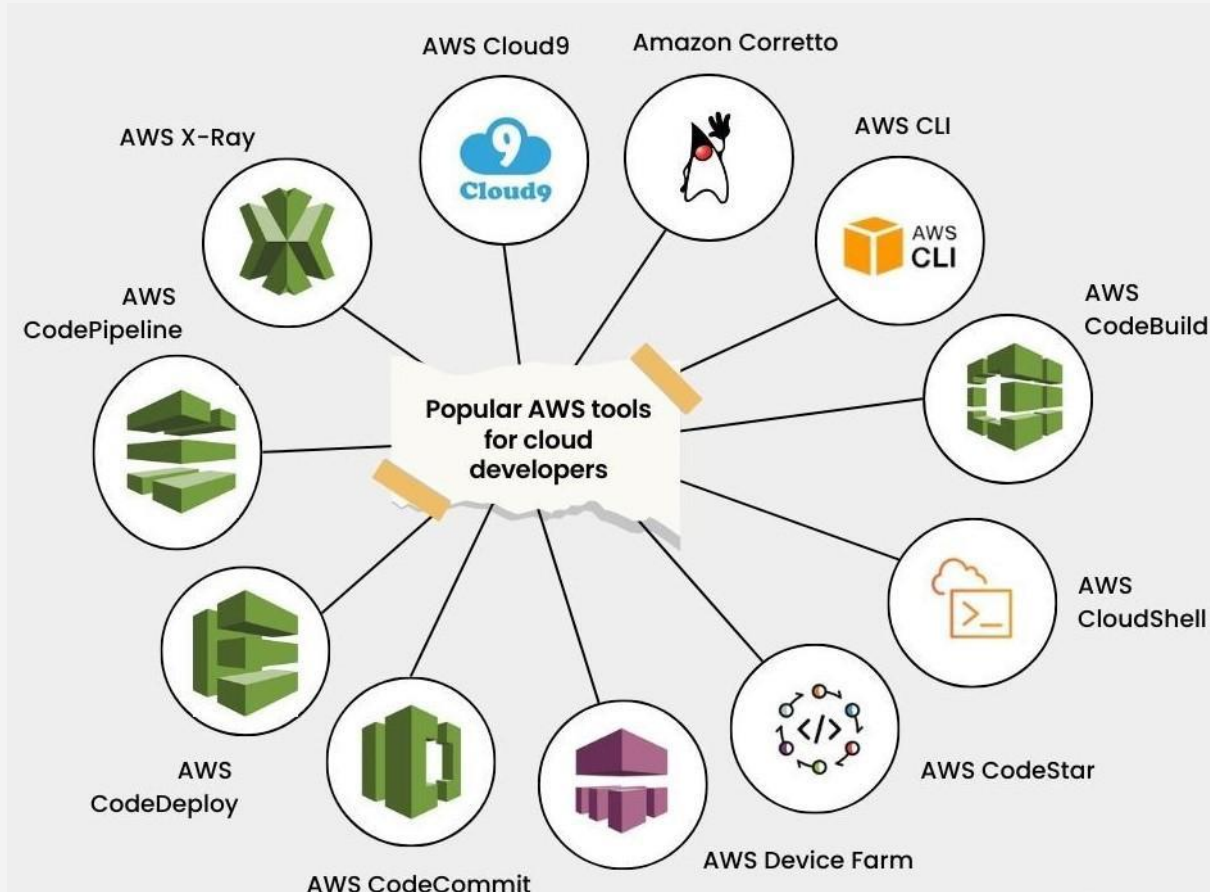
- AWS Developer Tools, a collection of services specifically designed to enhance the development lifecycle on the AWS platform.

- These tools streamline the process of building, testing, and deploying applications, enabling developers to focus on delivering innovative and reliable software solutions.

Key AWS Developer Tools:

AWS CodeCommit:

- AWS CodeCommit is a fully-managed source code control service that makes it easy for teams to host secure and scalable Git repositories.

- Collaborate efficiently with your development team, manage code changes, and ensure version control for your applications.

AWS CodeBuild:

- AWS CodeBuild is a scalable build service that compiles source code, runs tests, and produces deployable artifacts.

- With automated build processes, developers can quickly validate changes and deliver high-quality code.

AWS CodePipeline:

- AWS CodePipeline is a continuous integration and continuous delivery (CI/CD) service that automates the release process for your applications.

- Build, test, and deploy your code using a configurable pipeline, ensuring fast and reliable delivery to your users.

AWS CodeDeploy:

- AWS CodeDeploy automates application deployments to Amazon EC2 instances, on-premises servers, or serverless Lambda functions.

- Easily roll out updates with minimal downtime and control deployment strategies to match your application's needs.

AWS CodeStar:

- AWS CodeStar provides a fully integrated development environment (IDE) with project templates, code samples, and deployment pipelines.

- Accelerate application development with pre-configured resources for various programming languages and frameworks.

AWS X-Ray:

- AWS X-Ray is a powerful debugging and performance analysis tool that helps developers trace and analyze requests across distributed applications.

- Identify bottlenecks, diagnose errors, and optimize application performance for an improved user experience.

AWS Cloud9:

- AWS Cloud9 is a cloud-based integrated development environment (IDE) that enables collaborative coding.

- Developers can write, run, and debug code seamlessly, with features like pair programming and code sharing for enhanced productivity.

Getting Started with AWS Developer Tools :

Explore Individual Tools :

- Familiarize yourself with each AWS Developer Tool's functionalities and use cases to understand how they can benefit your development workflow.

AWS Management Console Integration :

- Access most AWS Developer Tools directly through the AWS Management Console.

- Log in to the console to start using these tools with ease.

Integrate with Your Development Workflow:

- AWS Developer Tools can integrate with popular development workflows, such as GitHub and Jenkins.

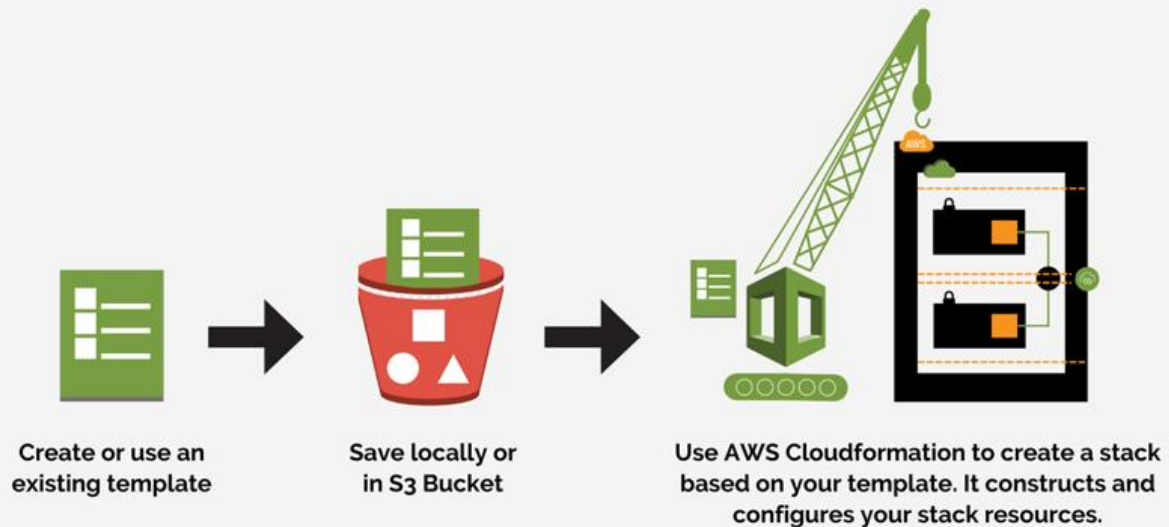- Learn how to integrate these tools seamlessly into your existing processes.

AWS Management Tools

AWS CloudWatch :
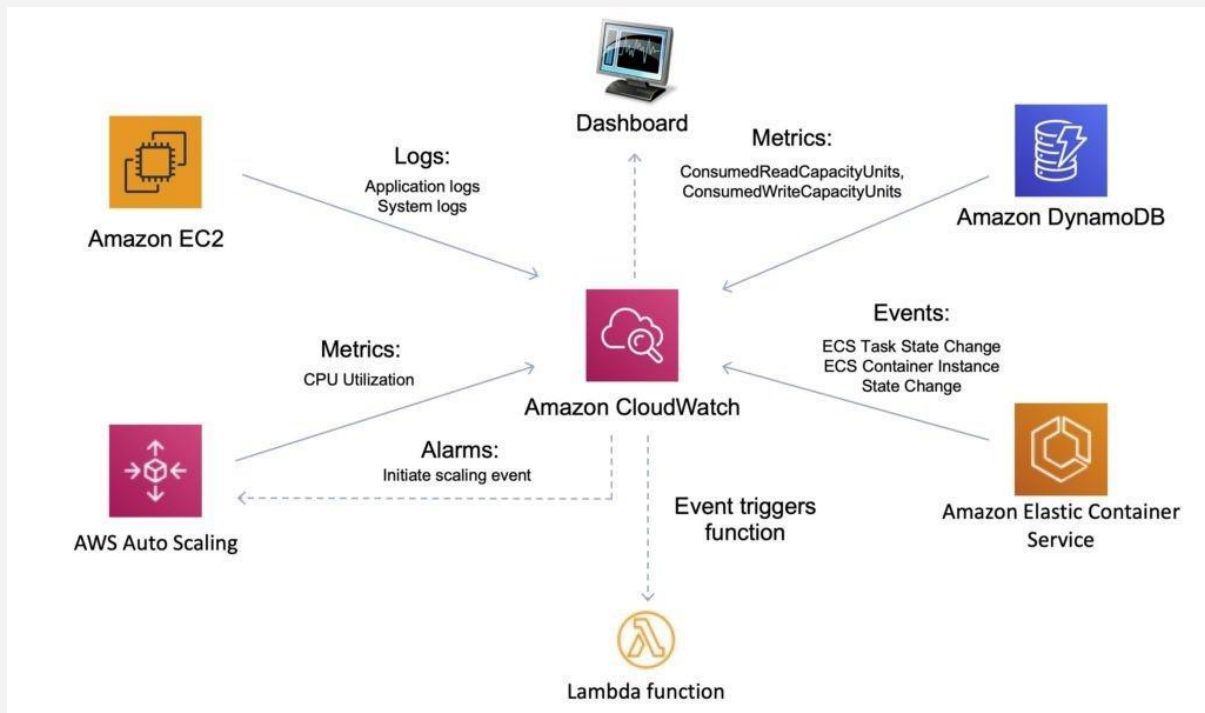
- AWS CloudWatch offers a unified monitoring and observability service for your AWS resources and applications.

- Gain real-time insights into system-wide performance metrics, set alarms to detect anomalies, and automatically react to changes in your environment.

- CloudWatch enables you to visualize and analyze operational data to ensure your applications run smoothly.

AWS CloudFormation :

Create or use an existing template → Save locally or in S3 Bucket → Use AWS Cloudformation to create a stack based on your template. It constructs and configures your stack resources.

- **AWS CloudFormation** allows you to provision and manage your AWS resources using templates.

- Create and update stacks that define your infrastructure as code, ensuring consistency and reducing manual intervention.

- **CloudFormation** supports version control, enabling you to roll back changes and maintain an auditable history of your infrastructure.

AWS Systems Manager:

- **AWS Systems Manager** provides a centralized hub for managing your **AWS instances**, both on-premises and in the cloud.

- With Systems Manager, you can automate tasks like patch management, software installations, and configuration updates across your fleet of instances securely.

AWS Config:

- **AWS Config** continuously monitors and records changes to your AWS resources.

- By providing a detailed inventory and history of configurations, Config helps you assess compliance, troubleshoot operational issues, and maintain a reliable and secure infrastructure.

AWS Trusted Advisor:

- **AWS** Trusted Advisor is your proactive advisor for optimizing your AWS resources.

- It offers recommendations in cost optimization, security, performance, and fault tolerance based on best practices and **AWS expertise**.

- Leverage Trusted Advisor to identify potential cost savings, security vulnerabilities, and performance bottlenecks.

AWS CloudTrail:

- **AWS CloudTrail** delivers comprehensive logging of AWS API activity.

- It enables you to monitor and audit actions taken within your AWS account, providing crucial insights for compliance, security analysis, and troubleshooting.

AWS Service Catalog:

- AWS Service Catalog lets you create and manage catalogs of IT services and applications that your organization can deploy.

- It ensures that your users have access to approved and standardized resources, streamlining the provisioning process while maintaining governance and compliance.

AWS Config Rules:

- AWS Config Rules enable you to define custom rules to evaluate the configuration of your AWS resources continually.

- Automate compliance checks and enforce security policies, ensuring your infrastructure adheres to your organization's standards.

Get Started with AWS Management Tools:

Learn the Basics:

- Familiarize yourself with each AWS Management Tool's capabilities and use cases to determine which tools best suit your needs.

AWS Management Console Integration:

- Most AWS Management Tools are accessible through the AWS Management Console.

- Log in to the console to explore and utilize these tools seamlessly.

Optimize Your Environment:

- Leverage AWS Management Tools to continuously optimize your cloud infrastructure.

- Automate routine tasks, monitor performance, and maintain high security standards to enhance your operational efficiency.