# **What is Cloud?**

"The cloud" refers to servers that are **accessed over the Internet**, and the software and databases that run on those servers.

# **What is cloud Computing?**

Cloud computing is a general term for anything that involves delivering hosted services over the internet.

Cloud computing is the **delivery of online services** (such as servers, databases, software) to users. With the help of cloud computing, storing data on local machines is not required. It helps you **access data from a remote server**. Moreover, it is also used to store and access data from anywhere across the world.

**Why do we use Cloud Computing?**

1. **Single point of Control** delivered over the web lets you manage multiple layers of complex infrastructure.
2. **Real time Human Technical assistance** will help you resolve your problem.
3. **Enterprise Grade infrastructure-as-a-service** system delivers unbeatable computing power.
4. **On-demand compute**,Network and storage components add storage capacity
5. **Pay-as-you-use** gives you choice and control over paying.

# **Why do we need cloud computing?**

Cloud computing helps in **portability, efficiency, and security** means users are able to get the data with the proper credentials of the business operations of the company. Cloud computing **packs up all the data and applications in one place** so that anyone can access them from anywhere. Cloud computing **saves money and time** for the company. Cloud computing offers Security for the data and can **recover data very efficiently.**

# **Pros and Cons of Cloud Computing?**

**Pros**:

### **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

### **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 organisation productivity and efficiency by ensuring that our data is always accessible.

### **Low maintenance cost:**-Cloud computing reduces both hardware and software maintenance costs for organisations.

### **Mobility**:-Cloud computing allows us to easily access all cloud data via mobile.

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

### **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.

1. **Pay per use:-**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.

**Cons**:

1. **Internet Connectivity:-**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 this data. However, we have no other way to access data from the cloud.
2. **Vendor lock-in:-**Vendor lock-in is the biggest disadvantage of cloud computing. Organisations 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. **Limited Control:-**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.
4. **Security:-**Although cloud service providers implement the best security standards to store important information. While sending the data on the cloud, there may be a chance that your organisation's information is hacked by Hackers.

# **Types of Cloud Computing?**

Based on Deployment Models:

1. **Public Cloud-** Public cloud is **open to all** to store and access information via the Internet using the pay-per-usage method.

**Ex**-Microsoft, Google App Engine,Amazon elastic compute cloud (EC2)

1. **Private Cloud:-**Private cloud is also known as an **internal cloud** or **corporate cloud**. It is used by organisations to build and manage their own data centres internally or by third parties

Ex-.HP Enterprises, Dell, IBM

1. **Hybrid Cloud:-**Hybrid Cloud is a **combination** of the **public cloud** and the **private cloud**.Hybrid cloud is partially secure because the services which are running on the public cloud can be accessed by anyone, while the services which are running on a private cloud can be accessed only by the organisation's users.

Ex-Amazon Web Services,Google Application Suite

Based on types of cloud computing services:

1. Infrastructure-as-a-Service (IaaS),
2. Platforms-as-a-Service (PaaS), and
3. Software-as-a-Service (SaaS).

# **Difference Between Public, Private and Hybrid Models?**

| **Parameters** | **Public Cloud** | **Private Cloud** | **Hybrid Cloud** |
| --- | --- | --- | --- |
| **OwnerShip** | Owned by customers | Owned by Single Organization | Partially owned by service provider and customers |
| **Performance** | Low to medium | Excellent | Good |
| **Setup cost of datacenters** | Low initial cost | High | Medium |
| **User By** | Anyone can access it | Limited peoples can access it | Medium accessibility |
| **User Control** | Limited Control | Full Control | Full control over private and limited control to public part |
| **Maintenance cost** | Lowest | highest | Moderate |
| **Example** | Amazon EC2 | Microsoft Azure | RackSpace Hybrid Cloud |

# **Difference Between Iaas,Paas and Saas?**

**IaaS?**

IaaS providers, such as Amazon Web Services (AWS), supply a virtual server instance and storage, as well as application programming interfaces (APIs) that let users migrate workloads to a virtual machine (VM). Users have an allocated storage capacity and can start, stop, access and configure the VM and storage as desired. IaaS providers offer small, medium, large, extra-large, and memory- or compute-optimised instances, in addition to enabling customization of instances, for various workload needs. The IaaS cloud model is closest to a remote data centre for business users.

Infrastructure as a Service, sometimes abbreviated as IaaS, contains the basic building blocks for cloud IT and typically provides access to networking features, computers (virtual or on dedicated hardware), and data storage space. Infrastructure as a Service provides you with the **highest level of flexibility** and **management control** over your IT resources and is most similar to existing IT resources that many IT departments and developers are familiar with today.

**PaaS?**

In the PaaS model, cloud providers host development tools on their infrastructures. Users access these tools over the internet using APIs, web portals or gateway software. PaaS is used for general software development, and many PaaS providers host the software after it's developed. Common PaaS products include Salesforce's Lightning Platform, AWS Elastic Beanstalk and Google App Engine.

Platforms as a service remove the need for organisations to manage the underlying infrastructure (usually hardware and operating systems) and allow you to focus on the deployment and management of your applications. This helps you be more efficient as you don’t need to worry about resource procurement, capacity planning, software maintenance, patching, or any of the other undifferentiated heavy lifting involved in running your application.

**SaaS?**

SaaS is a distribution model that delivers software applications over the internet; these applications are often called web services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access. In the SaaS model, users gain access to application software and databases. One common example of a SaaS application is Microsoft 365 for productivity and email services.

Software as a Service provides you with a **completed product** that is run and managed by the **service provider**. In most cases, people referring to Software as a Service are referring to **end-user applications**. With a SaaS offering you do not have to think about how the service is maintained or how the underlying infrastructure is managed; you only need to think about

how you will use that particular piece of software. A common **example** of a SaaS application is **web-based email** where you can send and receive email without having to manage feature additions to the email product or maintaining the servers and operating systems that the email program is running on.

| **Parameter** | **IaaS** | **PaaS** | **SaaS** |
| --- | --- | --- | --- |
| **Full form** | Infrastructure as a Service | Platform as a Service | Software As a Service |
| **General Users** | Business Users | Developers and Deployers | System managers |
| **Services Available** | Email , Office automation , CRM , website testing , Virtual desktop | Service and application test , development , integration and deployment | Virtual machines, operating systems, network, storage, backup services. |
| **Control** | Highest degree of control and flexibility | Good degree of control and flexibility | Minimal degree of control and flexibility |
| **Operational Cost** | Minimal | Lower | Highest |
| **Security** | Requires transparency in service provider’s security policies to be able to determine the degree of sensitive corporate data. | Additional security is required to make sure rogue applications don’t exploit vulnerabilities in software platform. | Should consider Virtual and physical servers security policy conformity. |
| **Examples** | Amazon Web Services, Microsoft Azure, and Google Compute Engine | AWS Elastic Beanstalk, Google App Engine, and Adobe Commerce | Gmail, Slack, and Microsoft Office 365 |

# **What is AWS?**

Amazon Web Service, or AWS, is an **online platform** providing **cost-effective**, **scalable cloud computing** solutions which is the world's most comprehensive and broadly adopted cloud platform. It offers a range of **on-demand operations**, such as **compute power, content delivery, database storage**, and more, to help enterprises and organisations grow.

AWS are **used** to **lower costs**,become more agile and innovate faster

# **Services Provided by AWS?**

1. **Compute service:**-These services help developers **build, deploy and scale** an application in the cloud platform.

i) EC2 ii)Lambda iii) Elastic Container Service

iv)Elastic load Balancer v)LightSail vi)Elastic Beanstalk

1. **Storage**:- AWS provides web data storage services for archiving data. Also its main **advantage** is **disaster data recovery with high durability.**

i)S3 ii)EBS iii)Glacier iv)Storage gateway

1. **Database**:-AWS database domain service offers cost efficient, highly secure and scalable database instances in the cloud.

i)RDS ii)DynamoDB iii)Elastic Cache iv)Amazon Redshift

1. **Networking and delivery of content:**- It offers **highly secure** cloud platform and **helps** in connecting **physical network to the private VN** with high transfer speed

i)VPC ii)Direct Connect iii)Route 53 iv)Cloud Front

1. **Security tools**:- It helps in monitoring a safe environment for your AWS resources by providing limited access to specific users.

i)IAM ii)KMS iii)Cognito iv)WAF

1. **Developer tools**:- It helps a u**ser build, deploy and run an application source** **code automatically**. It also **updates the server** and instances on the workload.

i)CodeStar ii)CodeBuild iii)CodeDeploy iv)Codepipeline

1. **Management tools**:- Using this service, an individual can **optimise costs, minimise risks, and automate all the resources** running on the AWS infrastructure efficiency.

i)CloudWatch ii)Cloud Formation iii)AutoScaling iv)CloudTrial

1. **Migration**:-AWS Application Migration Service simplifies and expedites your migration to the cloud.
2. **Media services:**-AWS **offers** the **most purpose-built media services, software, and appliances of any cloud** to make creating, transforming, and delivering digital content fast and easy. With pay-as-you-go Media Services and advanced video processing appliances, you can produce high-impact creative projects and outstanding viewing experiences.
3. **Machine Learning**:-Machine learning is the **science of developing algorithms** and **statistical models** that computer systems **use** to perform tasks **without** explicit **instructions, relying on patterns and inference instead**
4. **Analytics**:-Data analytics **converts raw data into actionable insights**. It includes a range of tools, technologies, and processes used to find trends and solve problems by using data.
5. **Mobile Services:**-AWS offers **purpose-built tools and services** for front-end web and mobile developers through AWS Amplify, which makes it easier to build apps with cloud functionality on AWS, so you can get to market faster.

AWS provides an end-to-end solution so you can develop, deliver, test, and monitor your app.

1. **Application Integration**:-Application integration services **enable** the **sharing** of **processes and business data** among a wide range of **applications** in an organisation. This means seamlessly connecting a variety of on-premise and cloud apps to transform and orchestrate the data required for business workflows.
2. **AR and VR**:-Amazon Sumerian lets you **create and run virtual reality (VR), augmented reality (AR)**, and 3D applications quickly and easily **without** requiring **any specialised programming or 3D graphics expertise**.
3. **Desktop and app streaming**:-AppStream 2.0 is a **fully managed application** **streaming service** that provides **users instant access** to their desktop applications from anywhere.
4. **IOT**:-AWS IoT Core is a **managed cloud service** that lets connected devices easily and securely i**nteract with cloud applications and other devices**. AWS IoT Core can support billions of devices and trillions of messages, and can process and route those messages to AWS endpoints and to other devices reliably and securely.
5. **Customer Engagement:**-As part of a successful customer-centric marketing strategy, many brands have **focused on improving their customer engagement**
6. **Business Productivity**:-Efficiency improvement by function on a task-by-task basis

# Difference between AWS, Azure and GCP.?

**AWS**-

Amazon Web Services (AWS) is a **cloud computing platform** which was introduced in 2002. It **offers** a wide range of **cloud services** such as I**nfrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)**.

AWS provides the largest community with millions of active customers as well as thousands of partners globally. Most of the organisations use AWS to expand their business by moving their IT management to the AWS.

**Flexibility, security, scalability, and better performance are some important features of AWS.**

**Azure**-

Microsoft Azure is also called **Windows Azure**. It is a worldwide **cloud platform** which is **used** for **building, deploying, and managing services**. It **supports** multiple **programming languages such as Java, Nodejs, C, and C#.** The advantage of using Microsoft Azure is that it **allows** us to a wide **variety of services without arranging and purchasing additional hardware components.**

Microsoft Azure **provides** several **computing services**, including **servers, storage, databases, software, networking, and analytics over the Internet.**

**GCP-**

**Google Cloud Platform (GCP)** was introduced by Google in 2011. It **allows** us to **use Google's products** such as **Google search engine, Gmail, YouTube**, etc. Most of the companies **use this platform** to easily **build, move, and deploy applications on the cloud**. It allows us to access these applications using a high-speed internet connection. The **advantage of GCP** is that it **supports** various **databases such as SQL, MYSQL, Oracle, Sam**, and more.

Google Cloud Platform (GCP) provides various cloud **computing services**, **including computing, data analytics, data storage, and machine learning.**

| **Parameters** | **AWS** | **Azure** | **GCP** |
| --- | --- | --- | --- |
| API Management | Amazon API gateway | Azure API gateway | Cloud endpoints. |
| Data Warehouses | RedShift | SQL Warehouse | Big Query |
| Object Storage | S3 | Block Blobs and files | Google cloud storage |
| Relational DB | RDS | Relational DBs | Google Cloud SQL |
| Block Storage | EBS | Page Blobs | Persistent disks |
| MarketPlace | AWS | Azure | G suite |
| File Storage | EFS | Azure Files | ZFS and Avere |
| Pricing | Per hour | Per Minute | Pe Minute |
| Catching | ElastiCache | RedisCache | CloudCDN |

# Pros and Cons of Azure?

**Pros**:-

1. **Secure**:-Azure offers a **security control system** based on the **DADSC** approach – this is, **Detect, Assess Diagnose, Stabilise, and Close.** Azure offers **strong protection against data loss**
2. **Scalable**:-There’s **no need to purchase extra data packets** on the days where you maximise data use. Azure allows you to purchase what is needed when, and then remove it once you have finished.
3. **App-Friendly:**-Azure **works** well with the **rest of the Microsoft family**. apps such as **Office 365, SalesForce, Twitter** and more operate well with Azure and allow administrative tasks to be integrated.
4. **Allows building hybrid infrastructure:-**Azure **allows** businesses to **build an effective hybrid infrastructure**. This includes combining the **public, private, and on-premises infrastructure**. The benefit of doing this lies in the fact that it provides greater agility by combining the power of various cloud services.

**Cons**:-

1. **Security issues:-**While Azure is typically a secure platform, it does have a different threat landscape than AWS. Attackers are aware of the weaknesses within Microsoft’s design, and as a Microsoft product, this has left Azure vulnerable.
2. **Region-Specific:-**Azure is a **globalised platform**, with **data centres located** across several **regions**.Azure only **stores** your **data** in the **regions** you allow it to.
3. **Difficult Migration:-**Migration from competitors to Azure can be **complex**. Azure itself provides tools within Azure Migrate to help with migration. This makes migration to Azure easier than it would be moving from Azure to another competitor.
4. **Overuse:-** Like with AWS there is **always a risk of overuse** with **ease of access**. A common problem with these services is that **resources** can be **consumed very easily** meaning that individuals might spin up services and not remove them when the services are no longer needed
5. **Data loss and compensation:-**Azure is a **single solution** – this means that your data will be hosted in one space and if you cannot access it for some reason this can leave you at a disadvantage – especially if Azure loses it.

# **Pros and Cons of GCP?**

**Pros**:-

1. **High Productivity:-**Google Cloud applications can handle tens of thousands of users at once without missing a beat.
2. **Quick collaboration:**-GCP allows quick collaboration for **multiple users** as they can be working from different countries and can yet access and edit a project at the same time.
3. **Pricing:-**GCP offers a **monthly pricing plan** which is billed according to the monthly usage. It also provides committed use discounts.
4. **Big data:**-Google Cloud Platform has many innovative tools for cloud warehousing like **BigQuery** and real-time data processing tools like Google Cloud Dataflow.
5. **Live migration:**-This is one of the **biggest advantages** of GCP which its competitors do not offer. You can perform live migrations of virtual machines during maintenance events. This means you’ll migrate live loads and there would be virtually no downtime in your services or websites.
6. **Highly Scalable:-**It is highly scalable and uses **auto-scaling** to automatically **adjust the sum of virtual machine instances** that are hosting your application.
7. **Data Backups:-**Google Cloud has been praised for **offering** not one, but four **data backups**: **cold line storage, nearline, regional, and multi-regional storage.** Whenever your application or one of its components experiences an issue, then backups are done automatically.

**Cons**:-

1. **Expensive:-**cloud hosting is way more expensive than traditional hosting, although you get what you pay for.
2. **Data Centers:-**GCP has relatively f**ew global data centres** compared to its counterparts. It has just three data centres (US, Europe, and Asia).
3. **Application Engines–**GCP Application Engine is **limited** to **Java, Python, PHP, and Google Go only.**
4. **Support–**GCP’s support **isn’t the strongest** when it involves handling customer issues plus the **support fees are quite expensive**.
5. **Documentation–** Google Cloud Platform has extensive documentation. It has many pages in total and therefore, the API Reference Guide is extremely detailed.

# **What is cloud infrastructure?**

Cloud computing infrastructure is the **collection** of **hardware and software elements** needed to enable cloud computing. **It includes computing power, networking, and storage, as well as an interface for users to access their virtualized resources.**That forms the underlying layer for the cloud deployment models infrastructure as a service (IaaS), platform as a service (PaaS), containers as a service (CaaS) and software as a service (SaaS).

It consists of **servers, storage devices, network, cloud management software, deployment software, and platform virtualization.**

# **Benefits of cloud infrastructure?**

1. **Cost Saving:-**The **pay-as-you-go** system also applies to the data storage space needed to service your stakeholders and clients, which means that you'll get exactly as much space as you need, and not be charged for any space that you don't.
2. **Security:**-Cloud vendors provide advanced **security features** like **authentication**, **access management, data encryption**, etc., to ensure sensitive data in the cloud is securely handled and stored.
3. **Flexibility:-**If you **need extra bandwidth,** a cloud-based service can meet that **demand instantly**, rather than undergoing a complex (and expensive) update to your IT infrastructure.
4. **Mobility:**-Cloud computing allows users to **access corporate data** from **any device**, anywhere and at any time, using the internet. With information conveniently available, employees can remain productive even on the go.
5. **Increased Collaboration:**-Cloud computing makes collaboration a simple process. Team members can view and **share information** easily and **securely** across a **cloud-based platform**.

# **How many cloud Providers? Or Cloud computing service Providers?**

1. AWS
2. GCP
3. Microsoft Azure

**Other Cloud providers are:-**

1. Alibaba cloud
2. Oracle cloud
3. IBM cloud
4. Tencent cloud
5. OVH Cloud

# **Services of Cloud Providers?**

| **AWS** | **Azure** | **GCP** |
| --- | --- | --- |
| Compute | AI + MachineLearning | Compute |
| Storage | Analytics | Storage and Database |
| Database | Compute | Networking |
| Migration | Containers | Big Data |
| Networking and content Delivery | Databases | Developer Tools |
| Developer Tools | Developer Tools | Identity and Security |
| Management Tools | DevOps | IoT |
| Media Services | Identity | Cloud AI |
| Machine Learning | Integration | Management Tools |
| Analytics | IoT | Data transfer |
| Security, Identity and Compliance | Management Tools |  |
| Mobile services | Media |  |
| Application Integrations | Migration |  |
| AR and VR | Mobile |  |
| Customer Engagement | Networking |  |
| Business Productivity | Security |  |
| Desktop and App streaming | Storage |  |
| IoT | Web |  |

**Azure**:-

1. **Compute:** Includes Virtual Machines, Virtual Machine Scale Sets, Functions for serverless computing, Batch for containerized batch workloads, Service Fabric for microservices and container orchestration, and Cloud Services for building cloud-based apps and APIs.
2. **Networking:** With Azure you can use variety of networking tools, like the Virtual Network, which can connect to on-premise data centres; Load Balancer; Application Gateway; VPN Gateway; Azure DNS for domain hosting, Content Delivery Network, Traffic Manager, ExpressRoute dedicated private network fibre connections; and Network Watcher monitoring and diagnostics
3. **Storage:** Includes Blob, Queue, File and Disk Storage, as well as a Data Lake Store, Backup and Site Recovery, among others.
4. **Web + Mobile**: Creating Web + Mobile applications is very easy as it includes several services for building and deploying applications.
5. **Containers**: Azure has a property which includes Container Service, which supports Kubernetes, DC/OS or Docker Swarm, and Container Registry, as well as tools for microservices.
6. **Databases:** Azure has also includes several SQL-based databases and related tools.
7. **Data + Analytics**: Azure has some big data tools like HDInsight for Hadoop Spark, R Server, HBase and Storm clusters
8. **AI + Cognitive Services:** With Azure developing applications with artificial intelligence capabilities, like the Computer Vision API, Face API, Bing Web Search, Video Indexer, Language Understanding Intelligent.
9. **Internet of Things**: Includes IoT Hub and IoT Edge services that can be combined with a variety of machine learning, analytics, and communications services.
10. **Security + Identity**: Includes Security Center, Azure Active Directory, Key Vault and Multi-Factor Authentication Services.
11. **Developer Tools**: Includes cloud development services like Visual Studio Team Services, Azure DevTest Labs, HockeyApp mobile app deployment and monitoring, Xamarin cross-platform mobile development and more.

**GCP**:-

1. **Compute:** GCP provides a scalable range of computing options you can tailor to match your needs. It provides highly customizable virtual machines. and the option to deploy your code directly or via containers.

i) Google Compute Engine ii) Google App Engine iii) Cloud Functions

iv)Google Kubernetes Engine v) Google Cloud Container Registry

1. **Networking:** The Storage domain includes services related to networking, it includes the following services

i) Google Virtual Private Cloud (VPC) ii) Google Cloud Load Balancing

iii) Content Delivery Network iv) Google Cloud Connect

v) Google Cloud DNS vi) Google Cloud Web Hosting

1. **Storage and Databases:** The Storage domain includes services related to data storage, it includes the following services

i) Google Cloud Storage ii)Cloud SQL iii)Cloud Bigtable

iv)Google Cloud Datastore v)Persistent Disk

1. **Big Data:** The Storage domain includes services related to big data, it includes the following services

i)Google BigQuery ii)Google Cloud Dataproc

iii)Google Cloud Datalab iv)Google Cloud Pub/Sub

1. **Cloud AI:** The Storage domain includes services related to machine learning, it includes the following services

i)Cloud Machine Learning ii)Vision API iii)Speech API

iv)Natural Language API v)Translation API

1. **Identity & Security:** The Storage domain includes services related to security, it includes the following services.

i)Cloud Resource Manager ii)Cloud IAM

iii)Cloud Security Scanner iv)Cloud Platform Security

1. **Management Tools:** The Storage domain includes services related to monitoring and management, it includes the following services.

i)Stackdriver ii)Monitoring iii)Logging

iv)Error Reporting v)Cloud Console

1. **Developer Tools:** The Storage domain includes services related to development, it includes the following services.

i)Cloud SDK ii)Deployment Manager

iii)Cloud Source Repositories iv)Cloud Test Lab

# **Diff between service providers - service, pricing, data-centres ?**

| **Parameters** | **AWS** | **Azure** | **GCP** |
| --- | --- | --- | --- |
| **Service** | AWS offers reliable,scalable and inexpensible cloud computing services.  It is a secure cloud service platform offering compute power,DB storage,content delivery and other functionalities to help grow business. | It is a cloud computing service created by Microsoft for building,deploying and managing applications.  It provides IaaS, PaaS, SaaS and supports many programming languages,tools and frameworks. | Google App Engine is a platform as a Service offering us to build, run and maintain applications on Google's infrastructure |
| **Pricing** | Per hour | Per minute | Per minute |
| **Data Centers** | AWS operates over 125 physical data centres in various global locations | 200+ physical Data centres are arranged in regions. | Google has 21 Data centres locations currently |
| **Availability Zones** | 84 | 116 | 103 |
| **Regions** | 26 | 60+ | 34 |
| **Country** | 245 | 140+ | 200+ |
| **Customers** | MI,BMW,ESPN, Netflix,Samsung,Unliever | Ebay, Apple, HP, Pixar, HoneyWell | SnapChat, Philips, HTC, HSBC, |
| **Services Offered** | 212+ | 100+ | 60+ |
| **Market Share** | 33% | 18% | 8% |

# **What are Data Centers?**

A data centre is a **physical location** that **stores** computing machines and their related hardware equipment. It **contains** the **computing infrastructure** that IT systems require, such as **servers, data storage drives, and network equipment.** It is the physical facility that stores any company’s digital data.

# **Pros of data centres in cloud computing?**

1. **Cost Effective:-**When enterprises opt for a cloud-based data centre, they have to **pay no maintenance costs.** Since they are **using the hardware** from the cloud provider’s data centre, they **don’t need to maintain hardware** at all.
2. **Data Security:-**In a cloud-based data centre, the service provider conducts **regular penetration testing** and **provides a baseline protection** for the platform and the data that is being stored. They **implement** security measures such as **authentication, access control and encryption** and empower enterprises to further **add additional layers of security** to bolster their data protection.
3. **Scale as per need:-**Cloud-based data centres are ideal for businesses with growing or fluctuating bandwidth demands. They allow businesses to increase the capacity as per the increased demand without making significant investment in the physical infrastructure.
4. **Mobility:-**Cloud-based data centre, all the **upgrades and updates are done automatically**, off-sight by the service providers. This saves time and team effort in maintaining the systems, thereby tremendously reducing the IT team workloads.
5. **Disaster recovery:-**Cloud-based data centres ensure that data is always available with quick back-up. Such data centres provide quick data recovery for all kinds of emergency scenarios — from natural disasters to power cuts.

# **Pros and Cons of AWS?**

**Pros of AWS:-**

1. AWS provides a **user-friendly programming model**, architecture, database as well as operating system.

2.AWS is a very **cost-effective service**.

3.There is **no need to pay extra money** on running data servers by AWS.

4.AWS offers a total **ownership** cost at very reasonable rates in comparison to other private cloud servers.

**Cons of AWS**:-

1. AWS has supportive **paid packages for intensive or immediate response**. Thus, users might need to pay extra money for that.
2. There might be some cloud computing problems in AWS especially when you move to a cloud Server such as **backup protection**, downtime, and some **limited control**.
3. From region to region, AWS sets some **default limitations on resources** such as volumes, images, or snapshots.
4. If there is a sudden change in your hardware system, the application on the cloud might **not** offer **great performance**.

# **Server and server less computing?**

1.**Server Computing**:-

A cloud server is a pooled, centralised server resource that is hosted and delivered over a network—typically the Internet—and accessed on demand by multiple users. Cloud servers can perform all the same functions of a traditional physical server, delivering processing power, storage and applications.

2.**ServerLess Computing**:-

Serverless computing is a **cloud-based service** where a **cloud provider manages the server**. The cloud provider dynamically allots compute storage and resources as needed to execute each line of code.

| **Parameter** | **Server Computing** | **Serverless Computing** |
| --- | --- | --- |
| **Scalability** | **A server** does not scale up or down. It has a capacity that cannot be exceeded, and its resources stay available even if they’re not being used | **Serverless** systems automatically scale server instances up and down to handle load. You do nothing to achieve this behaviour. |
| **Maintenance** | **A server** requires maintenance. If you run a server, you might have to monitor it, install software, install patches, tune it, and other operations. You have to figure out how to deploy your code to it. | **Serverless** systems require no maintenance. The cloud provider handles all these details of managing the underlying hardware. You just write and deploy code using tools provided by the cloud vendor. |
| **Cost** | **A server** has some ongoing cost associated with it. Typically costs are paid on an hourly, daily, or monthly basis just to keep the server up and running, even if it’s not being used. | **Serverless** systems are billed per function invocation. When you deploy code to a serverless backend, you will be charged for resources used (invocations, memory, bandwidth). If you use nothing, you are charged nothing. |

# **How many services does AWS provide?**

Here some of top services are:

1. Amazon EC2 (Elastic compute Cloud)
2. Relational Database Services
3. Amazon S3 (Simple Storage Service)
4. Amazon Lambda
5. Amazon CloudFront
6. Amazon Glacier
7. Amazon SNS (Simple Notification Service)
8. Amazon EBS (Elastic Block Store)
9. Amazon VPC (Virtual Private Cloud)
10. Amazon Kinesis
11. Amazon Auto-Scaling
12. Amazon IAM (Identity and Access Management)
13. Amazon SQS (Simple Queue Service)
14. Amazon Elastic Benstalk
15. Dynamodb
16. Amazon Elasticache
17. Amazon Redshift
18. Amazon CloudWatch

**Market Share of AWS?**

AWS market share is about 32% of the total cloud service market.

# **What is IAM?**

AWS **Identity and Access Management** (IAM) is a **web service** that helps you **securely control access** to AWS resources. You use IAM to control who is **authenticated** (signed in) and **authorised** (has permissions) to **use resources**.

# **What are the Functionalities of IAM?**

1. **User provisioning and management**:-This includes the ability to create and manage user accounts, as well as assign appropriate permissions and privileges.
2. **Authentication**:-This ensures that only **authorised users can access** the system and **data**. It can be based on **factors like passwords, tokens, or biometrics.**
3. **Authorization**: This **controls** what **users can do within the system**. It is based on the **permissions** and **privileges** that have been assigned to them.
4. **Audit logging**: This **tracks** all user **activity** within the system so that any **suspicious or unauthorised activity** can be **detected** and **investigated**.
5. **Access control**: This limits user access to only those areas and data that they need to perform their job functions.