

Module 2.

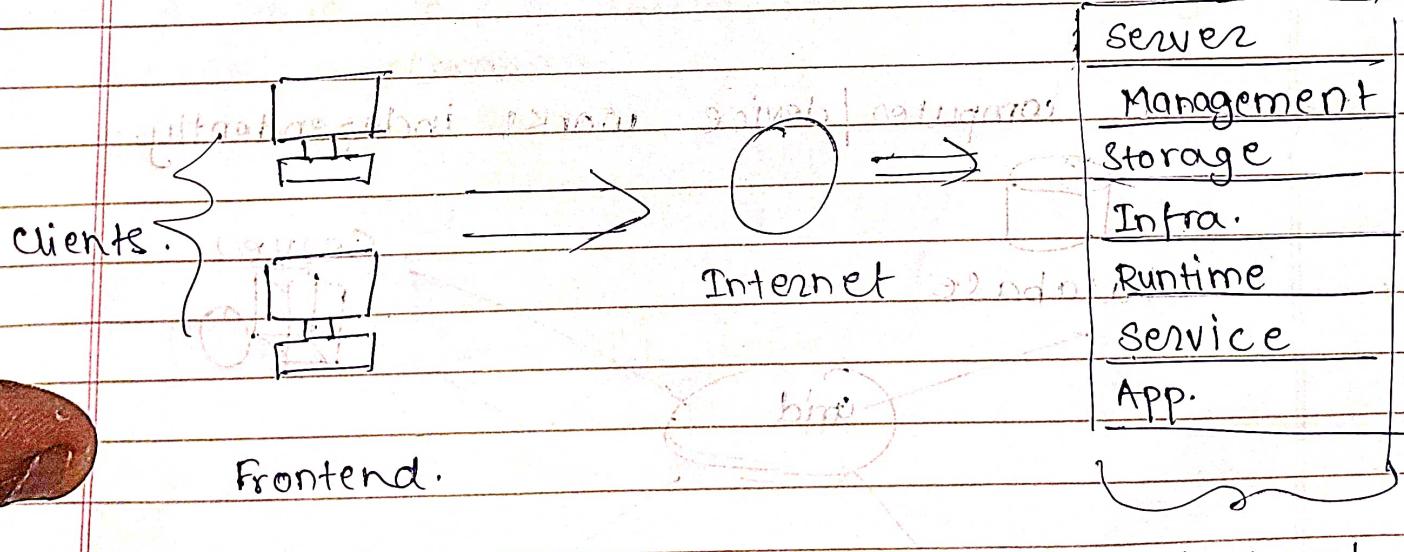
* Comparison b/w Grid, Cluster and Cloud Computing

① Cloud Computing

→ A cloud is a network of servers hosted or managed by an external company.

Cloud computing uses a client-server architecture to deliver computing resources like server, storage, databases and software over the cloud.

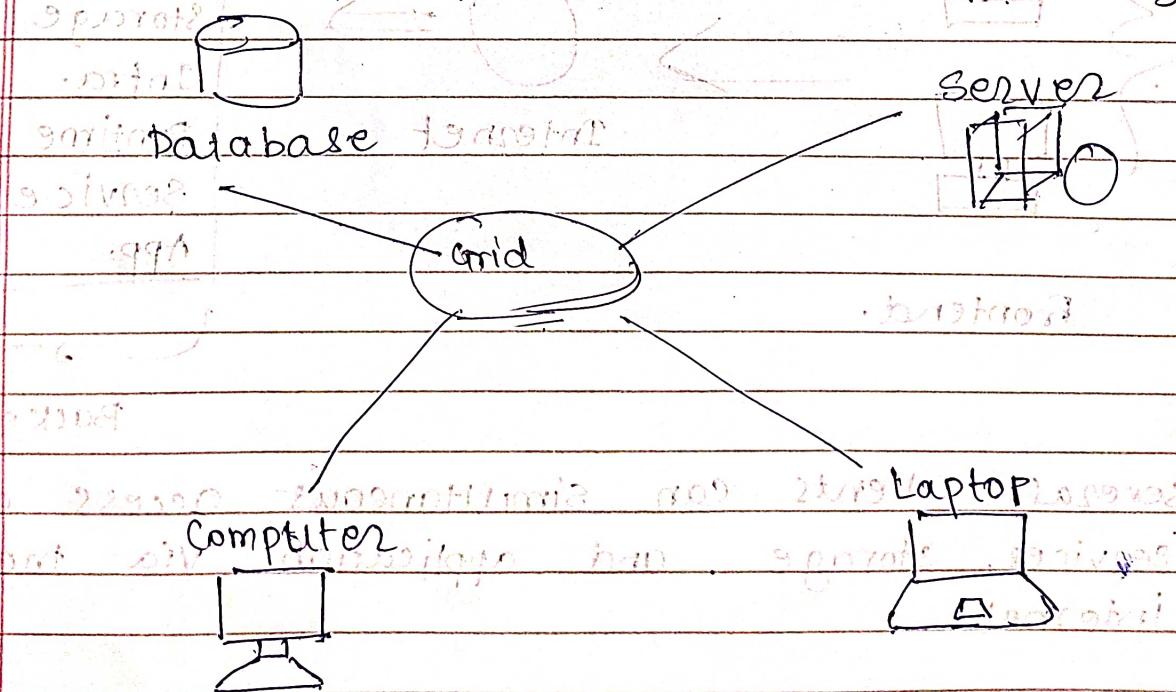
→ Additionally, it enhances server speed, operational costs and accelerates execution speed.



→ Several clients can simultaneous access different services, storage, and application via the Internet.

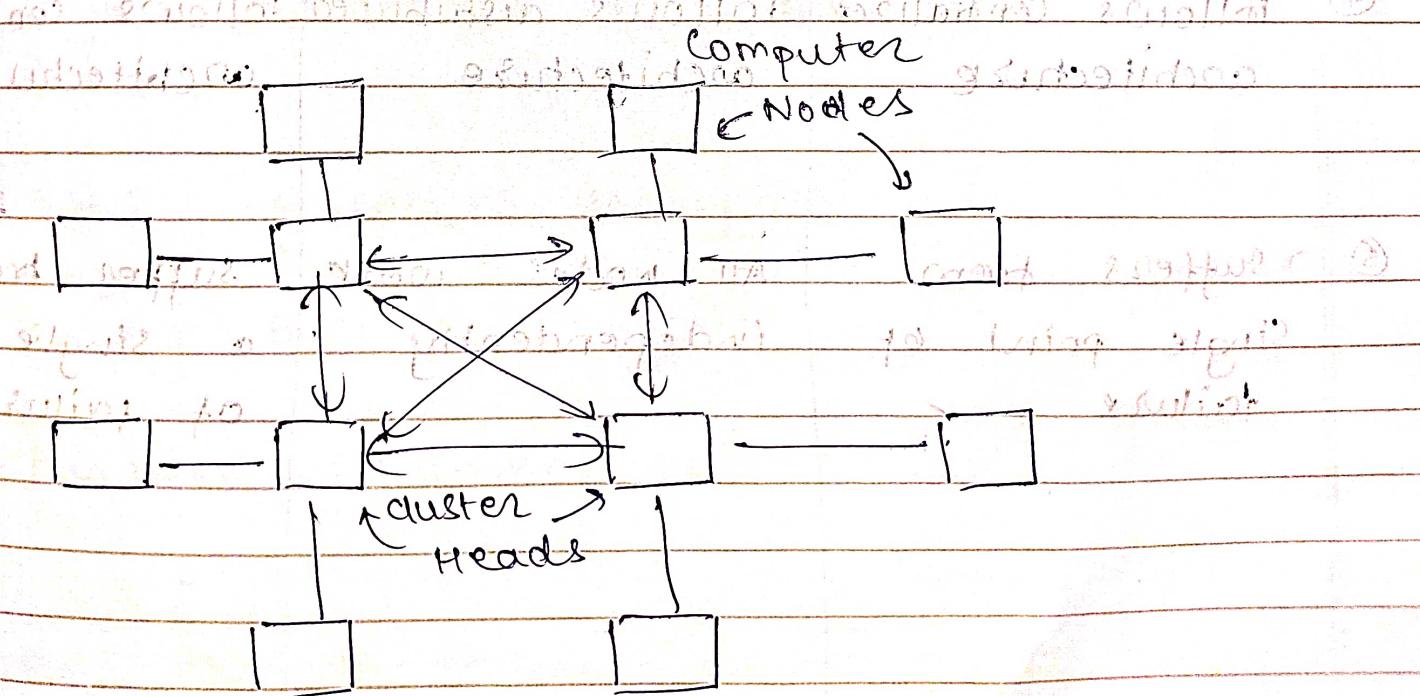
② Grid Computing:

- A grid is a distributed computing architecture that connects a network of computers to form an on-demand robust network.
- Network utilizes a grid to solve complex problems.
- The computers on a grid work together to perform a task. When a device finished a part of a task, it passes the rest of the task to the next device.
- Each computer/device works independently.



③ Cluster computing

- A cluster is a network topology containing two or more computers connected to each other.
- A local network connects the computers or nodes to form clusters.
- Generally all nodes in the same location are present together.
- Follows centralized architecture.
- A node in a cluster can be both synchronous and asynchronous.



Cloud

Grid

Cluster

① Consolidation of resources → Segregation of resources → Aggregation of resources.

② Single system made of many systems → Collection of systems acting as a single system → Group of nodes connected to each other.

③ Works with diff OS and hardware → Works with same OS and hardware → All connected nodes have same OS and hardware.

④ follows centralized architecture → follows distributed architecture → follows centralised architecture.

⑤ suffers from single point of failure. → All nodes work independently → suffer from a single point of failure.

* Benefits of Cloud Computing.

- ① Accessibility anywhere, in any device ensures that everyone is up-to-date with the latest information.
- ② No requirement of personal server, cables, network switches, backup generators. Depending on the cloud provider, this can be managed within a monthly fee.
- ③ Centralised data security. Individual users have no need to backup as the cloud provider automatically creates a backup.
- ④ Higher performance and availability.
- ⑤ Quick application deployment.
- ⑥ Instant Business Insights.
- ⑦ Business continuity.

* Challenges of Cloud Computing

- ① Data Security and Privacy: Data stored is critical and private so it has to be handled with care using proper cybersecurity methods.
- ② Cost Management: Sometimes company incur large amounts of fees if they have higher traffic than before.
- ③ Multi-cloud Environments: Sometimes companies use multiple cloud providers which can be difficult to manage.

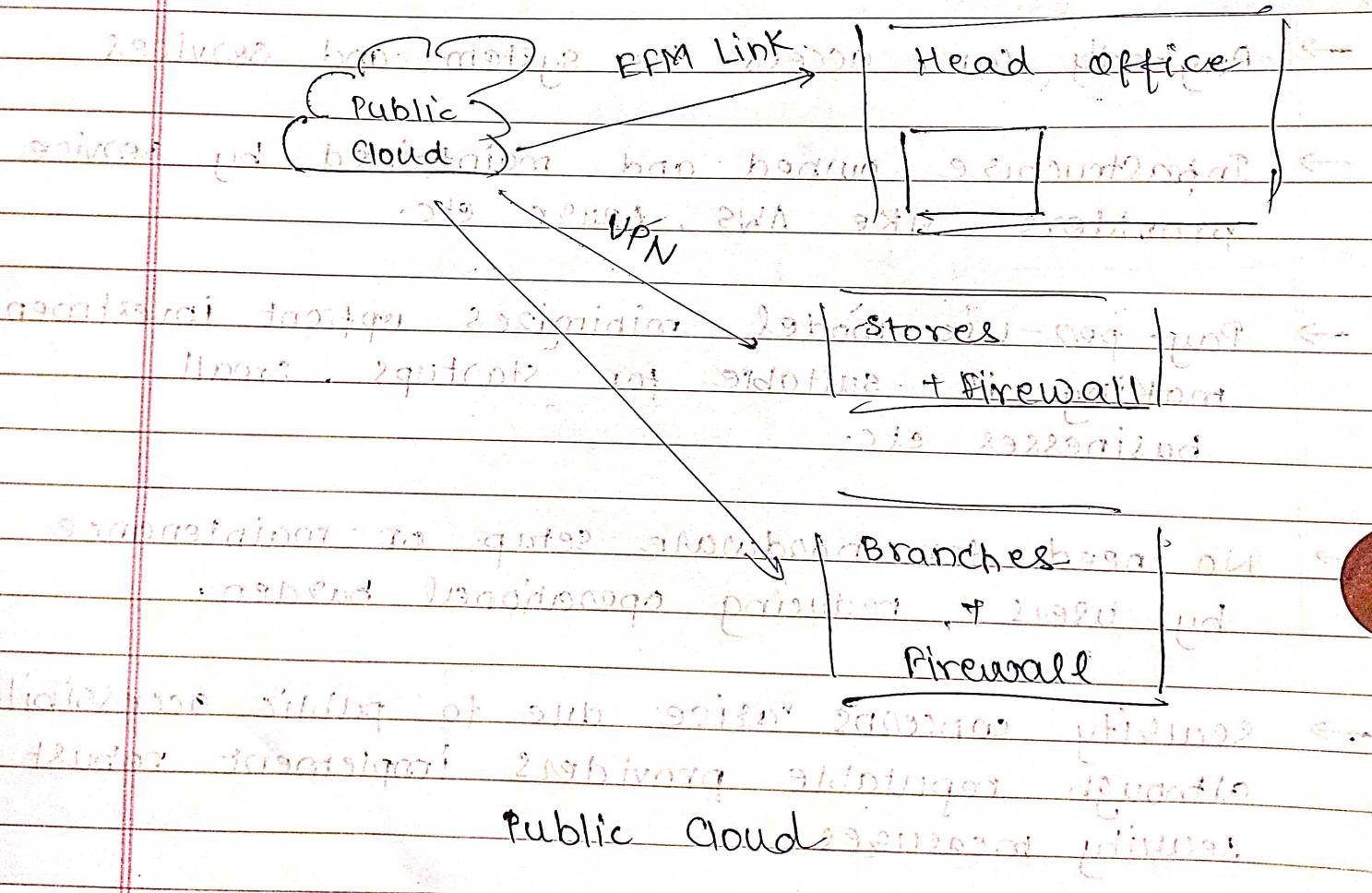
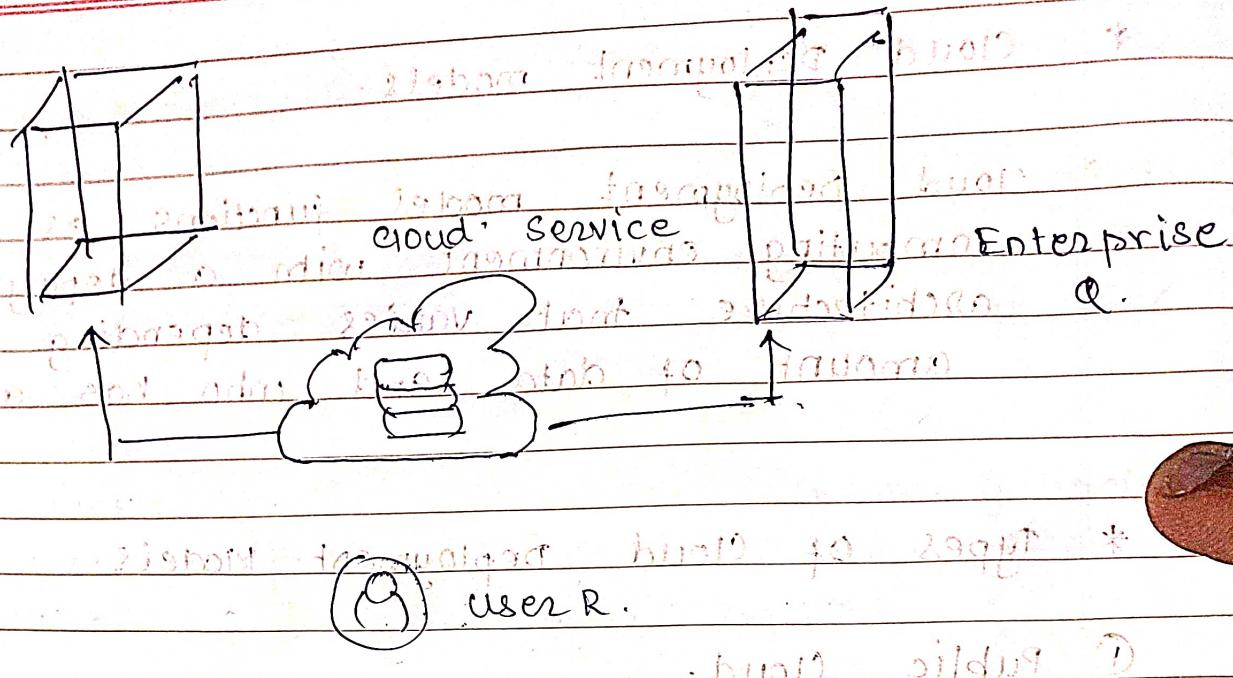
* Cloud Deployment models.

- Cloud Deployment model functions as a virtual computing environment with a deployment architecture that varies depending on the amount of data and who has access to it.

* Types Of Cloud Deployment Models.

① Public Cloud.

- Anybody can access the system and services
- Infrastructure owned and maintained by service providers like AWS, Azure etc.
- Pay-per-use model minimizes upfront investment making it suitable for startups, small businesses etc.
- No need for hardware setup or maintenance by users, reducing operational burden.
- Security concerns arise due to public accessibility although reputable providers implement robust security measures.



② Private cloud.

- Provides a single user environment, offering exclusive control and dedicated resources for enhanced security and performance.
- Accessible within an organisation, offering increased security due to private nature.
- Built exclusively for single enterprise, aiming to address concerns on data security.
- It has two variations

① on-premise private cloud

- Hosted within one's own data center, providing standardised processes and protection.
- Limited in size and scalability.
- Suited for applications requiring complete control and configurability.

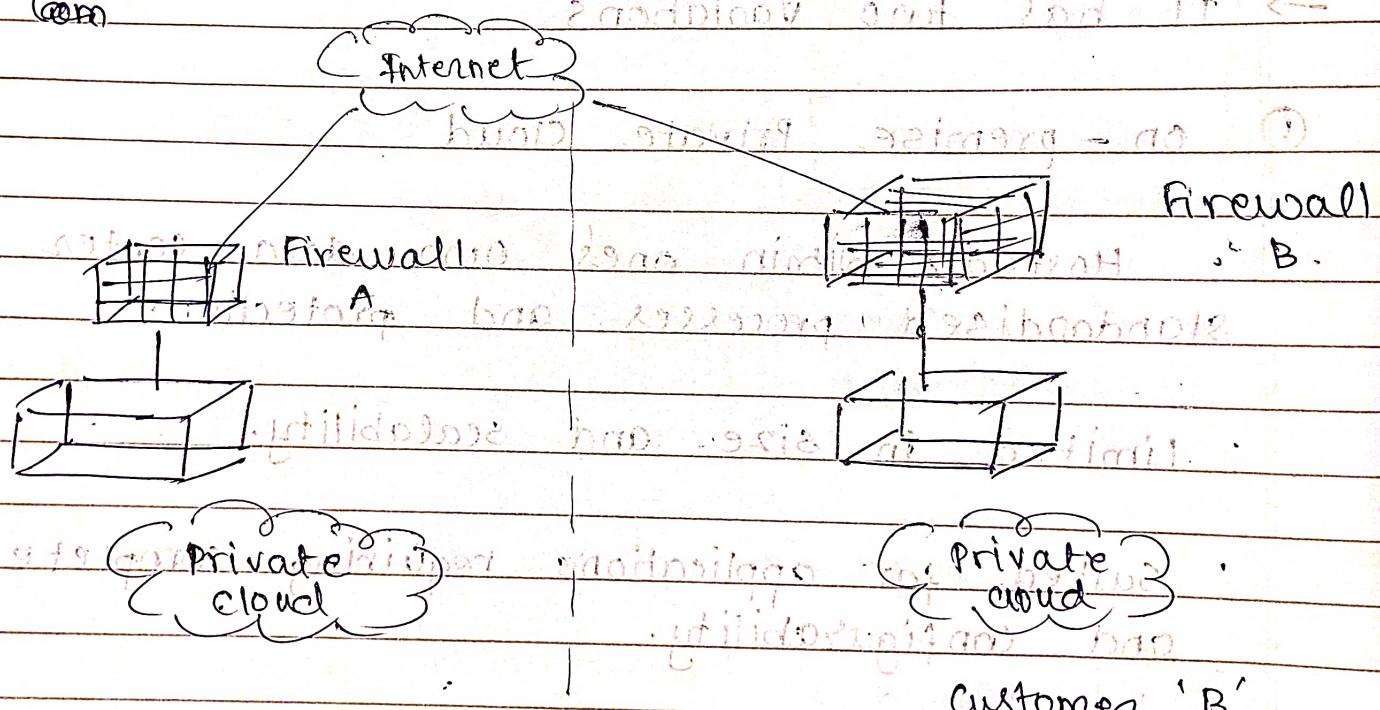
② Externally-hosted private cloud:

- Hosted externally by a cloud provider, offering an exclusive cloud environment with guaranteed privacy.

- Suitable for enterprises preferring privacy over sharing physical resources in a public cloud.
- Examples of Private cloud:

- ① Eucalyptus or the Open Cloud
- ② Amazon Virtual Private cloud
- ③ VMware's cloud Infrastructure Suite

④ Com



Customer 'A' Physical separation

Private Cloud Example

③ Community Cloud

- Shared infrastructure among multiple organization or communities providing cost-effective access to computing resources.
- Cost-savings achieved through shared costs.
- Enhanced security and multiple collab options.

Eg. ① Google Apps for Govt.

④ Hybrid Cloud

- A mixture of public and private clouds.
- Critical activities are typically performed using the private cloud, while non-critical activities are executed on public cloud.
- Offers increased flexibility.
- Capable of providing on-demand, externally provisioned scale, allowing for the augmentation of a private cloud.

Public cloud

- ① Accessible to anyone or major industry groups.

- ② Owned and managed by 3rd-party service providers

- ③ security measures are implemented by the service providers

- ④ Suited for less-confidential information

- ⑤ Supports multiple customers

Private cloud

- ① Accessible only within an organisation

- ② Built exclusively for single enterprises

- ③ offers increased security due to privacy and dedicated resources.

- ④ Suited for secured and confidential information

- ⑤ One cluster of dedicated customers are supported.

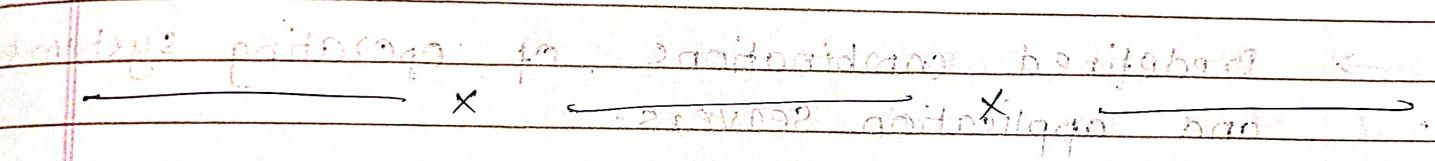
* Factors to consider during choosing a deployment server.

① Security requirements

② Scalability

③ Cost considerations

④ Control and customizations



* Types of Service Layering Models

① Software - as - a - service (saas)

(SaaS) giving a lot of additional

→ Complete applications are offered to customers as services. Examples: Google, Microsoft, Amazon, IBM, etc.

→ Single instance of the service runs on the cloud, serving multiple end users.

→ Reduces cost of ownership, facilitates scalability.

→ Eliminates upfront investment in servers or software licences.

→ Lower cost for providers, as only one application needs to be hosted or maintained.

Example :- Google Workspace

- ② Platform - as - a - service (PaaS) :-
- Offers a layer of software or development environment as a service.
 - Customers can build their own applications on the provider's infrastructure.
 - Predefined combinations of operating systems and application servers.
 - Pg - Google App Engine, Salesforce Platform.

③ Infrastructure - as - a - service (IaaS)

- Pool of hardware resources pulled from multiple servers and networks, maintained by the cloud provider.
- Offers virtualised hardware layer providing computing power and data centers for applications.

- Allows customers to manage and control their own virtualised resources.
- Amazon Elastic Compute Cloud (EC2)
- * SPI Model.
 - Standard for the Software - Platform - Infrastructure model.
 - Enables organizations to choose the level of abstraction and control that best suits their needs and requirements.
- SaaS is perfect for people who want ready-to-use applications.
- PaaS is ideal for developers seeking a platform to deploy applications quickly.
- IaaS is best for people who want full control over their infrastructure.

Cloud Computing

① Refers to delivery of different services such as data and programs through internet.

② Takes place on third party servers and hosted by third-party hosting companies.

③ Ability to access data anytime and anywhere.

④ Requires fast and stable internet connections.

⑤ More cost effective.

Traditional Computing

① Refers to delivery of different services on local server.

② Takes place on physical hard drives and website servers.

③ User can access only one system in which data is stored.

④ Doesn't require an internet connection.

⑤ Less cost effective.

* Scaling of Data.

- The ability to dynamically adjust the resources allocated to an application or service in response to changing demand.
- Involves adjusting factors like:
 - Computing Power.
 - Storage Capacity
 - Network Bandwidth.
- There are two main types of scaling.
 - ① Vertical Scaling (Scaling Up)
 - Involves increasing the power or capacity of existing systems to handle increased demand.
 - Involves upgrading resources like CPU/RAM/storage to meet rising demands.
 - No need to alter the logic or break down tasks into smaller chunks; instead, some code is executed on machines with more capacity.

→ Advantages

- Cost-effective
- Less complexity
- Easier maintenance

→ Disadvantages

- Less flexibility
- Downtime possibilities

② Horizontal scaling (Scaling out)

- Involves increasing the number of nodes or machines in the resource pool to meet increasing demand.
- Involves breaking down sequential logic into smaller chunks and distributing it across multiple machines.
- Logic is processed in parallel across the machines, allowing for increased capacity and performance.

→ Advantages

- High flexibility
- Easier scaling
- Lesser downtime.

→ Disadvantages

- Higher initial costs
- Maintenance challenge