30·6·25

CO-1

Introduction to Cloud Computing

- **Purpose of Cloud**

Cloud is the logical decision to train and run ML / DL Algorithm / Research activities

- **Features**

1) Ubiquitous - Any resource that is available anytime from anywhere

2) On-Demand-Scalability : Increase or decrease of resource

3) Convenient : Portable & Flexible (In cloud, results are available in dashboard)

4) No Capital Cost : Renting of resources. Cloud will ask us to pay for use

5) Less Maintenance Cost

6) No Technological Barriers

Scalability → scale up (increase) → when model underfit
Scalability → scale down (decrease) → when model overfit
→ "Unplanned surges"

The above 6 features are called as "Collection of Utilities"

1·7·25 (2-3 Marks)

- **Definition of Cloud**

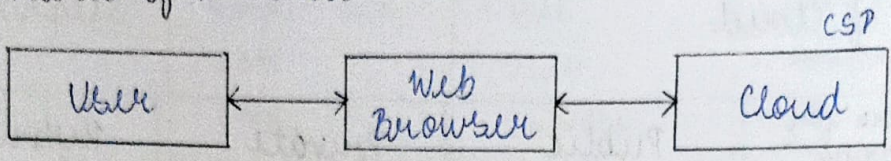
It is a parallel (simultaneously do multiple things) and distributed (portion of project can be run by anyone) system that consists of a collection of interconnected virtual computers that are dynamically provisioned based on SLA (Service level Agreement)

There are 2 groups of people working in cloud :

1) Users / Client
2) CSP (Cloud Service Providers)

* Go through
CPU
GPU
TPU

- Scenario of a Cloud



1) Request (for resources)
2) Resources allocated - "Provisioning"
3) Leverage (maximized utilization of any resource)
4) Resource deallocation - "Deprovisioning"
5) Billing - "Pay only for what you use"

- Vision of Cloud Computing

1) Access to Advanced Computing Technology
2) Flexible, Scalable, Cost Effective IT Resources
3) Seamless collaboration across different geographical locations
4) Rapid Development & Deployment of Applications and Services (RADD)
5) Integration of Recent Technologies ensuring data privacy and compliance

* Flexible - Portable, should not be environment dependent
* Scalable - Should be able to grow and shrink
* Virtual - Not tangible

* Check the meaning
  - Deployment
  - Application
  - Service

3-7-25 (3 & Weeks - Imp for CA)

• Types of Cloud

Parameters for comparing	Public	Private	Hybrid
① Definition	Cloud services and resources are available to all	Cloud services and resources are restricted only for individual usage or for an organization	Cloud services and resources adopt fusion technology to support both common usage & restricted usage
② Tenancy Sharing of resources Single • Single software instance or single hardware instance is allotted to each client • Sharing of resources is highly restricted Multiple • Multiple clients share & use the same environment • Every client is totally unaware of other client data while ensuring privacy of their data	It supports multi-tenancy	It supports single-tenancy	• For resources that support public use, it supports multi-tenancy • Otherwise, single-tenancy
③ Infrastructure → Cost → location → Maintenance	• Cost, location & maintenance will be completely in the control of CSP • Maintenance requires a team of expertise	• Cost, location & maintenance will be completely in the control of individuals or organization • Only for this category, users & CSP will be the same	Fusion of features of both public and private cloud

④ Examples	• Google - GCP • IBM • AWS • Microsoft Azure	• Dell • Cisco • VmWare • Oracle	• Croogle • Amazon • HP

7·7·25

• Characteristics of Cloud & Mapping that to Benefits of Cloud

*User Perspective

Characteristics		Benefits
① "NO" Upfront Cost	→	Economical Returns
No Capital Cost No Maintenance Cost No Operational Cost	⇒	Only in Utility Cost
② On-Demand Computing	→	Scalability (Better handling of unplanned surges)

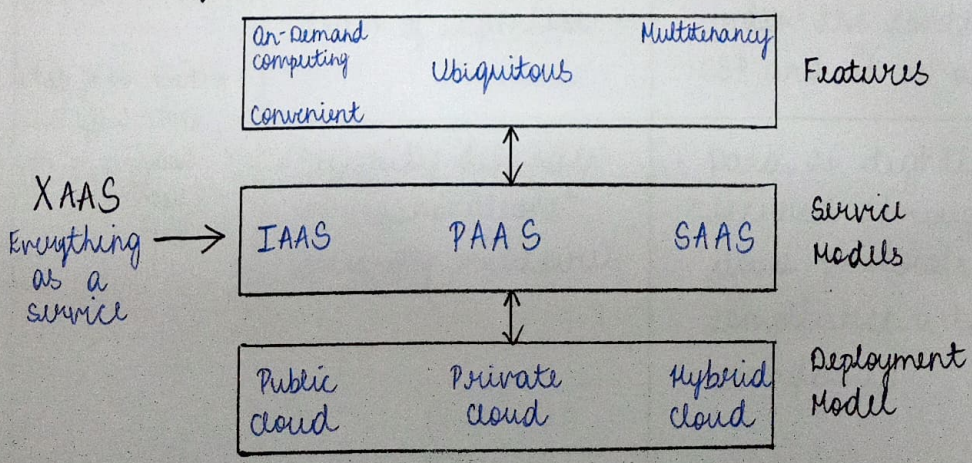
Write definition in Exam

• Scale Up - Allocation of resources due to sudden increase in demand

• Scale Down - Dismissing the resources which are no longer required

③ Multitenancy *	→	• Efficient Resource Utilization • Energy Efficiency
④ Creation & Usage of 3rd party cloud services	→	Rapid conversion of ideas into products

• Cloud Reference Model



• Differences

IAAS	PAAS	SAAS
• Infrastructure as a Service	• Platform as a Service	• Software as a Service
• Infrastructure refers to the architecture or hardware related resources of an environment	• It refers to : 1) Programming Language Environment 2) Web Servers 3) Operating System 4) Database Management System	• It offers instance of any software required by a client
• It includes : → Servers → Networking → Data Stores → Virtualization • Majority of the users will be system administrators	• This service enables users to compile, build & execute applications without worrying about underlying architecture and platforms	• It includes all the services IAAS, PAAS & SAAS
Eg. • AWS • EC2 • Go grid • Rackspace	Eg. • AWS • Elastic Beanstalk • Google App Engine • Microsoft Azure	Eg. • Google - Drive - Mail - Calender • Salesforce.com • HP

* Check no of data centers of:
- Google
- Microsoft
- IBM

8.7.25

Q) Elaborate the discrete differences with respect to the features offered in cloud computing environment by comparing that with On-Premise environment.

Features	On-Premise	Cloud Computing
① Definition	• On-Premise environment gives the complete control of infrastructure and data to an organization	• It is a parallel and distributed system that consists of a collection of interconnected virtual computers that are dynamically provisioned based on SLA which is established based on negotiations between users and CSP
② Scalability ✓	• Scaling up requires heavy investment in hardware setup • In the case of scale down, the resources may remain unused for a longer period of time	• Scale up and scale down is possible * Write definitions in exam • Better handles unplanned surges
③ Server Space ✓	• Setting up of a large scale infrastructure involves unexpected time	• Server spaces will be managed efficiently by CSP
④ Maintenance	• It requires a team of expertise	• Maintenance is under the control of CSP and it is at ease
⑤ Data Security ✓	• Security depends on organizations' security measures	• Data is tightly secured through cloud protocols and compliance with standards

⑥ Data Recovery	• Manual backups are done • Requires proper planning for disaster recovery	• Automated backups and data recovery techniques are available
⑦ Flexibility	• Limited flexibility due to slower adaptations to changes	• High flexibility due to quick adaptability to changes
⑧ Remote Access	• Is restricted because it demands for a different hardware setup	• Built in remote access is available
⑨ Collaboration	• It is very difficult due to restricted remote access	• Seamless collaboration due to built in remote access
⑩ Software Updates	• It requires manual update of software	• Automatic updates of software is possible
⑪ Implementation Time	• Implementation requires due to hardware setup, platform dependency and software installation	• Rapid conversion of ideas into products.