

Sr. No.	Title	Page No.	Sign./Remarks
1.	Cloud Computing Overview		
2.	Cloud Service Models		
3.	Cloud Deployment Models		
4.	Cloud And Virtualization		
5.	Importance And concerns.		
6.	Advantages & Disadvantages of cc		
7.	Evolution of Cloud computing.		
8.	Architecture - Deployment Models.		
9.	Virtualization		
10.	XML		
11.	SLA (Service level Agreement)		
12.	Economics .		
13.	Managing Data.		
14.	Map Reduce Model		
15.	Open Stack		
16.	Open Stack Work flows.		

CLOUD COMPUTING

→ Cloud Computing:-

Cloud in simple terms means storing, managing and accessing the data & program on the remote servers that are hosted over the internet.

(OR)

Cloud computing is the on demand availability of computer system resources, especially data storage (cloud storage) & computing power without without direct active management by the user.

- Why Cloud:-

- Instead of owning & maintaining physical hardware & software. We can use pay as you use model. which is cost effective & scalable.

- Some Providers:- AWS, Google cloud, IBM cloud etc

- Characteristics:

1. On demand Self service.
2. Broad network Access (mobile, tablets)
3. Security
4. low Cost Software.
5. Massive Scale
6. flexibility
7. Reliability.

→ Cloud Services Models

↳ Three Primary models

1. IaaS (Infrastructure as a Service)

- Model provides virtualised computing resources over Internet.
- Users can rent virtual machine, storage and networking infrastructure.
- Consumer can deploy & run software

Ex. aws

2. SaaS (Software as a Service)

- SaaS deliver fully functional software application over the Internet on subscription basis.
- Users can access these application via web browser.

Ex. Google Spread Sheet.

3. PaaS (Platform as a Service)

- PaaS offers a platform that allows developers to build, deploy and manage application.
- It provides tools, framework etc.



CLOUD CLIENTS
(Web Browser, mobile app)

SaaS	(Application)
PaaS	(Platform)
IaaS	(Infrastructure)

→ Cloud Deployment Model :-

1. Public Cloud : The cloud infrastructure is made available to general public. → Google doc.
2. Private Cloud : The cloud infrastructure is operated for an organization
↳ Windows Server.
3. Hybrid Cloud :
- The cloud infrastructure is a composition of two or more clouds.
(private or public), e.g. load Balancing
for Cloud Bursting.
4. Multi-cloud / Community cloud :
- The cloud platform is shared by several organizations and supports a specific goal.

→ Cloud AND VIRTUALIZATION:-

- Virtualization is a technique which allows to share single physical instance of an application or resources among multiple organization or customers.

- All virtual machines work independently.

Host Machine :-

Machine on which virtual machine is going to be build.

Guest Machine → Virtual machine.

HYPervisor :- (VMM) → Virtual machine monitor.

Software that creates & runs the VM.



Software used to create virtualization on physical machines.

Eg:- VMware, Hyper-V

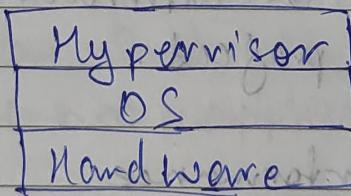
- Types of Hypervisors:-

1. Type 1 hypervisor bare metal or native hypervisor
2. Type 2 hypervisor (hosted or embedded)

- Benefits of Virtualization:

1. Better resource utilization.
2. lowers the cost of IT infrastructure.
3. Remote access
4. Pay per use of the IT infrastructure on demand.
5. enables running multiple O.S
6. If one VM is not working or having any problem, others will not be affected.

VM1 VM2 VM3 → user



→ Why cloud becoming important and concerns

- Importance:

1. Using high Scale / low cost providers.
2. Any time / place access via browser.
3. Rapid Scalability.

- Concerns :-

1. Performance & Reliability & SLA.
2. Application features & choices.
3. Control of data
4. Interaction b/w cloud providers.
5. Privacy, security, trust - .

→ Advantages and Disadvantages of Cloud Computing

- Advantages :-

1. lower computer cost:- No need of high priced
hardware required to computer to run cloud
computing.

2. Collaboration

- People sitting in different countries
can do one project.

3. Improved Performance

- With large programs running on your PC
you will see better performance.

4. Reduced Software Cost:-

- Instead of purchasing expensive software
application, we can get it for free.
- Google Docs suite.

3. Instant Software Updates:

- Web based application, updates happen automatically available the next time you log into the cloud.

6. ~~Unlimited~~ Unlimited storage capacity:

7. Device independence.

- Disadvantages:-

1. Requires constant internet connection.
2. Does not work well with low speed connection.
3. Features might be limited.
4. Can be slow.
5. Stored data might not be secured.
6. Stored data can be lost.
7. Each platform uses different protocols API.
8. Not clear that we can run compute intensive application.

→ Evolution Of Cloud Computing :-

- Main Reasons :-
 - Public clouds can significantly reduce IT costs.
 - Infinite capacity with ability to scale rapidly and pay only for features used.
- Benefits for end user for Deployment model :-

→ Public cloud deployment model :-

- High utilization
- High scalability
- No separate power cost
- No hardware procurement
- No infrastructure maintenance
- User friendly SLA
- for testing prototypes

→ Private Cloud :-

- Confidentiality of data is preserved.
- Virtual machine is cheaper than actual machine.
- Virtual machine is faster.

- Benefits of different Service Model.

→ PaaS Benefits :-

- No need of user to handle scaling & load balancing.
- PaaS provide web based integrated development & deployment.
- Easier to migrate code from development environment to the actual production environment.
- No need to buy separate licenses for IDE.

→ SaaS Benefits :-

- Users subscribe to web services & web application instead of buying.
Eg. Google Docs can be used for free instead of using Microsoft Word.

→ IaaS Benefits :-

- Application needs to be available for 24X7 but where the transaction is unpredictable.
- A minimum number of servers would need to provisioned at all time to ensure availability.

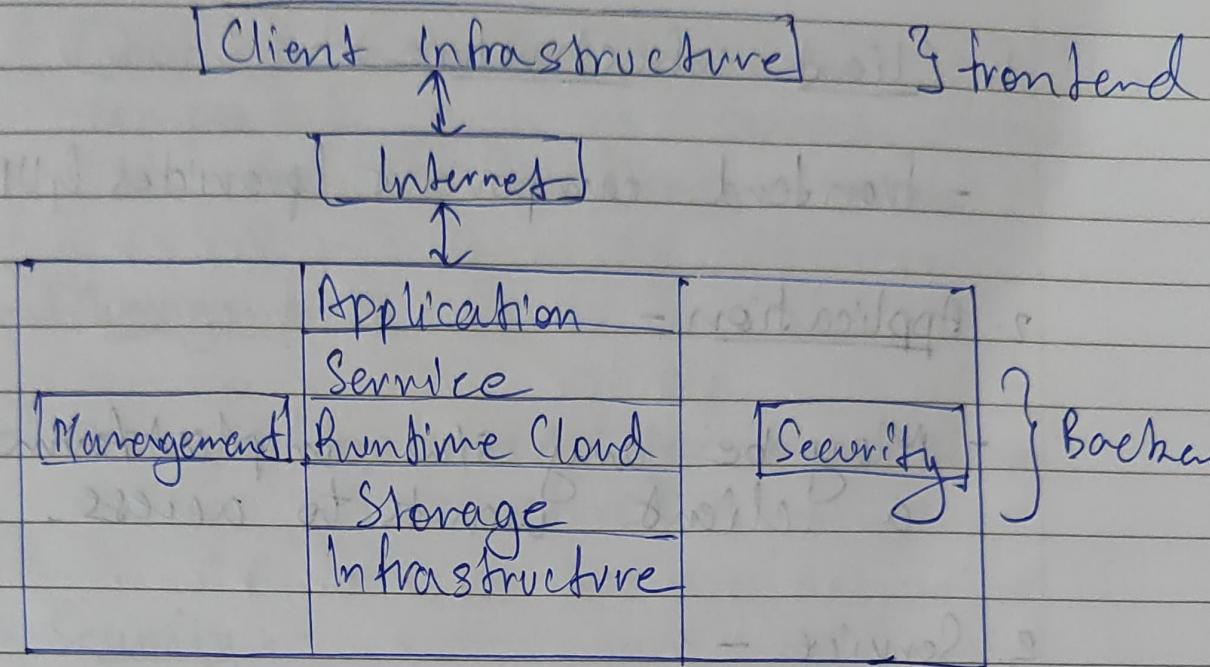
- Purpose of cloud in organization

- Providing an IT platform for business process involve multiple organization.
- Backing up data.
- Running CRM, ERP applications.
- Storing & archiving large file.
- Developing & testing software.
- Running business or e-govt. web sites.
- Analyzing data for research & development.
- Running data intensive batch application.

- Top features driving cloud adoption

- Mail and messaging.
- Archiving.
- Backup.
- Storage.
- Security.
- CRM.
- Collaboration across management.
- Video conferencing.
- Hosted PBX (Private Branch Exchange).

→ CLOUD COMPUTING ARCHITECTURE



- Cloud Architecture has mainly two parts

1) Frontend: - used by client

- Contains all the client side interfaces & application that are required to access the cloud platform.

2) Backend: - used by service provider.

- Manages all the resources that are required to provide cloud computing services.

- It includes data storage security, security mechanism, virtual machine deployment models etc.

- Components of cloud Architecture :-

1. Client Infrastructure :-

- frontend component provides GUI to interface.

2. Application -

- May be any SW or platform that a client wants to access.

3. Service -

- Manages that which type of service you access according to client requirement.

Cloud computing offers:-
1. Saas
2. Paas
3. Iaas

4. Runtime Cloud

- Provides "execution & runtime environment" proportional to the virtual machine.

5. Storage :-

- It provides a huge amount of storage capacity in the cloud to store & manage data.

6. Infrastructure :-

- Cloud infrastructure includes h/w & s/w components such as "servers, storage, h/w devices" & other resources.

7. Management :-

- Manages component (like application, service, infrastructure).

8. Security :-

- Inbuilt backend component provides security mechanism in the backend (Authorization etc.).

9. Internet :-

- Medium through which fronted & backend interact.



SERVICE MODELS :- (XaaS)

- Combination of Service Oriented Infrastruc(s)
- XaaS stands for "anything as a service" (everything as a service).
- XaaS referred to no. of services delivered over internet rather locally.
- XaaS is the essence of cloud computing.

→ Types of cloud computing services :-

1. Software as a Service (SaaS) :-

- It is a way of delivering services & application over the internet & hardware.
- Maintenance of s/w & h/w is done by the vendor.
- No need of install software in our machine.
- So, it remove cost of h/w & s/w maintenance.
- Generally used by end users.

* Characteristics :-

- It makes the s/w available over internet.
- S/w application maintained by vendor.
- cost effective (pay as per use).
- available on demand.
- can be used scale up scale down acc to our need.
- s/w automatically upgraded.

* Benefits :-

- Platform independence.
- Accessible anytime; anywhere.
- cost effective.

Eg. Dropbox, Salesforce, Office 365, Google Drive

2- Platform as a Service (PaaS)

- Developers can use it.
- It provides a platform & environment to allow developers to build application.
- Offers development and deployment tools required to develop application.
- PaaS services are hosted in the cloud & accessed by users via web browser.
- No control over infrastructure.
- We have control over the deployed applications and possibly configuration setting for the application hosting environment.

Advantages:-

- Cost effective (pay as per use)
- no need to purchase expensive servers.
- Scale up/down.
- Easy deployment of web application.

Eg. Google App Engine

Heroku

Windows Azure.

force.com.

3. Infrastructure As a Service (IaaS) :-

- Provider vs Infrastructure.
- It is used by system administrators / new architects.
- It simply provides the underlying OS, security, networking & servers.
- It provides access to resources such as physical machines, virtual machines etc.
- We can scale up & shrink the resources as per requirements.

IaaS offers :-

- Virtual machine disk storage
- IP address
- VLAN's (Virtual local access network)
- Load Balancers.

Eg. B: AWS → Compute → EC2 } We can get
virtual server
Web service

- We have full control over computing resources through administrative access to VMs (Benefit).
- More control than SaaS & PaaS

Eg. IBM cloud,
AWS,
Oracle cloud
Google cloud.

→ Networking in different cloud network Model

<u>OSI layer</u>	<u>Eg. Protocols</u>	<u>Loas</u>	<u>PaaS</u>	<u>SaaS</u>
7 Application	HTTP, SSH	C	C	P
6 Presentation	SSL, TLS	C	P	P
5 Session	TCP	C	P	P
4 Transport	TCP	C	P	P
3 Network	IP, IPsec	C	P	P
2 Data link	Ethernet	P	P	P
1 Physical	Copper	P	P	P

C = Consumer P = Provider .

Cloud storage services research (S3)

→ Cloud S3 is a storage system

Provides data retrieval

such as objects, metadata

A market

and distribution of storage

since

Amazon S3

2003

Cloud storage . Cloud provider

such as AWS

Amazon S3

Cloud

Cloud

→ ARCHITECTURE → Deployment Models:

→ Public Cloud

- Open to all to store & access information via Internet.
- Pay as per use (for the services).
- Managed by third parties (Cloud Service Provider).

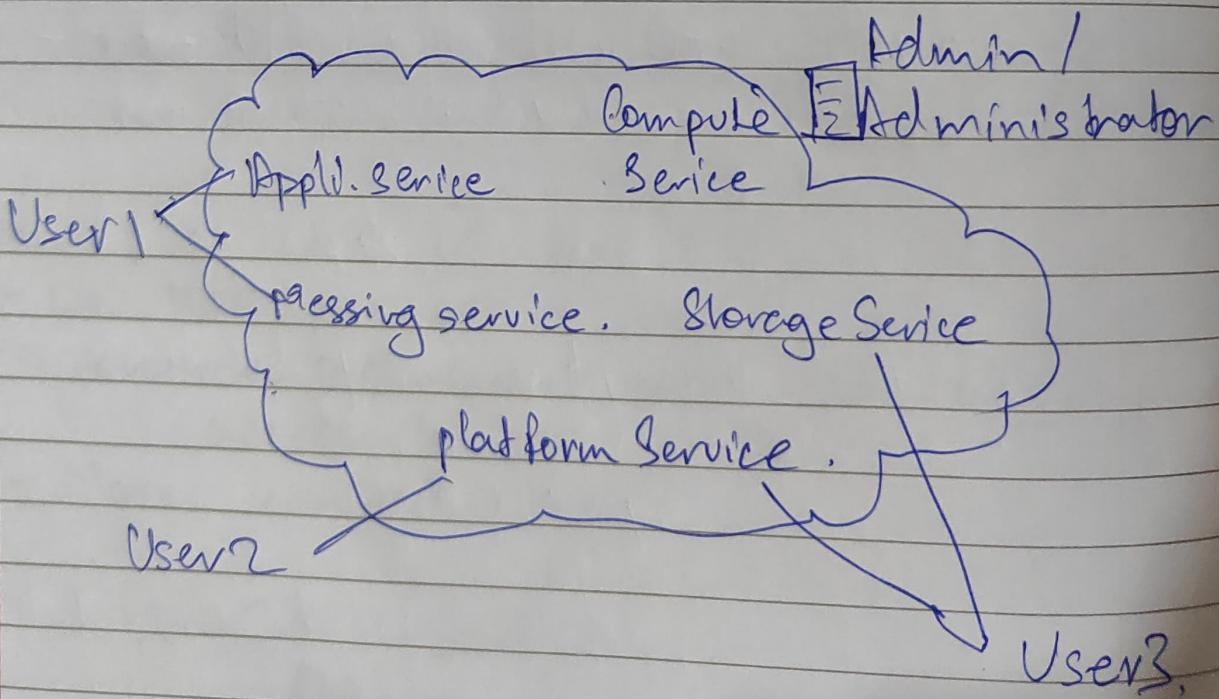
* Characteristics :-

- Multitenancy :-

Eg. EC2 (Amazon elastic compute cloud)

Google App Engine → is a PaaS for developing & hosting web application

Dropbox, Google Drive, etc.



* Advantages :-

- It is maintained by Cloud Service provider.
So, no need maintain it.
- Location independent b/w its services are delivered through the Internet.
- High scalability.
eg. gmail offer 15gb.
- Cost effective & pay as per use.

* Disadvantage :-

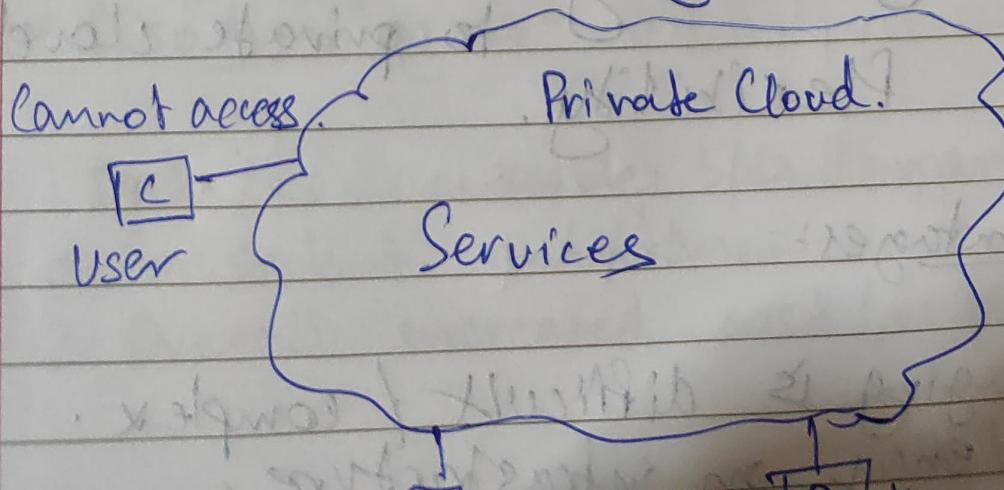
- less secure b/w resources are shared publicly
- less customizable as compared to private cloud.

→ Private Cloud:

- Service accessible within an organization.
i.e. it belongs to a specific organization

↳ also called internal / corporate cloud.

- can't be managed by organization, 3rd party



* Advantages:

1. High Security.
2. Data Privacy.
3. More customizable.
4. Improved reliability.

* Disadvantages:

- Private cloud is accessible within an organization so the area of operation is limited.
- High cost → invest in h/w & s/w.
- Limited scalability.

→ Hybrid Cloud :-

features of public & private cloud.

- Critical activities performed by private cloud non critical activities by the public cloud.

* Advantages:

- Scalability, security, low cost (as compared to private cloud).
- Flexibility.

* Disadvantages:

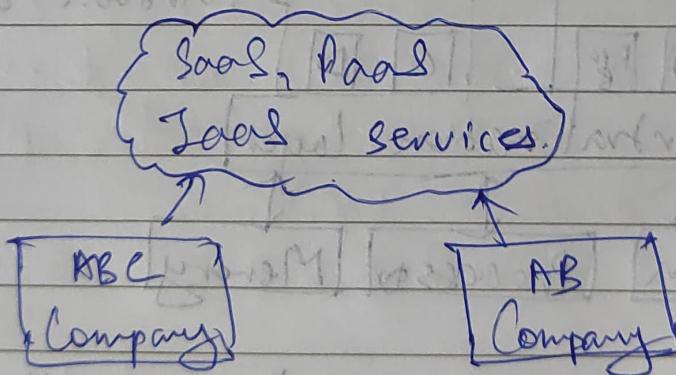
- Managing is difficult / complex.
- Dependency on infrastructure.

→ Community Cloud:

- Allows services to be accessible by a group of several organizations to share server info b/w organization.
- Owned, managed & operated by or more organizations in community or 3rd party.

* Advantages :-

1. Cost reduction / cost effective.
 - Cheaper than private cloud.
 - Multiple company share the cost.
2. Sharing among companies.
3. More secure than public cloud but less than private cloud.



* Disadvantages :-

1. Data is accessible b/w organizations.
2. Consistent maintenance cost.
3. Overall increased cost (vs ~~private~~ public cloud).

→ VIRTUALIZATION :-

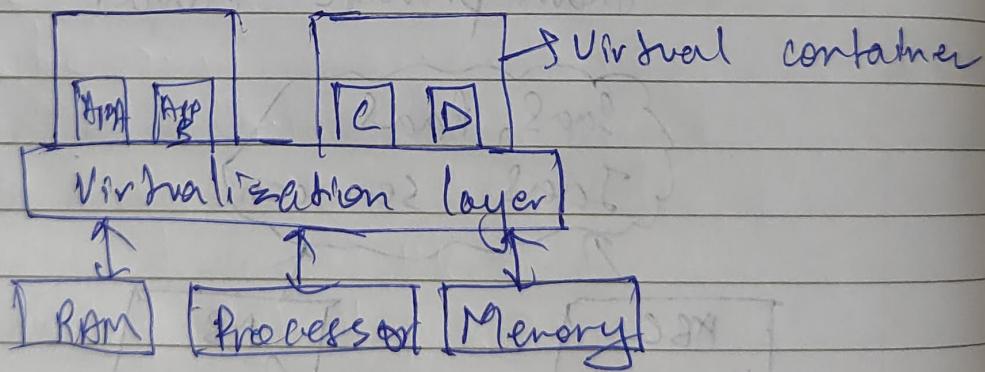
- Virtualization basically allows one computer to do the job of multiple computers, by sharing resources.

* Non-Virtualized System :-

A single OS controls all hardware platform resources.

* Virtualized System :-

- It is possible to run multiple virtual containers on a single physical platform.



- Virtualization is way to run multiple OS and user application on same hardware.

→ Running both windows & Linux on same laptop.

- Hypervisor / VMM (Virtual Machine Monitor).

- A hypervisor / VMM runs the guest OS directly on the CPU.

- SW that creates & ^{nine} return the VM.

Types :-

→ No OS

1. Type 1 hypervisor runs on bare system.

2. Type 2 hypervisor does its software interface

- Types of Hardware Virtualization :

1. full virtualization

2. Emulation Virtualization

3. Paravirtualization.

→ XML :- (Extensible Markup Language)

↓

- It is an markup language that provides rules to define any data.
- XML cannot perform computing operations by itself.
* **or**

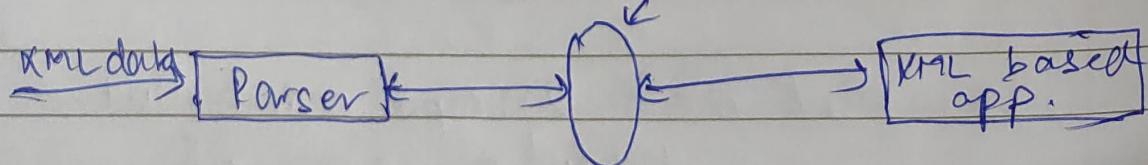
- XML is a software & hardware independent tool for storing & transmitting data.
- XML tags are not predefined.

- Why XML?

- Simple
- Extensible → can create own language of tag.
- Designed for distributed environment.
↳ can have data all over the place
can retrieve and use.
- Mix different data types.

- XML Parser Processing model :-

Parser Interface



→ Parser identify data is syntactically correct.