



Fundamental Model :-

Interaction Model :-

Issues dealing with the interaction of process such as performance and event timings

* Performance of the Comm. Channel

(S) (R)

→ Latency :-

$t_1 \rightarrow t_2$
↓ latency

delay b/w sending & receipt of message.

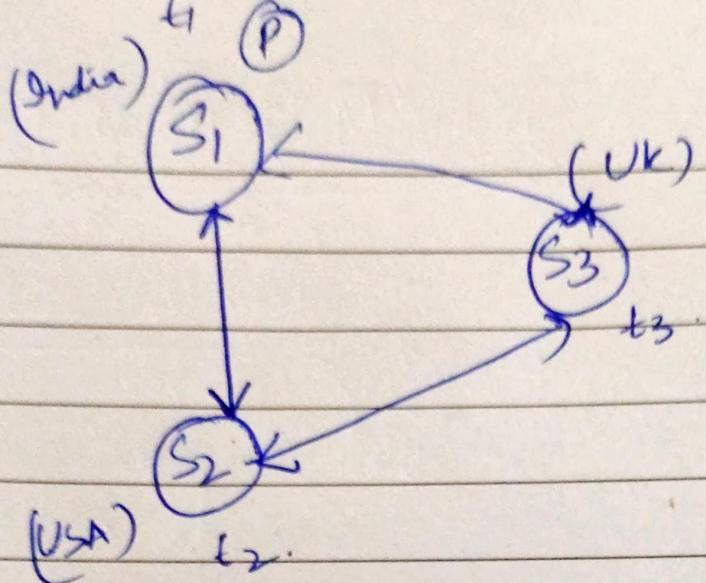
(t)

(NP)

→ Throughput :- No. of packets delivered per unit time.

→ Bandwidth :- Amt. of Info. transmitted per unit time.

* Computer Clock :-



Free the child's potential and you transform him into the work.

Failure

Synchronous distributed System -

- ① Process execution time lower & upper bound are set .
- ② Drift rates b/w local clocks have known bound .
- ③ Transmitted messages are received within known bound time .
- ④

Asynchronous D.S :-

Non Bound on:

- Process execution Time
- Message transmission delay
- drift rates.

- Unpredictable in terms of timing
- No timeouts can be used.

Event Ordering :-

Helps in knowing whether an event at one process occurred before, after or concurrently with other event at another process!

$l_1 \quad a \rightarrow b$

$l_2 \quad a \rightarrow b$

t



Failure Model

failure Model:- Defines the way in which failure may occur in order to provide an understanding of its effects.

* Emission failure :-

Process or Comm. channel fails to perform actions that they are supposed to do.

- ↳ Process failure :- Crash, no responding
- ↳ Comm. failure :- Loss of MSG b/w sender and receiver.

- ## * Arbitrary Failure :- Any type of error can occur in either process, channel or both
- ↳ Process failure :- not performing steps or doing unintended.
 - ↳ channel failure :-
 - ↳ MSG :- Corrupt, Duplicate etc.

These can be due to Hackers, Virus, worm,

* Timing Failure :- Only applicable to synchronous distributed system.

↳ clock :- it affects process.

↳ process local clock exceeds the drift rate bound.

↳ Performance :-

Process ↓ channel .
 ↑
Message exceeding transmission delay set bound .

↳ Exceeds the bounds on interval b/w two steps

* Reliability :-

(i) Validity :- Message in outgoing buffer is delivered to incoming buffer.

(ii) Integrity :- Correct message is delivered.

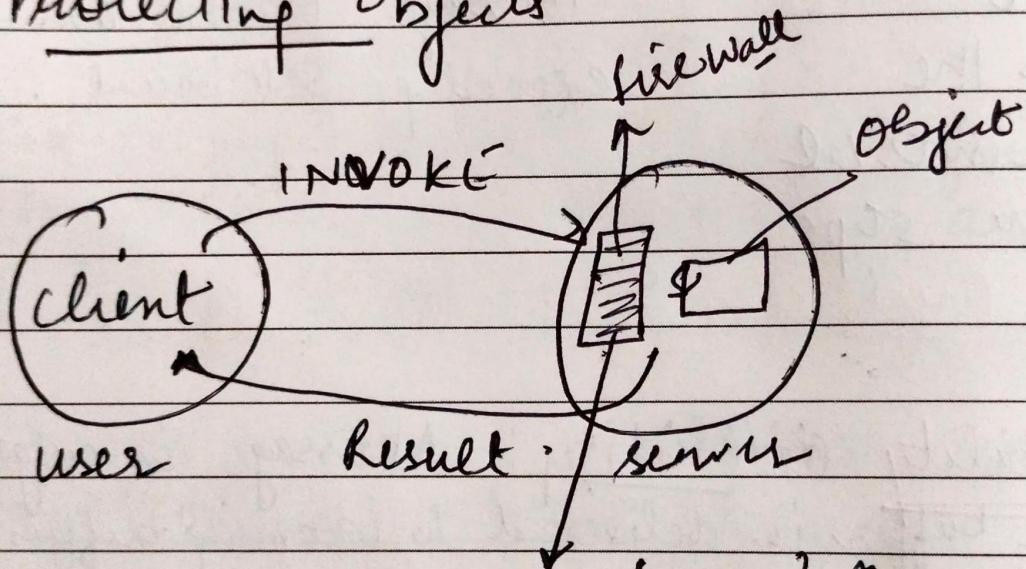
(iii) Threats :- Prevention from malicious users.



Security Model :-

Helps in securing process and channel from unauthorized activities

Protecting Objects



Access Rights } It specifies who
is allowed to
perform actions on the objects .

UNIT-1 (Chapter 2)



Cloud Computing (n/w)

It is the use of remote servers on the internet to store, manage and process data rather than local servers.

Example) Suppose you are the CEO of any company, you want to give laptops to your employees, and have to maintain the maintenance & security of all particular system.

↳ Maintenance, antivirus, security.

Service providers-

- Google Cloud → Alibaba cloud
- AWS etc.
- Microsoft Azure
- IBM cloud.

Scalability :- up & down -

→ They will scale up the resources based on the demand.

Eg:- Amazon (In case of festival season sale (EoSS)) → High traffic on website -



cloud computing is the on-demand availability of computer system resources (especially data storage and computing power) without direct active management by the users.

Live as if you were to die tomorrow.
Learn as if you were to live forever.

Types of cloud :-

- 1) Public → accessible to all
- 2) Private → Services accessible within an Org - ex; Infosys APP
- 3) Hybrid → public + private
- ④ Commodity → Services accessible by a grp. of organisations.

Characteristics of cloud :-



Service Provider

- * on-demand self service means that a consumer can request & receive access to a service offering, without any administrator or some support staff having to fulfill the request manually. Eg: Doctor - ~~reception~~ - receipt
- * Broad Access ie the services can be accessed from any location (using any type of device). ie anywhere access & anytime.
- * Resource Pooling :- (Resource can be storage, memory, n/w, bandwidth, virtual machine) i.e it can be any service which can be consumed by cloud users. Multiple customers are serviced from the same physical resources.
- * Measured Services:- Pay according to the services you use.



⑤ Rapid elasticity & scalability:

One of the great things about cloud computing is the ability to quickly provision resources in the cloud as the org. need them.

⑥ Security :- Copy of our data on various servers, if 1 fails data is safe on the other.

⑦ NO Maintenance/ easy Maintenance.

Advantages / Benefits

- (1) Resources accessible anywhere, anytime.
- (2) on-demand self-service - no third party in b/w like our receptionist
- (3) Reduced IT costs/- (we need not purchase hardware, no maintenance etc).
- (4) Scalability -



- collaboration :- people setting in different countries can do a project.
- offers security :- (recovery from failure) as data stored at many places.
- location & device independence.
- saves our time (we need not update the softwares or maintain the hardware).

Disadvantages :-

- 1) Wire connection dependency, Internet is must.
- 2) lack of support :- (eg. unable to access your data before a meeting etc.)
- 3) May not get all the features (not proper standard).

Great dreams of great dreamers
are always transcended.



Types of clouds:-

- 1) Public Cloud: ^{openess} open to all to store & access information via internet
- Open for general public
 - Pay as per use (for the services)
 - managed by third parties (cloud service providers)
 - It is employed globally.
- Fundamental characteristics of public cloud is MULTITENANCY
- ↓
- Shared resources used by multiple users.

eg: ~~Heroku~~ Google App Engine → is a PaaS for developing & hosting web Appln.

→ Dropbox, Google Drive etc.

MAY

01 wednesday

02 thursday

03 friday

04 saturday

05 sunday

06 monday

user 2

07 tuesday

08 wednesday

09 thursday

10 friday

11 saturday

users 1

users 3

Admin
Administrator

manage

the

cloud

service provider

Appn.
service

Media
service

Platform
service

compute
service

Storage
service

Advantages

thursday 16

friday 17

* It is maintained by cloud service, so, we need not maintain it

sunday 19

* location independent b/c its services are delivered through the internet

monday 20

tuesday 21

wednesday 22

* high Scalability (up & down)
Eg (gmail offers 15gb, we can increase anytime & decrease)

thursday 23

friday 24

saturday 25

sunday 26

* cost effective :- Pay as per use!

monday 27

tuesday 28

Disadvantages :-

wednesday 29

1) less secure b/c resources are shared publicly.

friday 31

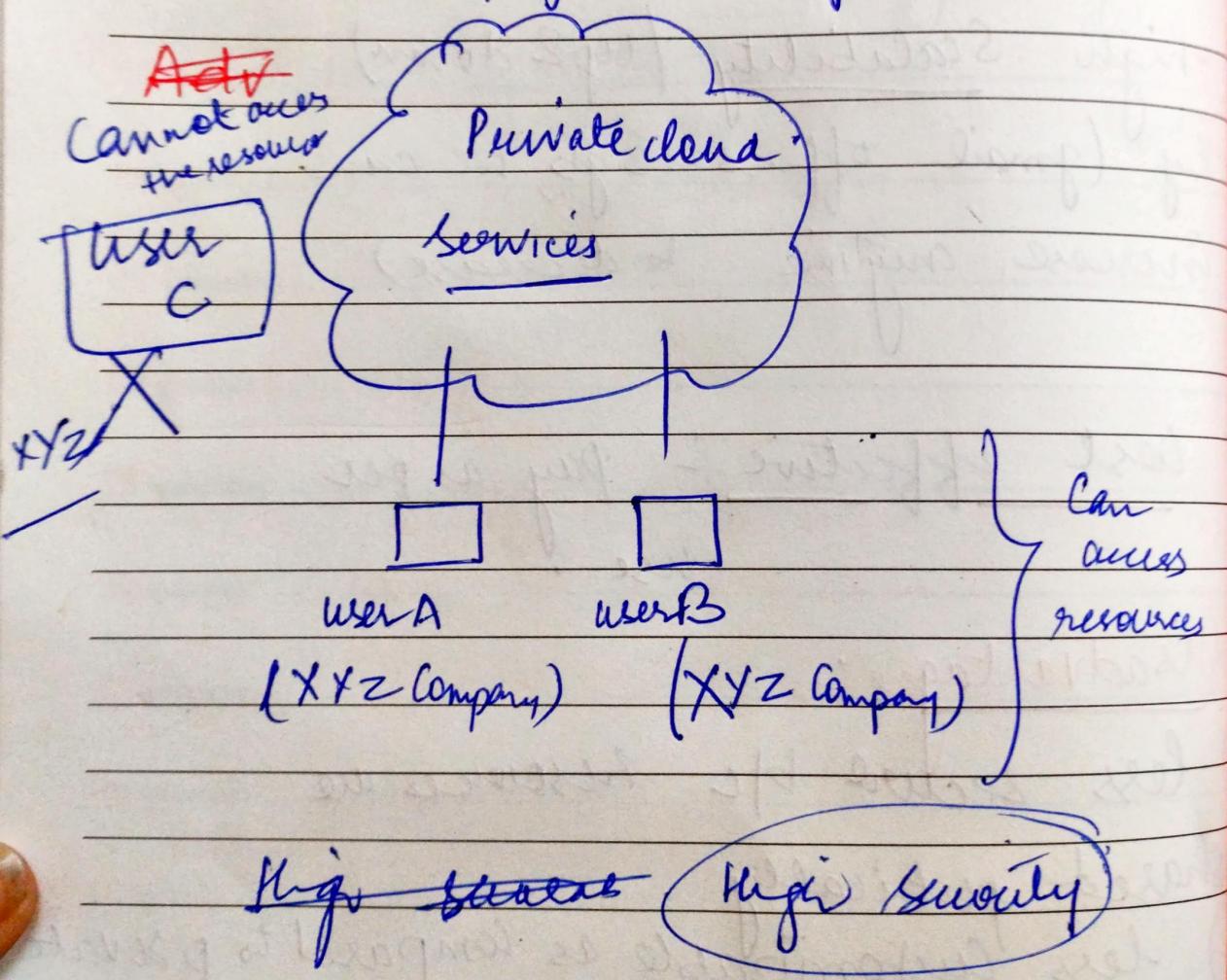
2) less customizable as compared to private cloud.



Private cloud :- Services accessible within an organisation i.e. it belongs to a specific organisation.

Note Sometimes also called internal / corporate cloud.

- Can be managed by → Organisation
- It is employed locally.





Advantages

- ★ High security :- In private cloud, security concerns are less since customer data & other sensitive info. does not flow out of a private infrastructure.
- ★ Data privacy :- only authorized people can access the data.
- ★ More customizable - as companies get to customize their sol'n as per requirement.

Disadvantages :-

- Private cloud is accessible within an organisation, so, the area of operations is limited!
- High cost → we need to invest in hardware & space.
Educating the mind without educating the heart is no education at all.
- Limited Scalability.

Hybrid :-

features of public & private cloud.

- Critical activities performed by private cloud.
- Non-critical activities by public cloud.

Advantages :-

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

- flexibility.

Disadvantages :-

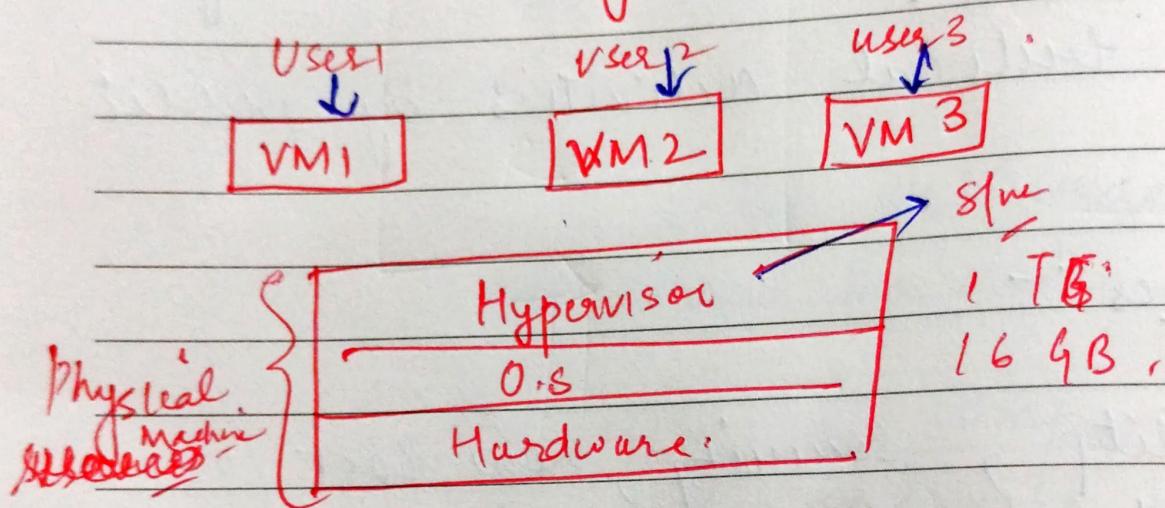
Managing is difficult / complex b/c there are more than 1 type of deployment model

- step



Virtualisation :-

It is a technique which allows to share single physical instance of an appn or resource among multiple org. & customer.



* All virtual machine work independently.

* HOST Machine :- Machine on which virtual m/c is going to be build.

Guest :- machine \rightarrow Virtual machine



Eg) KMware, Hyper-V
Hypervisor (VMM)

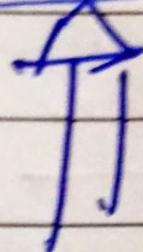
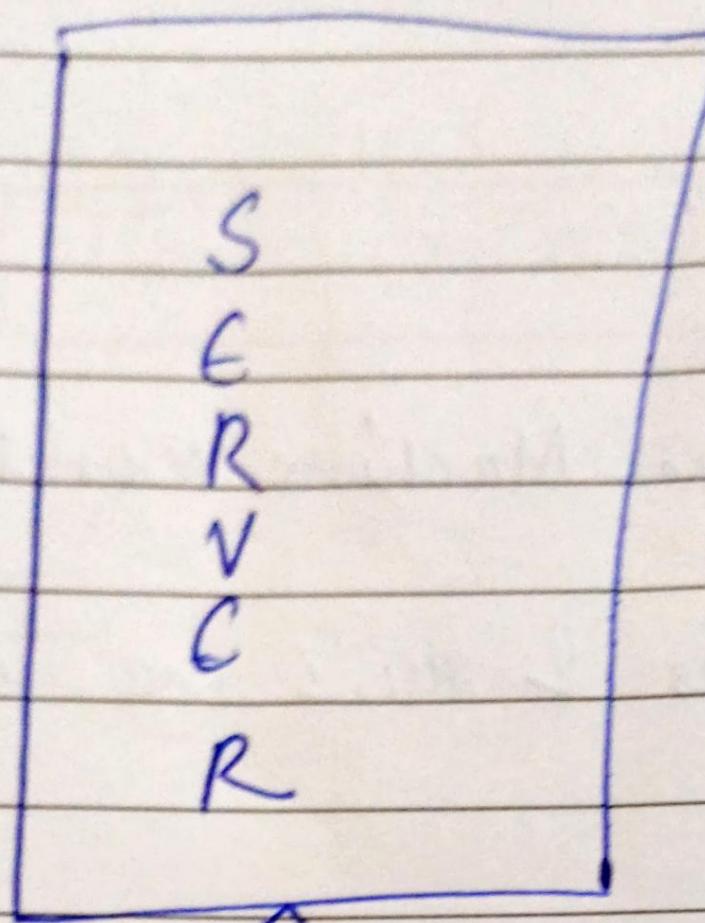
Let us not pray to be sheltered from dangers,
but to be fearless when facing them.

↳ Virtual Machine Monitor

↓
S/w that creates & runs the VMs (Virtual Machine)

Benefits of Virtualization

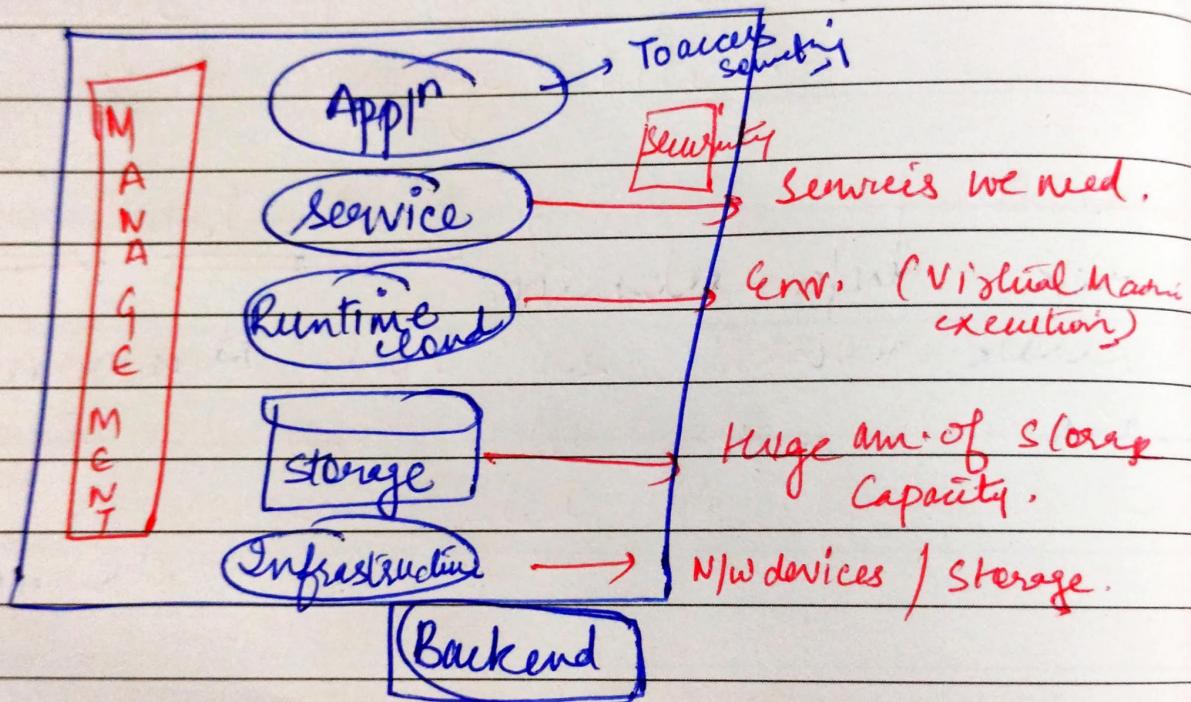
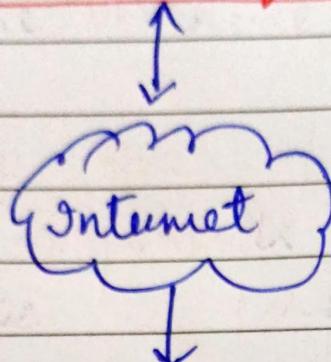
- (i) Better resource utilization
- (ii) lowers the cost of IT infrastructure
- (iii) Remote access.
- (iv) enables running multiple OS ^{sim}
- (v) If one virtual machine is not working or having any problem, others will not be effected.



hypervisor (VMM)

Architecture → Front end
Back end } 2 parts

client infrastructure → Frontend



Front end → used by client,

* contains all the client side interfaces & app'l's that are required to access cloud platform.

Backend: * used by service providers.

- * It manages all the resources that are required to provide cloud comp. services.
- * It includes huge amount of data storage, security mechanisms, virtual machines, servers etc.

Components :-

- 1) Client Infrastructure :- front end component (provides GUI to interact with cloud)
- 2) Applⁿ :- may be ^{any} platform or GUI, website that client want to access.
- 3) Services | Manages that which type of service you access & accordingly to clients requirement
cloud comp. offers P- SaaS, PaaS, IaaS.

 4) Runtime cloud:- provides "execution runtime env." to the virtual machine

5) Storage one of the most imp. components:-
It provides a huge amount of storage capacity in the cloud to store & manage data.

6) Infrastructure:- **Cloud infrastructure** includes hardware & software components such as Server, Storage, network devices, Virtualization software and other resources needed for cloud computing model.

When educating the minds of our youth we must not forget to educate their hearts.

7) Management:- Manages components like app^m, service, infra).

8) Security :- Inbuilt backend component provides security mechanism in the backend.