Iot unit 5 part B - iot material

IoT and Applications

Unit-5

Part-B

cloud computing

Introduction to cloud computing :-

* "cloud" refers to the servers that are accessed over the Internet.
* In simple terms, it means storing, managing and accessing the data & program on the remote services that are hosted on internet instead of computers hardware.

(or)

* cloud computing is the on-demand availability of computer system resources, (especially data storage/ cloud storage & computing process). without direct active management by the user.
* In short, we store, manage & process data on remote servers.

Definition of cloud computing :-

It is the delivery of different services through the internet, including data storage, servers, databases, networking, and software.

cloud based storage makes it possible to save files to a remote database and retrive them on-demand.

Service providers :-

		Market Share
1. Google cloud platform (GCP)	—	11%.
2. AWS (Amazon web services)	—	32%.
3. Microsoft Azure	—	22%.
4. IBM cloud	—	
5. Alibaba cloud	—	4%.

Types of cloud :-

1. public cloud
2. private cloud

3. Hybrid cloud

4. community cloud

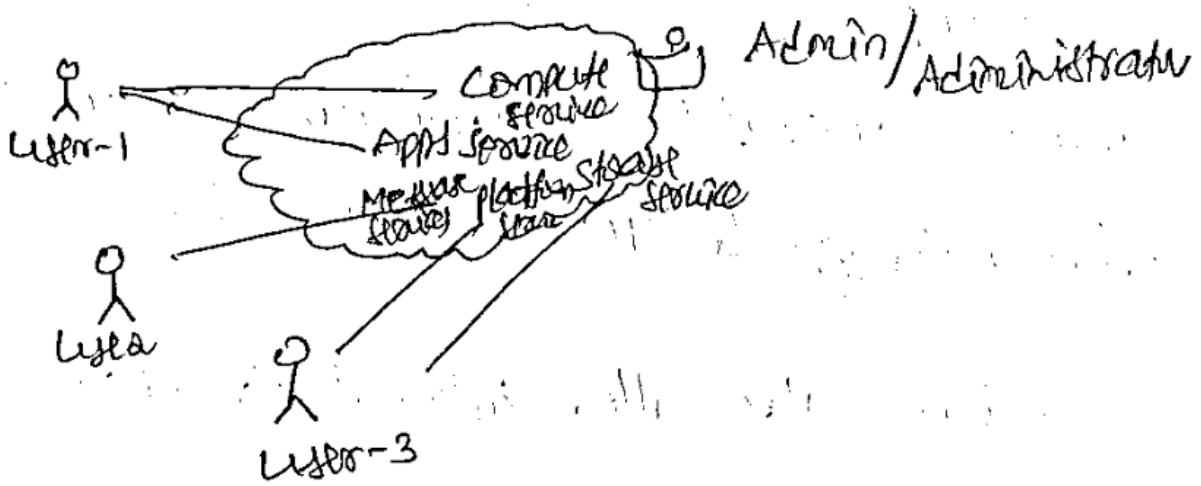
1. Public cloud :- * open to all to store & access information via Internet.

* pay as per use (for the services)
* Managed by third parties (cloud service provider).

Fundamental characteristics of public cloud is

Multitenancy.

Eg:- EC2 (Amazon elastic computer cloud), Google App Engine is a paas for developing & hosting web applications, drop box, Google drive ... etc.



Advantages:-

→ It is maintained by cloud services providers, so, we need not maintain it

→ location independent b/c all services are delivered through the internet.

→ high scalability - Eg (gmail offers 15gb, we can increase anytime & decrease also after increasing)

→ cost effective and pay as per use.

Disadvantages:-

1. less services because (b/c) resources are shared physically

2. less customized, eg compared to private cloud.

2. private cloud:-

→ services accessible within an organization - i.e. it belongs to specific organization

Note:- sometimes also called internal cloud / corporate cloud

→ can be Managed by → organization, Third party also.

Advantages:-

(i) High security :-
In private cloud, security concerns are less

(ii) data privacy → only authorized people can access the data

iii) More customizable → As companies get to customize their solution as per requirement.

iv) Improved reliability

Disadvantages:-

→ private cloud is accessible with in an organization, so, the area of operations is limited

→ High cost → we need to invest in H/w & S/w.

→ Limited scalability

3. Hybrid cloud:- It combines features of public & private cloud.

⇒ Critical activities performed by private cloud.

⇒ Non critical activities by public cloud

Advantages:-

Scalability, security, low cost., flexibility.

Disadvantages:

=> Managing is difficult/complex because there are more than 4 type of deployment model.

=> dependency on infrastructure.

4. community cloud :-

=> Allows services to be accessible by a group of several organizations to share the information between the organization & a specific community.

=> owned, managed & operated by (or) more organizations, the community or 3rd party.

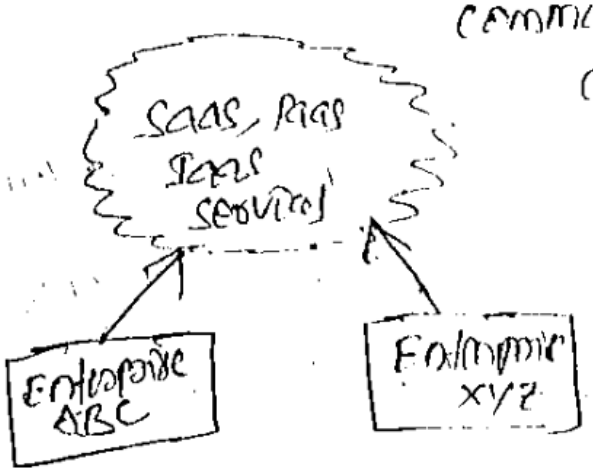
Advantages:

(i) cost reduction / cost effective

→ It is cheaper than private cloud. multiple companies share the bill, which reduces the cost.

(ii) Sharing among company (the resources)

(iii) More secure than public cloud but less than private cloud.



Disadvantages:

i) Data is accessible b/w organizations

ii) consistent maintanence cost

iii) overall increased cost (use private cloud)

Characteristics of cloud computing :-

1. on demand self service: It means that a consumer can request & receive access to a service offering, without an administrator or some sort of support staff having to fulfil the request manually.

2. Broad network access: The services can be accessed from any location using any type of device) i.e. any where access & any time.

3. Resource pooling:

Resource can be storage, memories, network bandwidth, virtual machines i.e. it can be any resources which can be consumed by cloud users.

Resource pooling means that multiple customers are serviced from the same physical resources.

4. 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 organization need them & then to remove them when they dont need them.

6. No Maintainance / easy maintainance.

7. Security: copy of our data on various servers. If 1 fails data is safe on the other.

Advantages & Disadvantages of cloud computing: (5)

Advantages:

i) Resources accessible any where, any time.

ii) on-demand self service - No third party is involved, like our receptionist.

iii) reduced IT cost (we need not purchase Hardware, no maintainance, etc).

iv) Scalability (of traffic on website) we can scale up any time & similarly scale down also & etc: "pay as per use"

⇒ collaboration - people sitting 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 software or maintain the Hardware)

Disadvantages:

1. Network connection Dependancy
   → internet is a must.

2. lack of support.
   (eg: unable to access your data before a meeting ...etc).
   so choose the provider carefully.

3. May not get all the features.
   Not all cloud services providers are same.

Cloud computing Architecture :-

* It has 2 parts, front end, Backend

Front end :- * used by client
* contains all the client side interfaces & applications that are required to access the cloud platform.

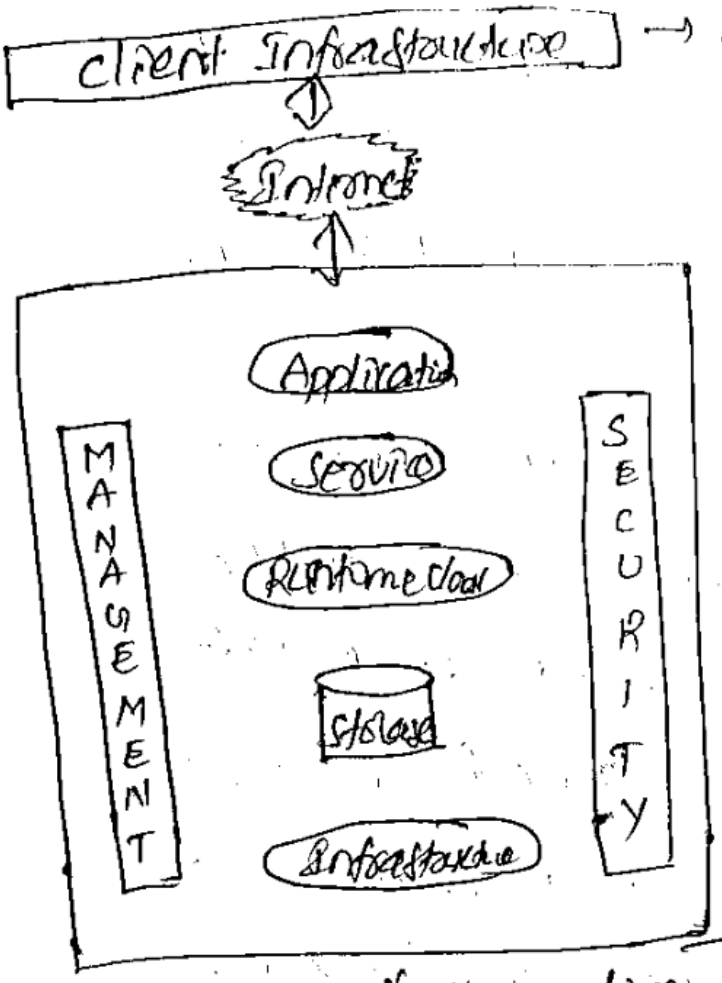
Backend :-
* used by service provider
* It manages all the resources that are required to provide cloud computing services.
* It includes huge amount of data storage, security mechanisms, virtual machines deployment models, servers etc.

components of cloud computing Architecture :-

1. client Infrastructure: It is a front end component (provides GUI to interact with cloud)
2. Application: May be s/w or platform that a client wants to access.

3. service :

It manages that which type of service user access account to client's requirements cloud computing offers ans, pans, ians.



4. Runtime cloud: provides " execution & runtime environment to the virtual machines

5. Storage :- It is one of the most important component 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 "servers, storage

New devices, virtualization softwares & other resources needed for cloud computing model.

7. Management: Manages components (like applications, services, infrastructures)

8. Security: It is a inbuilt backend component it provides security mechanism in the backend.

9. Internet: Medium through which frontend & backend interacts.

Cloud computing services:

There are '3' services:

1. SaaS (Software as a service)
2. PaaS (Platform as a service)
3. IaaS (Infrastructure as a service)

1. SaaS :- (Software as a service):

* It is a type of cloud computing services
* It is a way of delivering services and applications over the internet.

* Maintenance of software & Hardware done by the vendor.
* we need not install the software on our machine
* so, it removes the cost of h/w & s/w maintenance.
* Generally used by end users.

Characteristics:-

1. It makes the s/w available over internet.
2. s/w Application maintained by the vendors.
3. cost effective (pay as per use)
4. available on demand.
5. Can be scaled up or scaled down anytime access to our need.
6. works on shared model. one software is used by multiple clients.
7. softwares are automatically upgraded

Benefits:-

1. platform independency to the user (we can use android, mac, windows etc.)
2. Multitenant solutions

3. Scale up or scale down.
4. Accessible anytime, anywhere
5. Reduced time (we can use application directly from browser).
6. Cost effective (pay as per use)
* eg- Dropbox, Gmail, office 365, Google drive .. etc.

2. Paas (Platform as a service):-

* It is a type of cloud computing service.
* Developers use it.
* It provides a platform & environment to allow developers to build applications & services over the internet.
* offers development & deployment tools required to develop applications.
* Paas services are hosted on the cloud. & accessed by users via web browsers.
* no control over the infrastructure. we will interact with the UI only and O.S. will be provided by vendor.
* Paas provides hosts the H/w & S/w on its own infrastructure.

we donot have control over the cloud infrastructure including n/w, servers, O.S. or storage but we have control over the deployed applications and possibly configuration settings for the application-hosting environment.

Advantages:

1. cost effective (pay as per use)
2. No need to purchase expensive servers, s/w or data storage.
3. Scale up/down anytime.
4. s/w management (ie. updates & all managed by the provider).
5. easy deployments of web applications.

3. IaaS (Infrastructure as a service):-

* It is a type of cloud computing service used by system administrators/N/w architects.
* It provides 'us' infrastructure.
* It simply provides the underlying O.S., security, n/w, and servers for developing the applications.

* It provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc.

(or)

It is a form of cloud computing that delivers the fundamental compute, n/w & storage resource to the consumer on demand, over the internet on a pay as you go basis.

* We can scale up & scale down the resources as per requirement.

Iaas also offers.

→ virtual machine disk storage
→ IP address
→ VLANs (virtual local area network)
→ Load balancer

Eg: IBM cloud, AWS, oracle cloud infrastructure, Google cloud infrastructure.

Differences between cloud computing and fog computing

features	cloud computing	Fog computing.
1. Latency	High	Low
2. capacity	C.C. does not provide any reduction in data which sending or transferring data	F.C. reduces the amount of data sent to C.C.
3. Responsiveness	Response time of system is low	High
4. Security	Less security	High security
5. Speed	Access speed is high depending on the VM connectivity	High even more compared to CC.
6. Data Integration	Multiple data sources can be integrated	Multiple data source & device can be Integrated.

feature	cloud computing	fog computing
7. Mobility	Mobility is limited	Mobility is supported.
8. Location Awareness	Partially supported	supported
9. No. of server nodes	few	large nodes
10. Communication mode	IP n/w	wireless commun. WLAN, wi-fi, 3G, 4G, Zigbee

Cloud storage:-

* It is a service model in which data is transmitted and stored on remote storage system where it is maintained, managed, backedup and made available to the users over internet.

* cloud storage is based on virtualized infrastructure with accessible interfaces.

* with the help of RESTFUL API's user can retrieve and access data from storage.

Advantages:

1. pay for what is used
2. utility billing
3. Global Availability
4. Ease of use
5. Recovery, security & Accessible

Disadvantages:

1. Back-ups may be slower
2. Higher internet utilization
3. private concerns

(11)

Applications of Cloud computing:

1. Business Applications
2. Data Storage & backup Applications
3. Educational Applications
4. Entertainment Applications
5. Art Applications
6. Social Applications.

1. Business Applications:-

Every organization requires the cloud business application to grow their business.

Eg: These are a few business applications of cloud Computing.

(i) Salesforce → provides tools for e-commerce, sales etc.

(ii) Pay pal → Safe payments.

2. Data storage & backup applications:

→ we can store files, data, images, audios, videos (eg:- Google drive)

3. Educational Applications:-

→ online distance learning platforms are provided.

eg.→ Google documents, a service provided by google

→ Chromebook for Education

→ AWS in Education

4. Entertainment Applications:-

Eg: online games, video conferencing apps.

5. Art Applications:

It offers in various types of art applications for quickly & easily design attractive cards, booklets & images.

Eg: M00 → cloud art application (used for designing business cards).

6. Social Applications: Social cloud applications allow a large no. of users to connected with each other.

Eg: facebook, Twitter, LinkedIn.