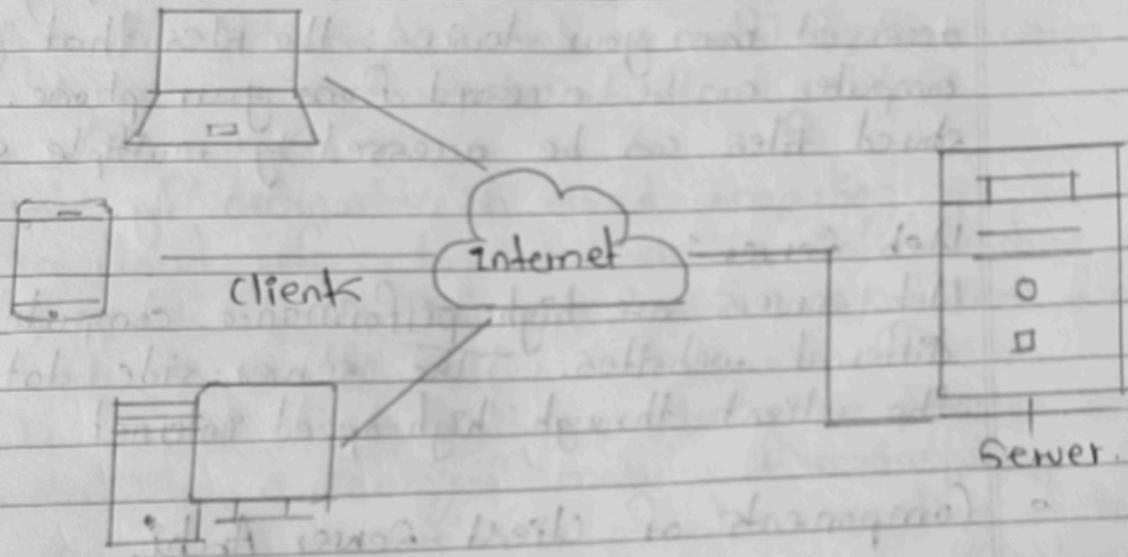


Assignment No. 2

Q. 1) Explain traditional computing architecture (client/server).

- Client-server architecture is a computing model in which the server hosts, delivers, & manages most of the resources & services requested by the client. It is also known as the networking computing model or client-server as well requests & services are delivered over a network.
- The client-server architecture or model has other systems connected over a network where resources are shared among the different computers.



- Client-server architecture is arranged in a way that clients are often situated at workstations or on personal computers, while servers are located elsewhere on the network, usually on more powerful machines. Such a model is especially beneficial when the clients & server perform routine tasks.

Client-Server architecture Examples

- Here are some of the client-server architecture eg. from our daily life.

Mail Server:

Email servers are used for sending & receiving emails. There are different software that allows email handling.

File Server:

- File servers act as a centralized location for files. One of the daily life eg. to understand this is the files that we store in google docs.
- The cloud services for microsoft office & google docs can be accessed from your devices; the files that you save from your computer can be accessed from your phone. So, the centrally stored files can be accessed by multiple users.

Web Server:

- Web servers are high-performance computers that host different websites. The server-side data is requested by the client through high-speed internet.

Components of Client-Server Archi.

13 Workstations:

- Workstations are also called client computers. Workstations work as subordinates to servers & send them requests to access shared files & databases.
- A server requests info. from the workstation and performs several functions as a central repository of files, programs, DB.

Servers:

- Servers are defined as fast-processing devices that act as centralized repositories of raw files, programs, DB.
- Servers have huge storage space & robust memory to deal with multiple requests approaching simultaneously from various workstations.
- Servers can perform many roles, such as mail server, DB server, file server & domain controller, in this architecture at the same time.

Networking devices

- Networking devices are a medium that connects workstations and servers in a client-server architecture.
- Many networking devices are used to perform various ops across the network, for eg. a hub is used for connecting a server to various workstations.

Q. 29 Describe role of networks in cloud computing.

- Network in cloud refers to interconnected infrastructure of server, storage, & appl' that are hosted on internet & made available to users world wide.
- The cloud network is managed by cloud service provider, who ensure availability, scalability & security of service they offer. Cloud network can be either public or private, depending on level of access & control required by users. Public cloud network are typically managed & maintained by third-party provider while private cloud network are hosted & operated by organization themselves, either on premises or through third-party service provider.

- Here are basic steps of how a cloud network works:
Virtualization. The physical infrastructure of data center is divided into virtual machine or instances which are isolated from

each other & have their own virtual resources, including CPU, memory & storage.

- Network creation: Cloud provider creates virtual network that allows these instances to communicate with each other. This network may include virtual routers, switches & firewalls that are managed by cloud provider.
- IP addressing: Each instance is assigned unique IP address, which is used to identify it on virtual network.
- Access control: Cloud provider can set up access controls to restrict communication between different instances or networks using firewall or security group.
- Load balancing: In cloud environment, multiple instances may be used to handle requests from users. Load balancing tools can distribute traffic across these instances to optimize performance & ensure high availability.
- Monitoring & management: The cloud provider can monitor network performance, including bandwidth usage, latency & packet loss, & provide management tools to help users troubleshoot & optimize their network configurations.

Importance of network in cloud:

- i) Scalability:
 - Cloud networks allow businesses to quickly adjust their resources to meet changing demand
 - Companies can expand their service rapidly without worrying about underlying infrastructure.

- 1) **Flexibility:**
 - cloud now allow user to move resource across multiple data centers of cloud environment.
 - Companies can create hybrid cloud system that integrate public & private cloud, increasing flexibility and agility.

- 2) **Collaboration:**

- By enabling teams to access remote resources from any location with an internet connection, cloud now make it simple for them to collaborate with one another.
- Users can access resources from any device, regardless of location or now restriction.

- 3) **Cost saving:**

- cloud now can save businesses money on both capital expenditure & operational expenses.
- cloud providers also offers economies of scales that can benefit businesses.

Types of network in cloud:

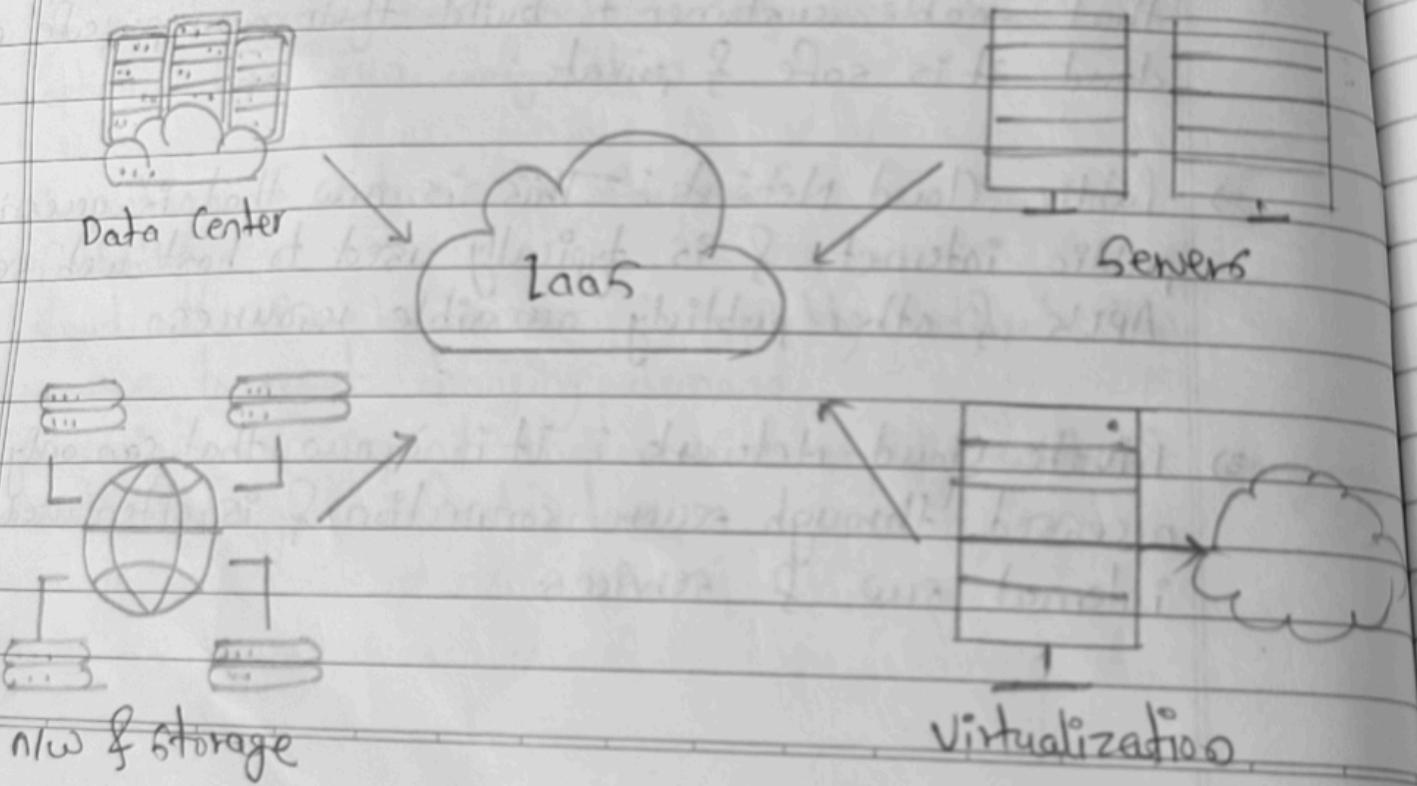
- 1) **Virtual Private Cloud (VPC):** A VPC is a virtual private now that enable customer to build their own private now in cloud. It is safe & private.
- 2) **Public Cloud Network:** This is now that is accessible to public internet, & is typically used to host web servers, APIs & other publicly accessible resources.
- 3) **Private Cloud Network:** It is a now that can only be accessed through secure connection & is often used for internal now & services.

a) Hybrid cloud network: This new is combination of public & private cloud new, where some resources hosted in public cloud & other in private cloud.

b) Multi-cloud Network: It is new that connect several cloud in order to private users access to each one's advantages and skills while preventing vendor lock-in & maximizing resilience & redundancy.

(Q3) Explain Infrastructure as a Service (IaaS)

- IaaS is also known as Hardware as a Service (Haas). It is one of the layers of the cloud computing platform.
- It allows customers to outsource their IT infrastructure such as servers, networking, processing, storage, virtual machines, and other resources.
- Customers access these resources on the Internet using a pay-as-per-use model.
- The IaaS cloud computing platform layer eliminates the need for every organization to maintain its IT infrastructure.



IaaS is offered in three models: public, private & hybrid cloud. The private cloud implies that the infrastructure resides at the customer's premises. In the case of the public cloud, it is located at the cloud computing platform vendor's data center, and the hybrid cloud is a combination of the two in which the customer selects the best of both public cloud & private cloud.

- IaaS provider provides the following services:

Computing:

To provision virtual machines (VM's) for end users, IaaS providers offer virtual central processing units (CPUs) and virtual main memory. As a result, users may run their workloads and apps on the provider's infrastructure without having to worry about managing the underlying hardware.

Storage:

Back-end storage services are provided by IaaS providers, enabling users to store & access their files and data. This offers scalable and trustworthy storage solutions for a variety of use cases & can include block storage, object storage.

Network:

IaaS providers provide networking tools, including routers, switches and bridges for the VM's through Network as a Service (NaaS). This enables connectivity and communication between VM's and other resources.

Load balancers:

Infrastructure-layer load balancing services are provided by IaaS providers. Incoming new traffic is split up among

2. PHP

```

$faults = array (
    "mango" => "small",
    "orange" => "big"
);
echo $faults["mango"];

```

* Multidimensional arrays

```

$z = [
    [0, 1, 2],
    [3, 4, 5]
];
for (accessing statements)
    if ($z == 10)
        if ($z < 15)
            echo $z;
        else if ($z > 15)
            echo $z;
    else
        echo "z is small";
    else
        echo "z is big";
}

```

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many virtual machines (VM's)

Security:

Security features of services are frequently offered by IaaS providers as part of their offering. To safeguard data & resources housed on the IaaS platform, this can include new security, firewall configuraⁿ, access controls & other security measures.

Advantages of IaaS Cloud Computing layer

- 1) Shared infrastructure:
IaaS allows multiple users to share the same physical infrastructure.
- 2) Web access to the resources:
IaaS allows IT users to access resources over the internet.
- 3) Pay-as-per-use model:
IaaS provider services based on a pay-as-per-use basis. The users are required to pay for what they have used.
- 4) Focus on the core business:
IaaS providers focus on the organization's core business rather than on IT infrastructure.

Q.4] Explain platform as a Service (PaaS). ?

- Platform-as-a-Service is distributed computing model where an outsider supplier appropriates equipment and programming instrument to client over internet.
- PaaS supplier has equipment and programming to create

on its own framework. Therefore, it liberates designers from introducing inside equipment and programming to create or run another application.

Different PaaS Services:

- Advancement group support
- Application plan & improvement
- Application testing & arrangement
- Web administration mix
- Information security
- Database integration
- How does PaaS Works
- Unlike IaaS or SaaS service models, PaaS solutions are specific to application and web development and typically include:
 - cloud infrastructure: Data centers, storage, new equipment, and servers
 - Middleware SW: Operating systems, frameworks, development kits (SDK), libraries & more
 - User interface: A graphical user interface, a command line interface, an API interface, & in some cases, all three.
- Platform as a Service is typically delivered as a secure online platform that developers can access over the internet, allowing them to work on projects from anywhere and collaborate freely with other members of their team.
- Applications are built directly on the PaaS system and can be immediately deployed once they are completed

IP
\$ruits = array
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"orange"
echo \$fruits[1] . " is "
+ Multidimensional arrays
\$x = [0][1][2]
for accessing x[0][1]
* Conditional statements.
2. PHP
if \$x = 10 {
else if \$x = 15 {
else echo
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81.2. 'Welcome'.

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Benefits of PaaS

- 1) Faster time to market
No heavy lifts required. Developers have instant access to a complete appⁿ development platform that they don't have to build or manage, freeing up time to develop & deploy.
- 2) Low maintenance
In-house appⁿ stacks come with headaches, especially when it comes to upgrades. With PaaS, the provider is responsible for keeping everything up-to-date - and none of the maintenance pain is yours.
- 3) Easy scalability
No more worrying about capacity. PaaS lets you scale down for low-traffic periods or scale up immediately to meet unexpected surges in demand.
- 4) Flexible access
Development and DevOps teams can access shared PaaS Service and tools from anywhere and on device over an internet connection.
- 5) Shared security
With PaaS, the provider is responsible for securing the infrastructure. Most major PaaS service providers also offer guidelines and best practices for building on their platforms.
- 6) Cost-effective pricing
PaaS resources are on-demand, so you only pay for what you actually use.

Q53



Q5) Explain Software as a Service (SaaS).

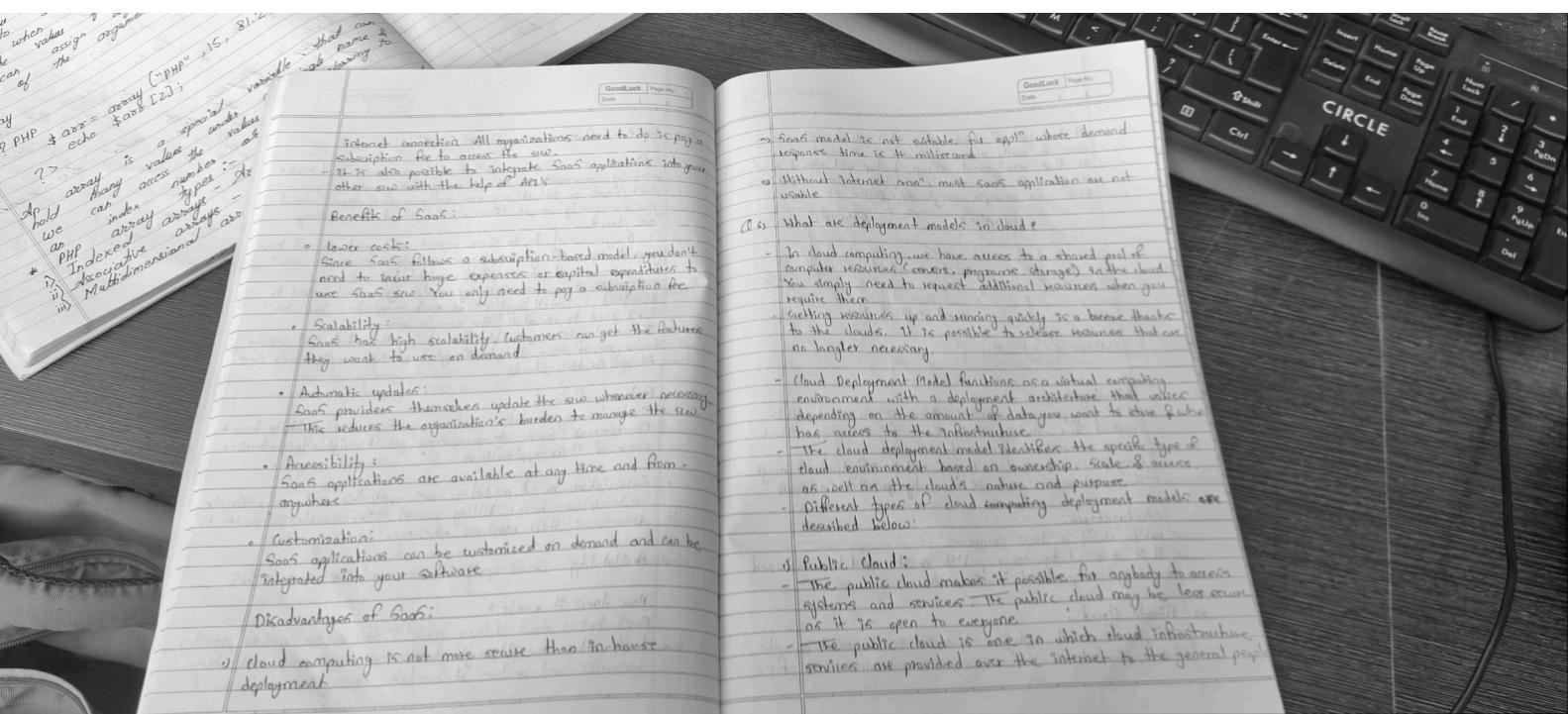
- Software as a Service is the most common cloud service used by organizations. While using SaaS services, you don't have to install any SW on your computers. Instead, you can easily access them on the cloud where they are stored.
- So, if you want to do some urgent work and do not have your laptop with you, all you need is an internet conn' f a browser to access the required tools.
- SaaS follows a web delivery model, you don't need to download & install applica's on each computer. You also don't need to maintain the SW or manage it.
- The vendor is responsible for all possible technical issues. Some ex. of SaaS include Google workspace, Microsoft 365, Adobe Creative Cloud.

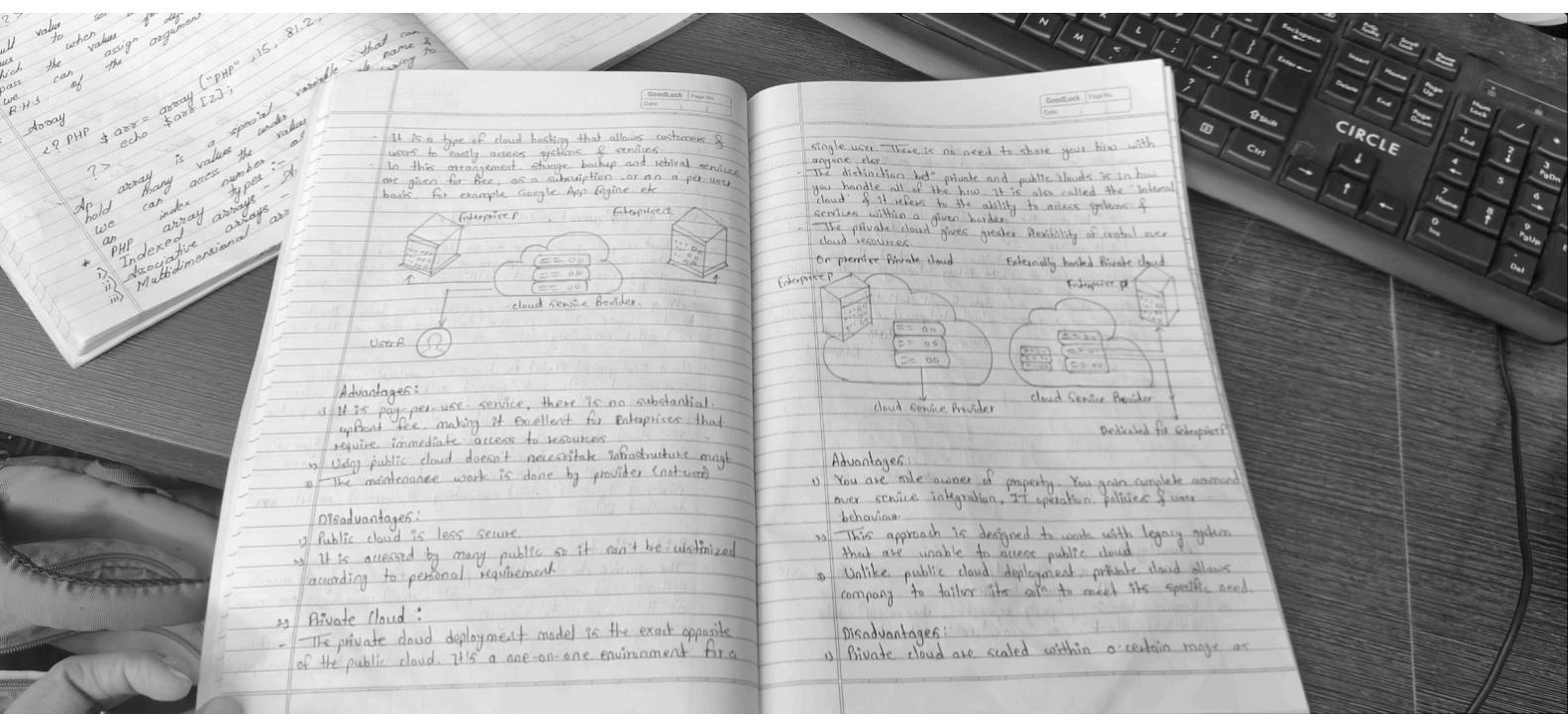
Features of SaaS

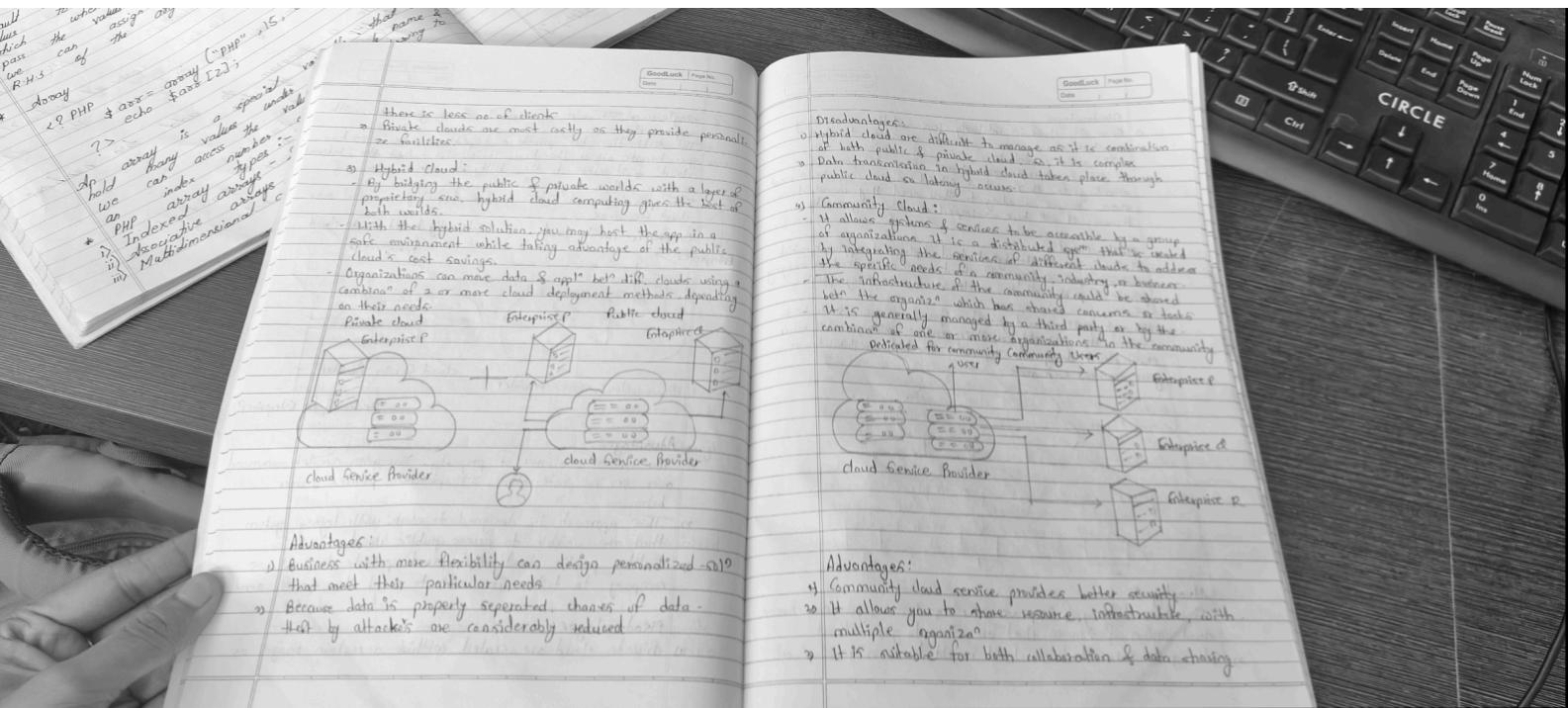
- . Multi-tenancy model - SaaS applica's serve multiple tenants (customers). Some tenants may get the right to customize some of their applications.
- . Subscription-based model - SaaS applica's have a simple subscription-based billing model. This enables tenants to discontinue their services whenever necessary.
- . Availability - SaaS applica's are available 24*7*365.

How does it work?

SaaS has a cloud delivery model. This means a SW provider hosts the SW through databases, servers or computing resources and makes it available to anyone with an







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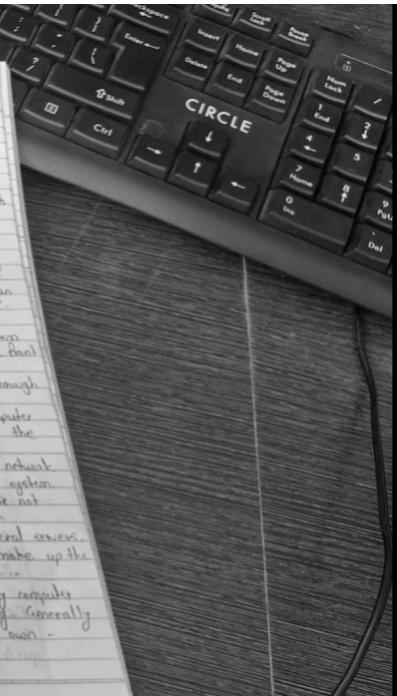
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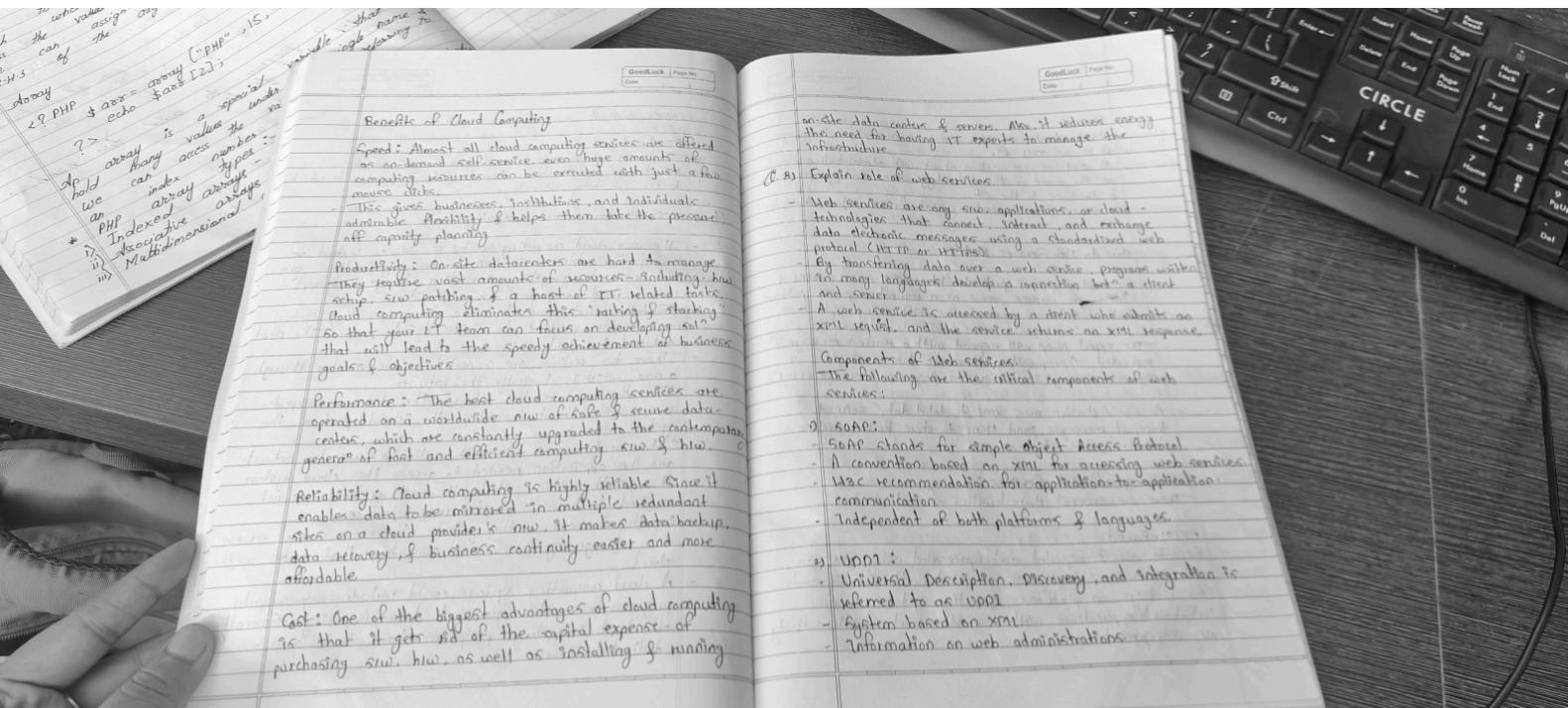
- Disadvantages:**
- Community cloud is relatively less suitable as memory organizations share some resources according to their collaborative interests.
 - As data & resources are shared among diff organizations according to their mutual interest if one organization wants some changes according to their need they cannot do so because it will have an impact on other organizations.
- Multi Cloud:**
- It is similar to the hybrid cloud deployment approach which combines public & private cloud resources instead of merging private & public clouds multi cloud uses many public clouds.
 - Although public cloud providers provide numerous tools to improve the reliability of their services, mishaps still occur.
 - Multi-cloud deployment improves the high availability of your services even more.



- Advantages:**
- To reduce latency & improve user experience, you can choose cloud region & zones that are close to your client.
 - It's quite rare that a cloud would have an incident as

- same moment**
- Disadvantages:**
- "We combine" of many clouds make system complex.
 - Owing to complex structure, there may be loopholes to which hacker can take advantage.
- Q. 23. Describe how cloud computing work**
- The way cloud computing works is simple. Instead of owning data centers or IT infrastructure, organizations can rent access to everything - including storage and apps - from a cloud computing service provider.
 - To better understand how the cloud computing system works, it is prudent to divide it into parts: the front end and the back end.
 - These two sections are connected to one another through a network, which is basically the internet.
 - The front end is the side of the client or computer user, while the back end is the "cloud" part of the system.
 - The front end contains the client's computer network and the application needed to access the cloud system. It's worth noting that all cloud systems are not required to have a similar user interface.
 - On the backend of the system, there are several servers, data storage systems, and computers that make up the cloud.
 - A cloud computing system could include any computer program, from video games to data processing. Generally, all cloud computing programs have their own dedicated servers.





Benefits of Cloud Computing

Speed: Almost all cloud computing services are offered as on-demand self-service. Even huge amounts of computing resources can be executed with just a few mouse clicks.

This gives businesses, institutions, and individuals admirable flexibility & helps them take the pressure off capacity planning.

Productivity: On-site datacenters are hard to manage. They require vast amounts of resources— including hardware, software, patching of a host of IT-related tasks. Cloud computing eliminates this “waiting & starting” so that your IT team can focus on developing solutions that will lead to the speedy achievement of business goals & objectives.

Performance: The best cloud computing services are operated on a worldwide network of safe & secure datacenters, which are constantly upgraded to the contemporary generation of fast and efficient computing now & henceforth.

Reliability: Cloud computing is highly reliable since it enables data to be mirrored in multiple redundant sites on a cloud provider’s own. It makes data backup, data recovery, & business continuity easier and more affordable.

Cost: One of the biggest advantages of cloud computing is that it gets rid of the capital expense of purchasing SW, HW, as well as installing & running

on-site data centers & servers. Also, it reduces energy & the need for having IT experts to manage the infrastructure.

C 83) Explain role of web services

- Web services are any SW, applications, or cloud technologies that connect, interact, and exchange data electronic messages using a standardized web protocol (HTTP or HTTPS).

By transferring data over a web service, programs written in many languages develop a connection between a client and server.

- A web service is accessed by a client who submits an XML request, and the service returns an XML response.

Components of Web services:

The following are the critical components of web services:

1) SOAP:

- SOAP stands for simple object access protocol.
- A convention based on XML for accessing web services.
- IEC recommendation for application-to-application communication.
- Independent of both platforms & languages.

2) UDDI:

- Universal description, discovery, and integration is referred to as UDDI.
- System based on XML.
- Information on web administrations.

	Cloud Computing	Traditional Computing
1) Cloud computing refers to delivery of different services such as data and programs through internet on different servers.	Traditional computing refers to delivery of different services such as data and programs through internet on different servers.	
2) Cloud computing takes place on third party servers that is hosted by third party hosting companies.	Traditional computing takes place on physical hard drives of website servers.	
3) Cloud computing is ability to access data anywhere at any time by user.	User can access data only on system in which data is stored.	
4) Cloud computing is more cost effective as compared to traditional computing as operation & maintenance of server is shared among several parties that in turn reduce cost of public services.	Traditional computing is less cost effective as compared to cloud computing because one has to buy expensive equipment's to operate and maintain servers.	

<p>* Array <code>29 PHP \$arr = array ("PHP", "JS", "HTML", "CSS");</code> <code>echo \$arr[2];</code></p> <p>?> array is a special we can access the values in array by index numbers PHP arrays types - Indexed arrays - Associative arrays - Multidimensional arrays</p> <p>Cloud computing requires fast reliable and stable internet and to access info anywhere at any time.</p> <p>Cloud computing provides more storage space and servers as well as more computing power so that applications and services run much faster and effectively.</p> <p>Cloud computing also provides scalability & elasticity, i.e. one can increase or decrease storage capacity, server resources, etc. according to business needs.</p> <p>Cloud service is served by, provider's support team</p> <p>Software is offered as an Software is purchased</p>	<p>Traditional computing is less friendly as compared to traditional computing because data can have access to data anytime anywhere using internet connection.</p> <p>Cloud computing is more user friendly as compared to traditional computing because user can have access to data anytime anywhere using internet connection.</p> <p>Cloud computing infrastructure is shared with public by service provider over internet it supports multiple customers i.e. enterprises</p> <p>Cloud computing infrastructure is shared with private organization by service provider over internet it supports one enterprise</p> <p>Multi-tenancy i.e. data of many enterprises are stored in shared environment but are isolated</p> <p>Cloud service provider provides all possible services & how as per user base in world</p> <p>It is hosted at service provider site</p> <p>It is connected to public internet</p> <p>Scalability is very high, and reliability is moderate</p>	<p>Traditional computing is less friendly as compared to traditional computing because data cannot be accessed anywhere and if user has to access data in another system then he needs to save it in external storage medium.</p> <p>Traditional computing does not require any internet connection to access data or info.</p> <p>Traditional computing provides less storage as compared to cloud computing.</p> <p>Traditional computing does not provide any scalability & elasticity</p> <p>Traditional computing requires own team to maintain & monitor system that will need a lot of time & efforts</p>	<p>on demand service (aaS) that individually for every user can be accessed through which requires to be updated frequently</p> <p>Differentiate between private & public cloud</p> <table border="1"> <thead> <tr> <th>Public cloud</th> <th>Private cloud</th> </tr> </thead> <tbody> <tr> <td>Cloud computing infrastructure is shared with public by service provider over internet it supports multiple customers i.e. enterprises</td> <td>Cloud computing infrastructure is shared with private organization by service provider over internet it supports one enterprise</td> </tr> <tr> <td>Multi-tenancy i.e. data of many enterprises are 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<p>3) cloud service provider manage cloud & customer use them 4) It is cheaper than private cloud 5) Security matters & dependent on Service provider 6) Performance is low to medium 7) It has shared server 8) Ex: Amazon Web Service & Google AppEngine etc.</p>	<p>Managed & used by single enterprise</p> <p>It is costlier than public cloud</p> <p>It gives high class of security</p> <p>Performance is high</p> <p>It has dedicated server</p> <p>Ex. Microsoft KVM, HP Red Hat & vmware, etc</p>