

OSI Model

The OSI Model divides the problem of moving data b/w computers into seven smaller tasks and they equate to 7 layers of OSI reference model.

7 Application



6 Presentation



5 Session



4 Transport



3 Network



2 Data Link



1 Physical

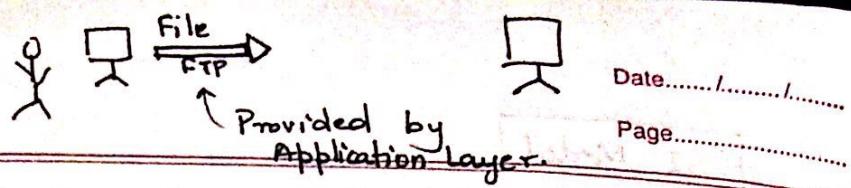
Application Layer

↳ Top layer of OSI model

↳ It does not refer to the actual applications that users run.

↳ Instead, it provides the actual framework that the actual application run on top of.

Provides Network Services to Application processes (such as e-mail, file transfer [FTP], and web browsing)



Example: If a user wanted to use 'Google Chrome' to open a FTP session and transfer a file. In this particular case, the application layer will define the file transfer protocol. This protocol is not directly accessible to the user.

Here the user must use an appr that is designed to interact with FTP.

6. The PRESENTATION LAYER

- ↳ Does some rather complex things
- ↳ It takes the data that is provided by Applⁿ Layer and converts it into a standard format that the other layers can understand.
- ↳ Similarly, converts the inbound data received from session layer into something that the application layer can understand.
- ↳ This layer is necessary bcz applications handle data differently from one another. In order for network communication to work properly, the data needs to be structured in a standard way.

Ex: Encryption, GIF, ASCII, JPEG, mp3

5. Session Layer

- ↳ It is responsible for establishing, maintaining and eventually terminating the session with the remote host.
- ↳ It is more closely related to application layer than it is to the physical layer, this is because sessions are actually established b/w applications.
- ↳ If a user is running multiple appl's, several of these appl's may have established sessions with remote resources at any time.

4. TRANSPORT LAYER

- ↳ It is responsible for maintaining 'flow control'
- ↳ Windows allows many appl's to run at same time. It is possible that multiple appl's and the OS may need to communicate on the network simultaneously.
- ↳ The Transport layer takes data from each appl' and integrate it all into a single stream.
- ↳ Also responsible for providing error checking and performing data recovery when necessary.

on line \rightarrow $y =$

$$x_1w_1 + x_2w_2 + b$$
$$x_1w_1 + x_2w_2 + b = 0$$

Date..... //
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↳ It ensures that all data makes it from sending host to receiving host.

3. NETWORK LAYER

- Responsible for determining how the data will reach the recipient.
- This layer handles things like addressing, routing and logical protocols.
- It creates logical paths, known as virtual cts between the source and destination. The ckt provides individual ways for individual packets with ways to reach their destination.
- Also responsible for its own error handling, and for packet sequencing and congestion control.
- Sequencing of packet is helpful when the size of the data is greater than size of individual packet.

2. DATA LINK LAYER

Media Access Control (MAC)

- Establishes computer's identity on the network, via its MAC address

- MAC address is the address assigned to an adapter at hardware level.

- This is the address ultimately used for sending and receiving data.

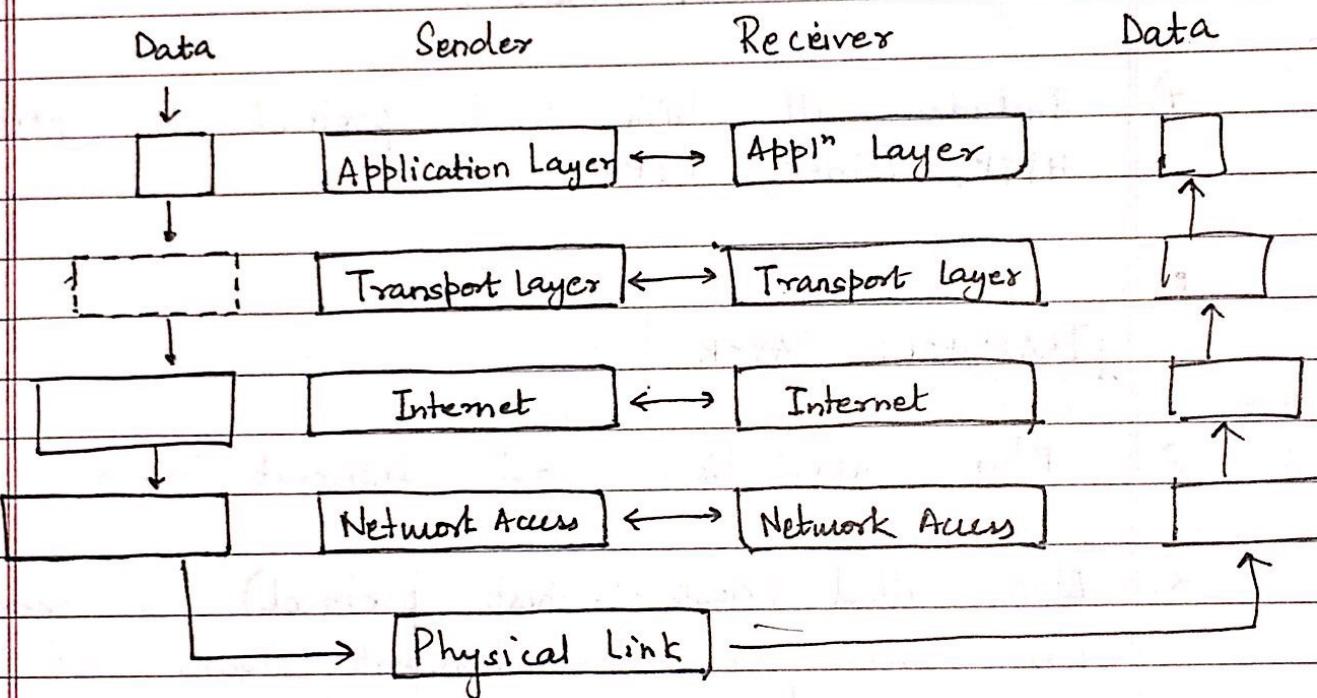
Logical Link Control (LLC)

- Controls frame synchronization and provides a degree of error synchronization checking.

1. PHYSICAL LAYER

- ↳ Refers to actual hardware specifications
- ↳ It defines characteristics such as timing and voltage.
- ↳ Defines the hardware specifications used by network adapters and by network cables.
- ↳ To put it simply, it defines what it means to transmit and receive data.

TCP/IP MODEL

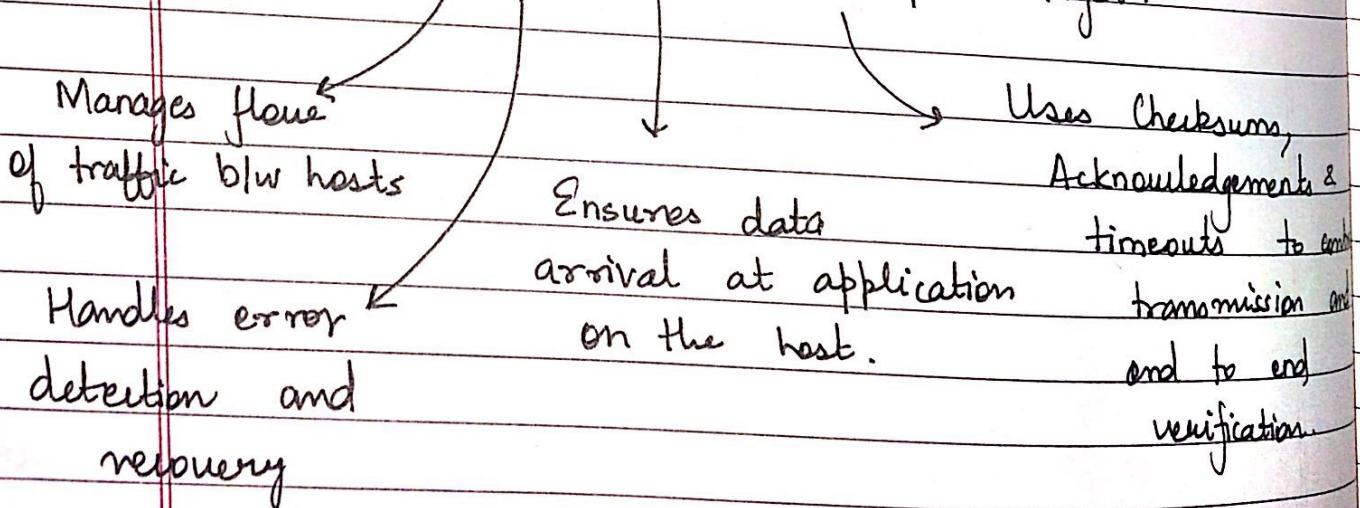


APPLICATION LAYER

- 1) Top most layer of four TCP/IP model. It is present on the top of Transport layer.
- 2) It defines TCP/IP application protocols and how host programs interface with transport layer services to use the network.
- 3) It is comparable to Appln + Presentation + Session layer of OSI model.
- 4) Includes all high level protocols like DNS, HTTP, Telnet, FTP.

TRANSPORT LAYER

- 1) B/w Application and Internet layer.
- 2) Also called (host-to-host protocol) is more or less same as OSI transport layer.



INTERNET LAYER

- 1) Same services as OSI model Network layer.
 - 2) Purpose is to route packets to destination independent of path taken
 - 3) Routing & Delivery of data is responsibility of this layer. Its key component of this architecture.
 - 4)
 - Allows communication across networks of same and different types
 - Performs translations to deal with dissimilar data addressing schemes
- Injects packets into any network and delivers them to destination independently to one another.
- Packets may be re-ordered because path through the network is not pre-determined.

Main Protocols : IP (Internet Protocol)
of Internet Layer

ICMP

ARP (Address Resolution Protocol)

RARP (Reverse)

Network Access Layer

- ① Defines how data is physically sent through the network i.e. how bits are electrically or optically sent by hardware devices that interface with a network medium.

DIFFERENCE

OSI

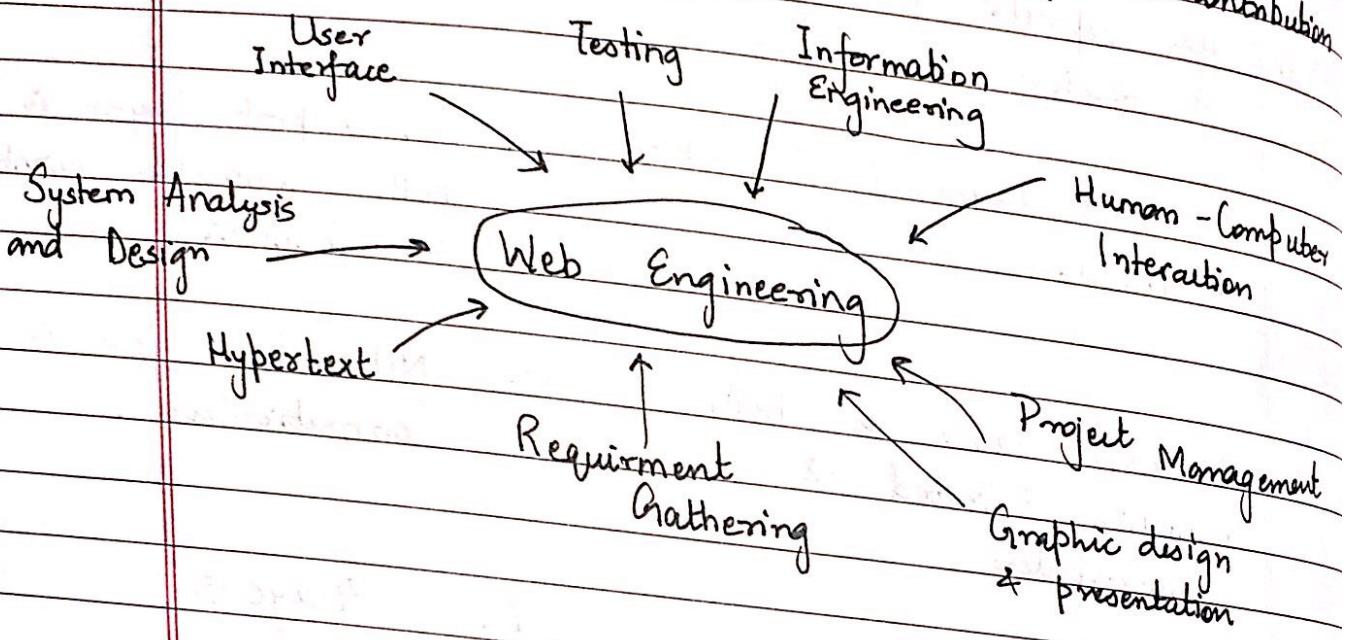
TCP/IP

- | | |
|--|--|
| 1. Transport layer guarantees the delivery of packets. | 1. Does not guarantee delivery of packets. Still the TCP/IP model is more reliable. |
| 2. Follows vertical approach. | 2. Follows horizontal approach. |
| 3. Has separate Presentation & Session layer. | 3. Does not have. |
| 4. Transport layer is Connection Oriented. | 4. Transport layer is both Connection oriented & Connection less |
| 5. Network layer is both Connection Oriented & Connectionless | 5. Network layer is Connectionless. |
| 6. It has 7 layers | 6. 4 layers |
| 7. OSI model defines services, interfaces and protocols very clearly and makes clean distinction b/w them. It is protocol independent. | 7. TCP/IP services, interfaces & protocols are not clearly separated. It is also protocol dependent. |

Ques 2. What is Web Engineering?

Ans: Web Engineering is use of scientific and management principles and systematic approaches with the aim of successfully developing, deploying & maintaining high quality web based systems and applications.

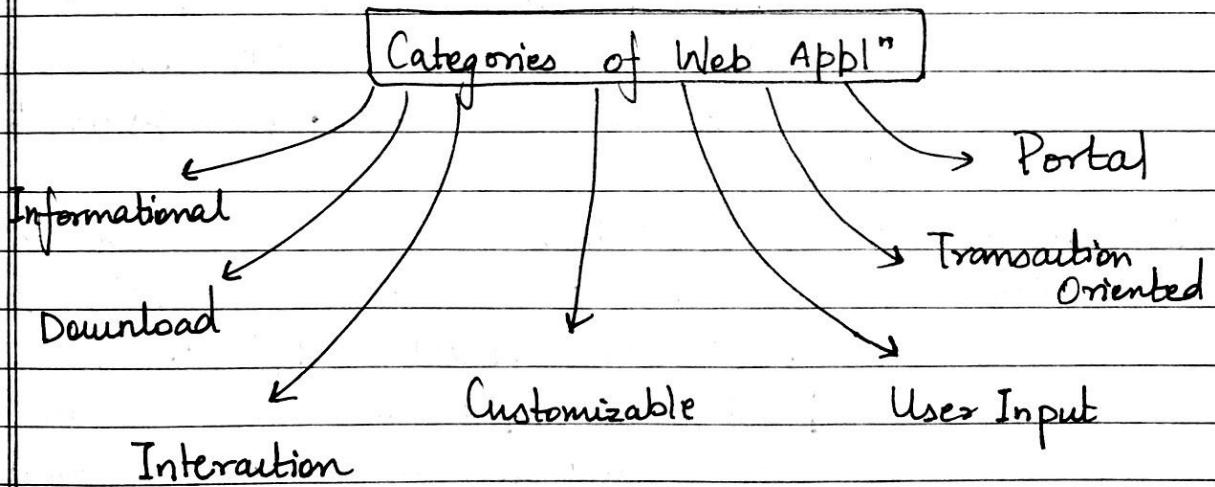
It is multidisciplinary and encompasses contribution from diverse areas -



Ques 2. Why we need Web Engineering

Ans. 3) Industries such as Construction, Education, Hospitality, manufacturing, banking, government and business are utilizing web based application to improve and increase their operations.

- 2) In addition, web allows for development of corporate intranet web applications.
- 3) To E Till today , the development of web appl's has been in general ad hoc , resulting in poor quality applications , which are difficult to maintain. The main reason for such problems are unsustainable unsuitable design and development process , poor project management practices.
- 4) As larger and more complex web appl's are increasing , so is the need for using methodologies / standards / best practice guidelines to develop applications that are delivered on time, within budget , have a high level of quality & easy to maintain.



- i) Informational → Read-only content is provided with simple navigation and links.
- ii) Download → A user downloads information from appropriate server.
- iii) Interaction → Communication among a community of users occurs via chat room, instant messaging.
- iv) Customizable → The user customizes content of specific need.
- v) User Input → forms-based input is the primary mechanism for communicating need.
- vi) Transaction Oriented → The user makes a request (e.g.: place an order) that is fulfilled by web app.
The application provides a service to the user (e.g.: assists the user in determining a mortgage payment)
- vii) Portal Oriented → The application channels the user to other Web Content or services outside the domain of portal application.
Database access : The user queries a large database & extracts information.
- Data Warehouse : The user queries a collection of large database and extracts information.

#

Characteristics of Web Application

Product Related

- Present
- Hypertext
- Content

User Related

- Natural Content
- Social Content
- Technical Content

Development Related

- Dev Team
- Dev Process
- Tech Infranstr.
- Integration

Evolution Related

i) PRODUCT RELATED -

- Present :
- Presentation plays an imp role in product marketing & survival
 - Looks and feel is the first impression
 - Must be attractive, interactive, acc to fashion trend.

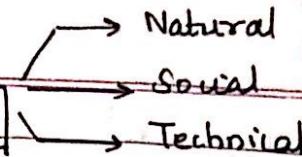
HyperText :

- It is the base of web appl"
- Basic elements of hypertext are - link, anchor & node.
- It implements linearity, cognitive overload & disorientation feature that makes the appl" highly interactive & improves performance.

Content : It is the informational part. Content generation, integration and updating and availability is an important factor.

It must be of high quality, reliable, consistent and up-to date

User Related Characteristics

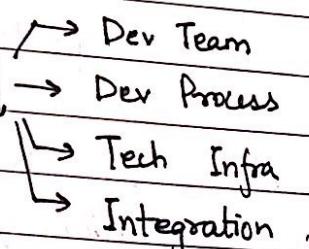


- i) Natural Content:
 - It includes the geographical location from where the web applications are accessed and availability of the web application.
 - Global accessibility with 24x7 availability improves the performance, stability and demand of the web applications.
- ii) Social Content:
 - Related to user specific aspect
 - Thousands of competitive web applications, the user need spontaneous and immediate benefits.
 - Scalability and multiculturalism are extremely essential feature required for web application.
- iii) Technical Content:

Connection bandwidth, stability, reliability etc are some essential features that affect the performance of web application.

 - Device specification, browser configuration, etc are responsible for web application performance and accessibility.

Development Related Characteristics



- i) Development Team:

Must be highly knowledgeable in their field.
They must be knowledge freaks, willing to work, interested in latest technology.

- ii) Development Process: It must be flexible. There must be parallel processes of development.
- iii) Tech Infrastructure: WebAppⁿ must be bug free & development should be under time limit
- iv) Integration: WA must support integration with already existing system or with external content and services.

EVOLUTION : As per changes in requirements there occur some changes or upgradation in WA. Market competition or short time development may cause the changes.

Software Engineering

- It is an engineering branch associated with development of software products using well defined scientific principles, methods & procedures.
- Outcome is efficient & reliable software product.
- It involves communication, pre-post delivery support.
- Here software could be any mobile or web application.

Web Engineering

- It is the application of systematic, disciplined and quantifiable approaches to development, operation and maintenance of Web based applications.

Software

Maintenance • These need to be installed. These need to be installed separately on each device. + only once.

Updating an application is cumbersome for the same reason.

Web Application

Usage Site • They are confined to a physical location & hence have usability constraint

• Make it convenient for user to access the application from any location

Speed & Performance • Do not face any hindrance resulting from Internet connectivity.

• Relies significantly on Internet connectivity & speed

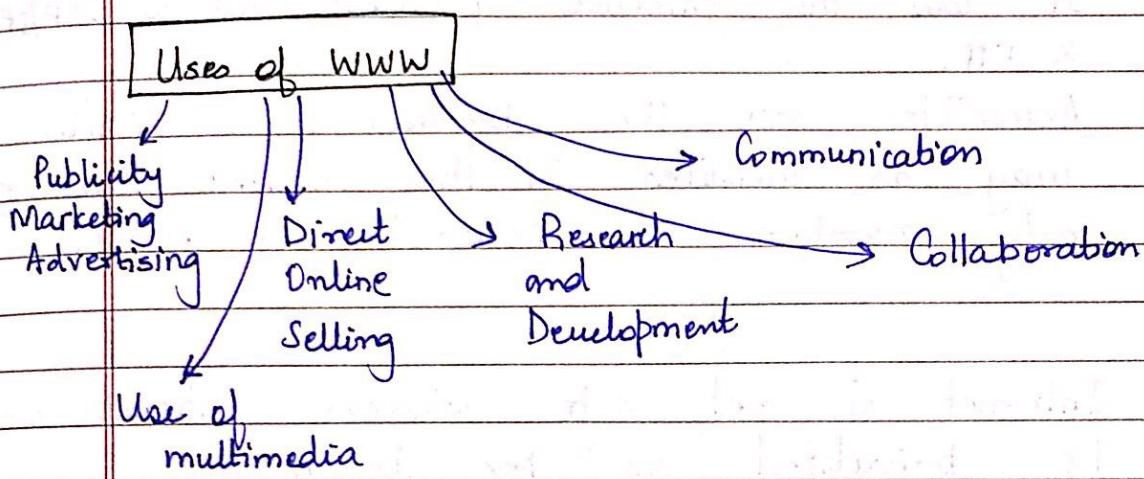
Bandwidth Cost • Less bandwidth reqd.

• These cost more bandwidth usage as they are internet dependant.

World Wide Web

- ↳ It is a network of online content that is formatted in HTML and accessed via HTTP. The term refers to all the interlinked HTML pages that can be accessed over the internet.
- ↳ It was originally designed in 1991 by Tim Berners Lee.
- ↳ It is most often referred simply as 'the web'.

- ↳ It is all the web pages, pictures, videos and all other online content that can be accessed via a web browser.
- ↳ It is not same as Internet, Internet in contrast is the underlying connection that allows us to access the www.



- INTERNET:
- Global system of interconnected computer network which uses standardized protocols (TCP/IP) to link devices worldwide
 - It includes private, public, business, academic, govt networks - connected by guided, wireless and fibre optic technologies.
 - The Internet refers to global communication network system, including hardware and software infrastructure, while the web is one of the services communicated over the internet.

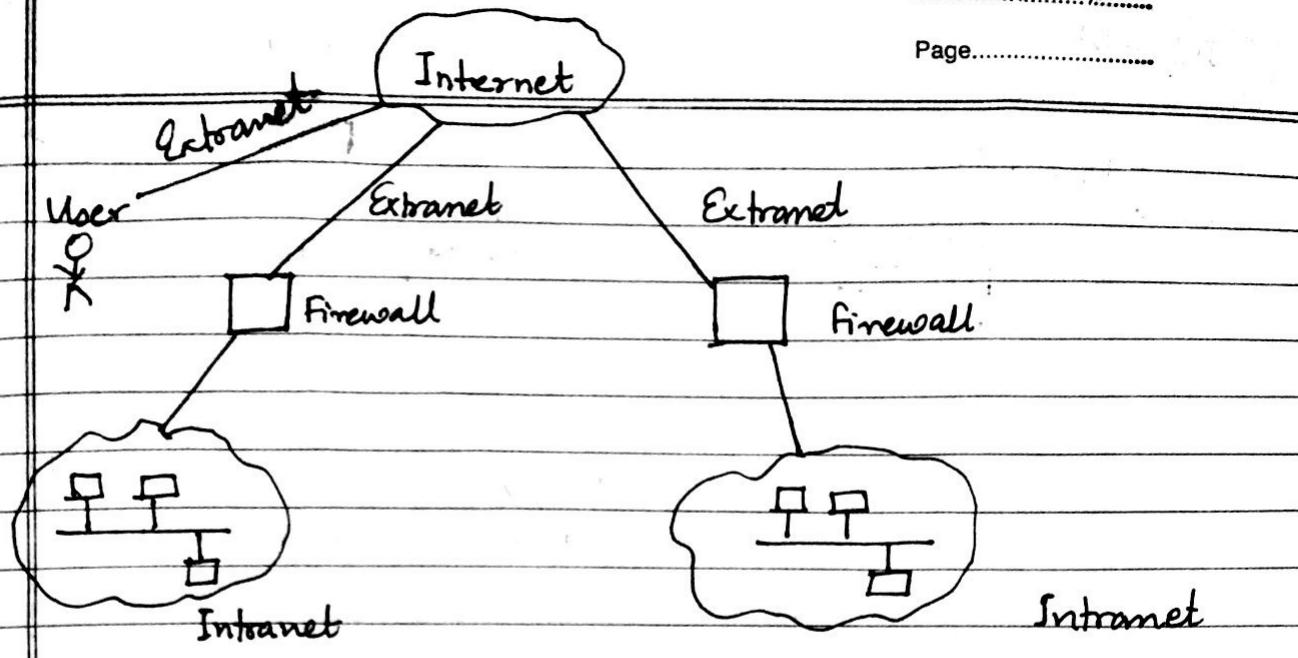
First : ARPA NET

1st Jan, 1983



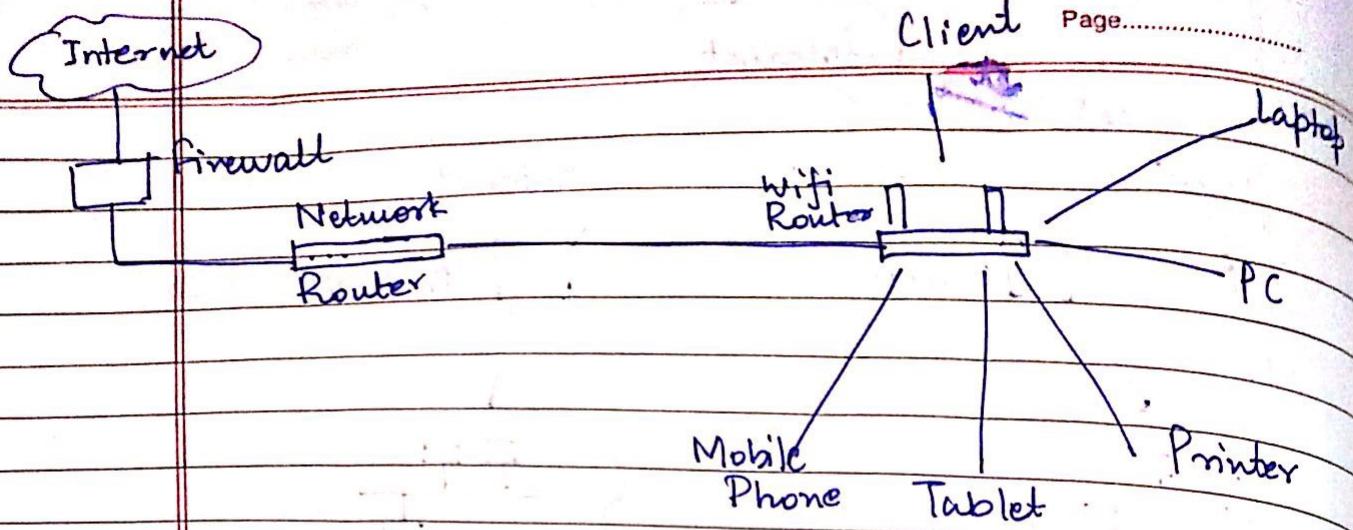
INTRANET: Intranet refers to collection of networks within a logical body.

- It can be as simple as two computers connected at home or as vast as two branch offices connected to each other.
 - Intranet has firewall or router.
 - It uses the internet protocols such as TCP/IP & FTP.
 - Accessible via the browser in a similar way as websites in the internet. However, only members of intranet can access.
 - Internet is not safe whereas Intranet can be privatised as per the need.
 - Internet provides wider and better access to websites to a large population, whereas Intranet is restricted.
- EXTRANET: It is a controlled private network that uses internet protocols, network connectivity.
- It can be viewed as part of company's intranet that is extended to users outside company, usually via Internet.



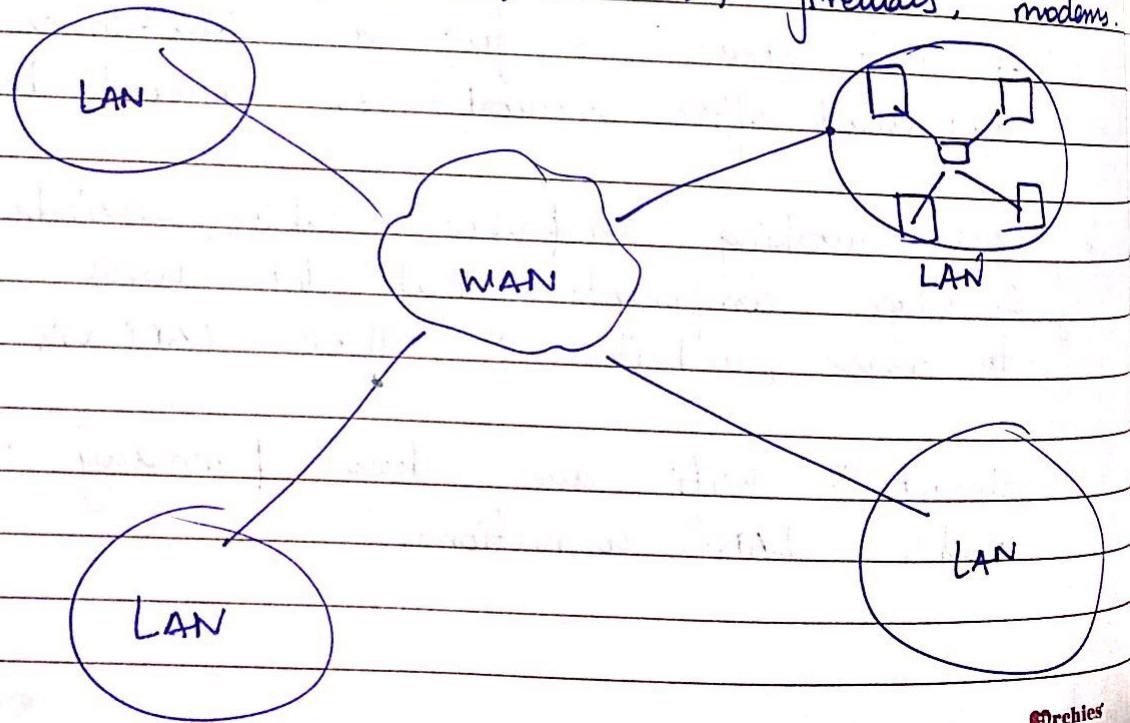
LAN

- LAN is a group of computers and associated devices that share a common communication line or wireless link to a server within a distinct geographical area such as an office or commercial establishment.
- Devices use a LAN connection to share resources such as printer or network storage.
- It may serve as few as two-three users (e.g.: small office network) or several hundred.
- LAN networking comprises cables, switches, routers & other components that let users connect to servers, websites & other LAN via WAN.
- Ethernet & WiFi are two primary ways to enable LAN connections.



WAN

- A wide area network that exists over a large scale geographical area.
- Connects different smaller networks, including LAN's & MAN's.
- Its implementation can be done either using private network OR public transmission system.
- TCP/IP protocol is used.
- Works similar to LAN - just larger.
- Comprises switches, routers, firewalls, modems.



MAN

- A metropolitan area network (MAN) is similar to LAN but spans an entire city or campus.
 - MAN's are formed by connecting multiple LAN's
- LAN's < MAN's < WAN
- MAN is highly efficient & provide fast communication via high speed carriers, such as fibre optic cables.
 - Its working mechanism is similar to an ISP (Internet Service Provider), but a MAN is have owned by a single organisation
 - It mostly works on the data link layer which is layer 2 of OSI model
 - It extends upto 30-40km