CHAP - 3

Telecommunication and Networks

NETWORK

Network means collection of computers & terminals (e.g. ATM) connected with communication system.

SERVER

Server means a computer which provides specific services like data base, communications, web hosting, etc. to client computers.

CLIENT

Client is a computer which receives specific services from server.

TYPES OF NETWORK

LAN	MAN	WAN	VPN
Local Area Network	Metropolitical Area Network	Wide Area Network	Virtual Private Network
Limited geographical area	Roughly 40 km. area is covered. (E.g. Cable T.V.)	No geographical boundaries.	Created on WAN. It is a imaginary network.

VPN

Intranet	Extranet
Secure network within the organisation	

NODE

Node means any computer or terminal which are connected on networ.

BUSINESS VALUE OF COMMUNICATION

Geographical Barrier	Time Barrier	Cost Barrier	Structural Barrier
			E.g. Iphone can communicate with other phones through Whatsup App.

EMAIL : Chheda.jignesh@gmail.com contact : 9819068991

TRENDS IN TELECOMMUNICATION

Industry

E.g. www, ISP (Internet Service Provider)

Technology

- Open system – a system which freely interacts with other system.
- From analog to digital system
- From co-axial to fiber optic.
  - Easy installation
  - Faster communication
  - No interfearance

Business Applications

- www
- Website
- Applications
- E-commerce

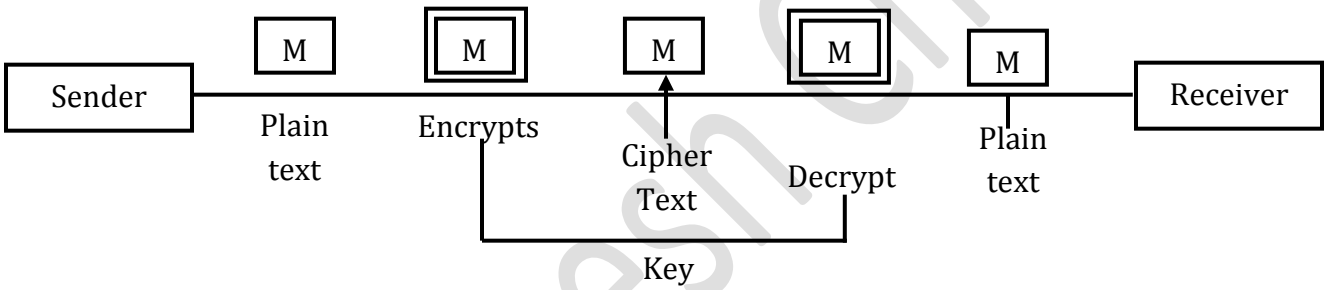
Benefits

– Locking supplier & buyer

– Reduce cost

– Reduce lead time

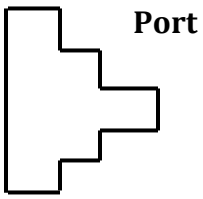
CRYPTOGRAPHY



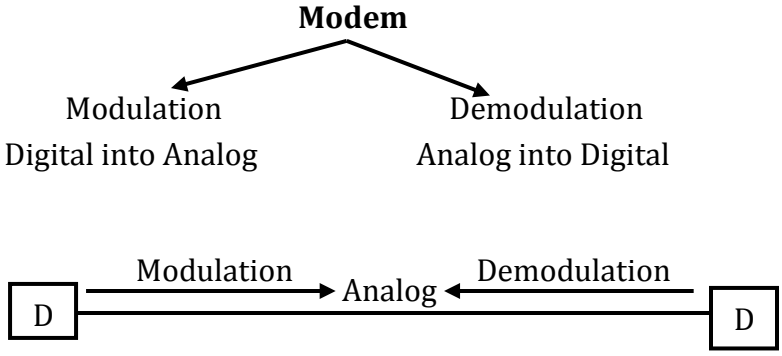
TELECOMMUNICATION NETWORK MODEL

1) NIC:

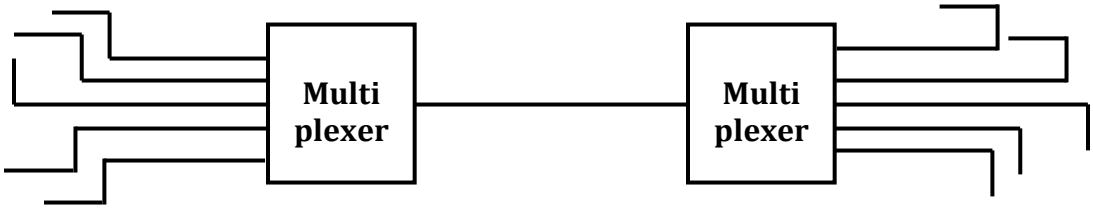
It connects computer with computer network.



2) Modem:



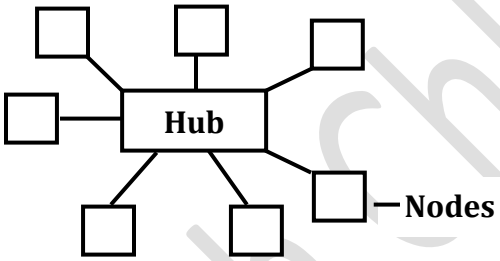
3) Multipiexers:



It allows simultaneously data transmission from many terminals (merger at one end & demerger at another)

4) Hub:

Hub is a common wiring point in LAN.



5) Switch:

Switch creates point to point temporary links between telecommunication circuits.

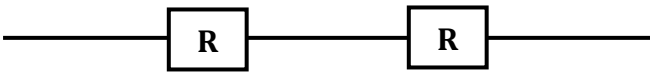
6) Bridge:

Bridge conects multiple LAN.

7) Router:

8) Gateway:

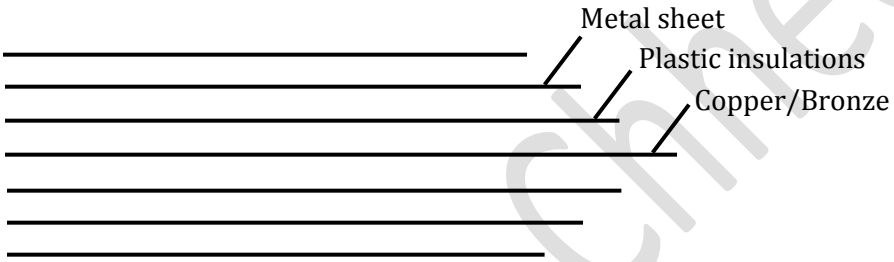
9) Repeater:



10) Twisted Pair Cable:

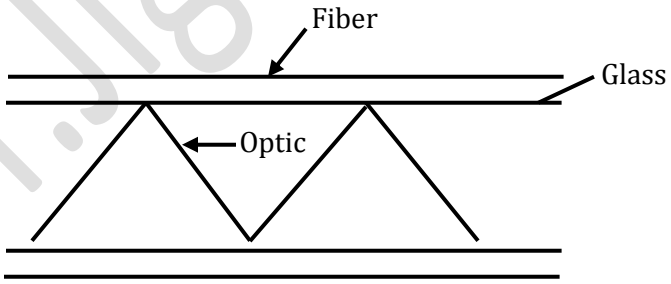
- Consisting of copper wire twisted into pairs.
- It is used for both voice s data transmission.
- Mostly used in home & office telephone systems.
- Susceptible to various types of electrical interfearance.
- Signals must be “refreshed” every one to two miles through the use of repeaters.
- Do not offer security.

COAXIAL CABLE



- Copper or aluminum wire wrapped with layes to insulate.
- Insulation on minimizes interference.
- Carry a large volume of data.
- Can be placed underground & laid on the floors of takes & oceans.
- Used in office buildings & other work sites more expensive than twisted pair.

FIBER OPTICS



- Glass fiber wrapped in a protective jacket.
- Signals are converted to light form & fired by loses.
- Can carry digital as well as analog signals.
- Not affected by electromagnetic radiations.
- Can be used under sea.
- 10,000 times faster than that of microwave & satellite systems.
- Biggest disadvantages installation can be difficult & costly to purchase.

UNGUIDED MEDIA/UNBOUND MEDIA

Data signal are not bound to a cabling media. Cosists means for the data signals to travel do specific path.

i) Radio Waves:

– No cables for data transmission.

– Indivisible form of electromagnetic radiations.

– Wave length a milimeter to 1,00,000 km.

– Used in the Wireless Local Area Network.

ii) Micro Waves:

– Wave length one milimeter to one meter.

– Used in radar system, spectorscopy i.e. X-ray.

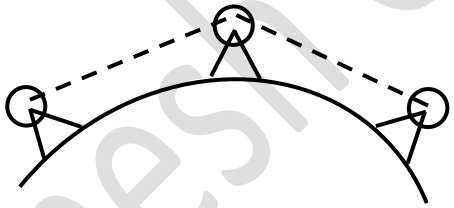
iii) Infrared Waves:

– Used in industrial, scientific & medical application.

– Night vision devices uses this.

– It uses heat to detect the target.

iv) Terrestrial Microwave:

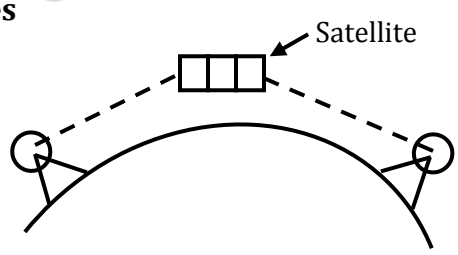


– Involves earth bound microwave systems approx. 30 miles.

– Uses atmosphere as the medium. It is used highly for high volume & long distance communication of voice & data.

– Can not bend as per curvature of earth.

v) Communications Satellities



– Use the atmosphere (microwave radiowaves)

– A satellite is some solar-powered electronic device that receives, amplifies boots) & retransmits signal.

– Used for high volume as well as long distance communication of both data & voice.

– Cost effecctive method for moving large quantities.

– Satelites life is 7 – 10 years.

– Sensitive data should be sent in a secret on encrypted form.

COMPUTERS

All types of computers connected through media to perform their communication assignments.

TELECOMMUNICATION CONTROL SOFTWARE

Consists of programs that control telecommunications activities & manage the functions of telecommunications networks.

Network management telecommunications software packages provide a variety of communication support services.

Q. Examples of major network management function include

1) Traffic management:

Manages network resources & traffic to avoid congestion & optimize telecommunication service levels to userss.

2) Security:

Provides authentication, encryption.

3) Network Monitoring:

Troubleshoot problems & inform potential, problems before they occur.

4) Capacity Planning:

Determine how best to accommodate the needs of the network as it grows & changes.

NETWORK TOPOLOGIES

It means geometrical arrangement of computers & network resources.

Star Network

Characteristics:

- Tiles end user computer to central computer.
- Central unit acts as the traffic controller.
- Centralisation

Advantages:

- Several users can use central unit at a time.
- Easy to add new nodes.

Bus Network

Characteristics:

- A single length of wire, cable or optical fiber connects a no. of computers.
- All communucation travels along this cable called a bus.
- Decentralised approach.

Advantages:

- No host computer/server.
- If node fails no effect on network.

Ring Network

Characteristics:

- Computers tied together.
- Decentralised approach.
- Data passes through ring.
- More reliable & less costly.

Advantages:

- Do not require a central computer.
- Each computer connected in network can communicate

Mesh Network

Characteristics:

- Random connection of nodes using communication links.
- May be fully connected & partly connected.
- High reliability.
- Used in ISP (Internet Service Provider)

Advantages:

- No effect if 1 of nodes fails network traffic can be redirected to another node (i.e. High efficiency).

- A node failure do not breaks the network.
- Easy to troubleshoot.

- Least amt. of cable so less expensive.
- Easy to extend.
- Repeater can also be used to extend a bus configuration.

directly.
- High performance for a small no. of works stations.
- Can span longer distances.
- Easy extendable.

- Easy to troubleshoot.

Disadvantages:

- Whole network affects by failure of server.
- Less reliable than a ring network.
- Cost of cabling is high.

Disadvantages:

- Heavy network traffic.
- Each connection weaknes the electrical signal.
- Difficult to trouble shoot.
- A cable break cause the whole network to stop functioning.

Disadvantages:

- Relatively expensive & difficult to install.
- Failure of one computer affect the whole network.
- Difficult to trouble shoot.
- Adding or removing node can discrupt the network.

Disadvantages:

- High cost of installations maintenance.

DATA COMMUNICATION MODES/DATA TRANSMISSION MODES

1) Simplex:

Permits data flow in only one direction. E.g. FM Radio.

2) Half Ouples:

Data can only go in one of the two directions at any given point of time. E.g. Walky talky.

3) Ful Duplex:

Simultaneously transmit & receive data between two station. E.g. Cellphone.

Data Transmission Techniques

Circuit Switching

We plaace a call & either get our destination party or encounter a buy signal, we cannot transmit any message. E.g. Call

Message Switching

E.g. Email, SMS

Packet Switching

- Breaking data message into transmission units called packets.
- E.g. Passwords included in the packet.
- Protocol for making is called as TCP/IP.

AREA COVERAGE BASED CLASSIFICATION OF NETWORKS

1) LAN:

Within limited physical area.

Characteristics:

- Different types of cables are used to connect the network & its devices.
- To communicate NIC is required.
- Uses a powerful microcomputer with a large disk capacity as a file server contains a network operating system.
- LAN allow share hardware, software & data resources.

Furhter LAN provides (Benefits of LAN)

- Security:
  Achieved using servers.
- Expanded PC usage through in expensive work station:
  Once LAN has been set up; it cost less to automate additional employees through disc less PC's.
- Distributed processing:
  Each computer on network can process their own data.
- Electronic mail & message broadcasting:
  E-ail allows allows users to communicate easily.
- Data management benefits:
  Data locates centrally on the server. Easier to manage, access, back it up.
- Organisation benefits:
  Reduced costs in computer hardware, software & peripherals.
- Software cost & upgradation:
  Network version can save a log of a money.

2) MAN:

- Between LAN & MAN
- Roughly km. in length from one point to another.
- Interconnects computer resources in a geographic area or region larger than LAN but smaller than WAN.
- Surplus both data & voice.
- Used in cable television networks.

3) WAN:

- Covers larger geographic areas.
- Telephone service, satellite transmission & under-sea cables.
- Areas like large city or metropolitian area, whole country, many countries & continennts are covered.

OWNERSHIP BASED CLASSIFICATION OF NETWORKS

Public Data Network

- Network shared by users not belonging to single organisation.
- Operated by telecommunications administration or private operating agency. E.g. BSNL/MTNL.
- Internet is an example of public data network.

Private Data Network

- Dedicated network to continuously receive & transmit data.
- Critical to both the daily operations needs of the organisation. E.g. LAN.

Virtual Private Network

- Which are iterkat networs on top of public networks they are called "virtual" because they are merely an illusion.
- To esatblish secure intranets & exranets.

CLIENT

Is a computer which receives specific servers from server.

Fat/Thick Client

- Performs the bulk of any data prpcessing operations itself.
- Does not rely on server as processing as processing is done locally.
- Server is accessed for storage purpose only.
- Not well suited for public environments. For e.g. Personal computer.

Thin Client

- Thin clients use the resources of server (host computer)
- Only presents processed data.
- There is little hardware & software installed on the user's machine.
- A device using web applicable. E.g. Tablet.

Hybrid Client

- Mixture of fat & thin.
- Similar to fat it processes locally but relies on the server for storing
- Offers feature from both the fact client & thin client.
- Well suited for video gaming.

- A VPN is a private network that uses a public networ to connect remote sites or users together.
- Ensure security – any one one intercepting the encrypted data can't read it.

FUNCTIONAL BASED CLASSIFICATION OF NETWORKS

Cliet – Server Networking

Satisfies business need by appropriate allocating the application processing between the client & the server processors.

Working of a Client-

Peer-to-Peer

Advantages:

- Easy & simple to set
- Cost effective.
- One computer fails to work other computer continues.

Disadvantages:

Multifier Networking

A tier is a distinct part of hardware & software.

a) **Single Tier System/One Tier Architecture:**

A single computer that contains a database & a application to access the database. Used for small business.

Advantages:

Server Network:

- Servers are typically powerful computers.
- End user personal computer are the clients.
- Clients are interconneced by LAN.
- Either the client platform or the server platform can be upgraded.
- The server is able to service multiple clients, clients can access multiple initiated at the client end.

Prominent Characteristics:

Service: Server is service provider & client is a consumer.

Shared resources: Server shares services.

Transparancy of location

Mix & match: uses independent hardworked & OS platforms.

Scalability: Server load can be distributed.

Integrity: Data & code centrally managed.

- Problem in accessing files if note connected.
- Does not support connections with two computers.
- Security is very poor.

Issues

- If server goes down network stops.
- Simultaneous access to data takes little more time.

Requires 1 computer, cost effective system.

Disadvantages:

Only 1 user at a time.

b) Two Tier System/Two Tier Architecture:

Consist a client & server. Database is stored on server & application to access database installed in client.

Advantages:

- Performance is higher.
- More users could interact with system.
- Simple structure is easy to set up.

Disadvantages:

- Performance deteriorates if users is greater than 100.
- Restricts flexibility.

c) Three Tier Architecture:

Client-server architecture, function process logic, data access, computer data storage & UI are developed & maintained as independent platforms.

Presentation Tier: Communicates with other tiers.

Application Tier: Performing detailed processing.

Data Tier: Houses database.

Advantages:

- Clear specification of UI
- Dynamic load balance
- Process can be moved to toher servers
- Change Management: Easy & faster to exchange a compoonent on the server.

Disadvantages:

- Need of network traffic management.
- Current tools are more complex.

TRANSMISSION TECHNOLOGIES

1) Serial Transmission:

- Bit by bit data is sent alongwith single path.
- Data is transmitted over a single wire.
- Cheaper mode than parallel.
- Slower than parallel.
- For long distances.

2) Parallel Transmission:

- Data is byte by byte transmitted simultaneously.
- Data is transmitted over & different wires.
- Expensive than serial.
- Not applicable for long distances.
- Faster than serial.

3) Synchronous Transmission:

- Type of serial transmission.
- Bits that are placed at the start & end are known as synchronised bits.
- Efficient as easy to transfer due to transfer.
- Due to continues link it is less reliable.
- More expensive.

4) Asyncronous Transmission:

- Type of serial transmission.
- Uses start & stop bits before & after each byte of data transmitted.
- Relatively cheaper.
- More reliable.
- Less efficient.
- Slow down the transmission.

NETWORK COMPUTING

- Network computers provide a browser-based user interface.
- Network computers are micro computers without floppy or hard disk.
- Server provides the OS, softwares, database etc. to clients.

CENTRALISED COMPUTING

Computing done at a central location using terminal attached to a central computer.

Advantages:

- Security due to centralised approach.
- Terminal break down doesn't affect the network.

Disadvantages:

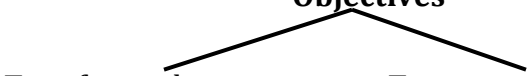
- Relies totally on central computer.
- If central computer is supported inadequately then usage will suffer greatly.

DECENTRALISED COMPUTING

- Allocation of resources (hardware, software, etc.) in different work stations.
- Decentralised computer collection.
- Capable & running independently of each other.
- Enables file sharing, devices sharing, internate sharing.
- In case of upgradation all computers should be upgraded. It increases cost.

NETWORK SECURITY

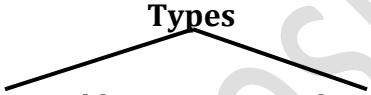
1) Objectives



To safeguard assets

To ensure & maintain the data integrity

2) Types



Physical security like to protect hardware, personnel etc.

Logical security
It controls
- Malicious & non-malicious threats to physical security
- Malicious threats to logical security itself

3) Level of security

Regular & periodic review of controls exercised to ensure safeguarding of assets & maintenance of data integrity.

Security programs involve following eight steps:

→ Prepare plan of enforcing security.
→ Asset identification (e.g. server, application, storage device)
→ Asset valuation.
→ Threats identification (virus, hacker etc.)
→ Probability of threats on occurance.
→ Exposure analysis (estimated cost of losses)
→ Controls adjustment security (e.g. firewall)
→ Report generation.

THREATS

A threat is anything that can disrupt the operation, functioning, integrity or availability of a network system.

Unstructured

→ Mostly from inexperienced individuals using easily available hacking tools from the internet. E.g. Myself.

Structured

→ Mostly from a highly motivated & technically competent & usually understand network system design & creates scrips for hacking.

→ Hired by competitors, etc.

→ E.g. Professional hacker

External

→ These originate from individuals or organisations working outside an organisation.

→ It is unauthorised person.

→ E.g. CompetitorsZ

Internal

→ By whom who are authorised to access the network.

→ E.g. Employees

VULNERABILITIES

Is an inherent weakness in the design, configuration or implementation of a network or system that genders it susceptible to a threat.

Responsible for occurrence of vulnerabilities in the software.

Software Bugs	Timing Windows	Insecure default configuration	Bad	Trusting	End Users
Bugs = errors User has developed techniques to work around bugs.	When temporary file is exploited by an intruder to gain access to the file. E.g. Cookies	Default passwords are not usually changed this causes to access intruders effortlessly.	Protocols lack of security.	Untrust working info.	Negligence about passwords.

NETWORK SECURITY PROTOCOLS

Designed to prevent any unauthorised user, application, service or device from accessing network data.

- **Cryptography:**

  Practice & study of techniques for secure communication in the presence of third parties. Collectively known as cryptology.

- **Encryption:**

  Process of encoding message so that unauthorised person can't read it.

- **Plain Text:**
  It is the message that is to be encrypted.
- **Cipher Text:**
  Output of the encryption process.
- **Cryptoanalysis:**
  The art of breaking ciphers.

Basic approach of encryption

Hardware encryption	Software encryption
Devices are available at a reasonable cost can support high traffic.	Employed in conjunction with specific applications
E.g. Digital signature	Certain e-mail packages.
	E.g. Cellphone – Security Encryption

Some (important) popular network security protocols include

Secure Shell (SSH)

→ Is a program to log into another computer over a network to execute commands in a remote machine & to move files from one machine to another.

→ During SSH login, entire session is encrypted.

E.g. Team viewer

Secure Shell Transfer Protocol (SFTP)

→ Computing network protocolfer accessing & managing files on remote file systems.

→ Unlike standard File Transfer Protocol (FTP), SFTP encrypts command & data both.

Hypertext Transfer Protocol Secure (HTTPS)

→ Secure communication over a computer network with especially wide deployment on the internet.

Secure Socket Layer (SSL)

→ Is typically used when a web browser need to securely connect to a web server over the inherently insecure internet.

→ Used in secure online credit card transactions.

NETWORK SECURITY TECHNIQUES

To protect information & systems against intrusion, misuse etc.

Firewall

Act as barrier between a secure & an open environment.

E.g. Internet

Message Authentication

Makes sure that a message is really from whom it purports to be & that it has not been tampered with.

Site Blocking

→ Software based approach.

→ Prohibits to access certain websites.

IDS Technology

→ The goal of unauthorised packet is to monitor network assets to detect anomalous behaviour & misuse.

→ Defined as:

Network Intrusion Detection (NID)

→ Deals with in formation passing on the wire between hosts.

→ Referred as "packet-sniffers" network intrusion detection devices intercept packets travelling along various communication mediums & protocols usually TCP/IP.

→ One captured the packets are analysed in a no. of

Host-based Intrusion Detection (HID)

→ To monitor, detect the activities of employees.

→ Best suited to detect internal threats.

Hybrid Intrusion Detection

→ Mixture of NID & HID.

→ Provides central intrusion detection management.

Network Node Intrusion Detection (NNID)

→ Developed to work around the inherent flaws in traditional NID.

→ Pulls the packet intercepting technology off of the wire & put it on the host.

→ The packet is then analysed

INTERNET REVOLUTION

The internet is the largest "network of netwrk of networks".

Features:

- Net does not have a central computer system.
- The net does not have a headquarters or governing body.
- The internet is growing rapidly.

INTERNET ARCHITECTURE

- To join the internet, the computer is connected to an internet service provider from who the user purchases internet access or connectivity.
- A common way to connect to an ISP is to use the phone line.
- Digital Subscriber Line (DSL) reuses the telephone line that connects to our house for digital data transmission.
- CMTS (Cable Modem Termination System) method is to send signals over the cable T.V. system.
- Wireless is used for internet access for 3G mobile phone networks.
- ISP is made up of long distance transmission lines.
- ISP is connect their networks to exchange traffic at IXP is (i.e. Internet Exchange Points).
- The peering that happens at IXP's depends on the business relationships bettween ISPS. E.g. Vodafone – Airtel – Loop.
- The path a packet takes through the internet depends on the peering choices.

INTERNET APPLICATIONS

Can be used as

1) E-mail
2) E-commerce
3) Electronic discussion forums & bulletin board system. E.g. Electronic notice board.
4) Downloading software, accessing data base etc.
5) Real-time conversations. E.g. Chatting.
6) Gathering information through online services (i.e. surfing).
7) Enables to surf www by clicking their way to the multimedia (Audio, video, graphics) information.

BUSINESS USE OF THE INTERNET

- Providing customer & vendor support.
- Collaboration among buisness partners.
- Buying & selling products & services.
- Eletronic commerce.
- Marketing, sales & customer service applications.
- Developing new web based markets & distribution channels for existing products.
- Enterprise communication & collaboration.

INTRANET

Is a secure network created within the organisation over internet.

- **Business value of intranets:**
  - Communication & collaboration: Improve communication & collaboration within the organisation. E.g..e-mail, fax etc.
  - Web publishing: Lower cost of publishing & accessing multimedia business information internally via internet. E.g. Notice new product info, launching of new services.

- **Business operations & management:**
  Intranet used as the platform for developing & deploying critical business application.
  Example includes
  - Developing customers applications like order processing. E.g. Big Bazar.
  - Employees within a company, can access & run applications using web browsers.
  - Newsletters, technical drawings, product catalogs can be published.
  - Help to easily navigate & locate the business information.

EXTRANETS

Extranet means secured network between organizations.

- **Business value of extranets:**
  - Derived from several factors:
  - Extranets makes customer & supplier access of resources easier & faster.
  - Ofer new kinds of interactive web-enabled services to their business partners.
  - Improves collaboration
  - Facilitate an online, interactive product development, marketing.

- **Companies can use extranet for:**
  - Share product catalogs.
  - Joint development efforts.
  - Jointly develop & use training programs.
  - Provide or accessories.
  - Share new of common interest.

- **Five rules of the extranet (BDPOS)**
  Be as flexible as the business
  Flexible to implement change in technologies, in current extranet.
  Deploy in "Internet time"
  Extranet should be implemented within available resources.
  Protect the interest of the data owner
  So that correct user can access the right services. E.g. Encryption/decryption.
  Serve the partner as a customer
  Do not require to change their security policies, applications to form extranet community.
  Drive information to the decision maker
  Must provide a central means to measure progress, performance.

ELECTRONIC COMMERCE

Buying & selling of goods & services through electronic medium. E.g. Flipcart, Snapdeal.

Various benefits of E-commerce applied & implementation are listed below:

- Reduced costs to buyers.
- Reduced costs to suppliers.
- Creation of new markets.
- Easier entry into new markets specially in remote markets.
- For companies of all size & locations.
- Reduced OH cost through automation.
- Reduced advertising cost.
- Reduced delivery cost.
- Improved market intelligence & strategic planning.
- More opportunity for niche marketing.
- Equal access to markets.
- Access to new markets.
- Customer involvement in product & service innovation.

Risk involved in e-commerce

- **Problem of anonymity:** To identify & authenticate users.
- Repudiation of contract:
- **Lack of authenticity of transactions:** Produced document may not be reliable.
- Data loss or theft or duplication.
- Attack from hackers.
- **Denial of service:** Non-availability of server due to viruses, e-mail bombs, flood, etc.
- **Non-recognition of electronic transactions:** Digital signature may not be recognised as evidence in courts of law.
- Lack of audit trails.
- **Problem & piracy:** Less privacy.

Types of e-commerce

1) Business to Business E-commerce:

Automated process, performed in much higher volumes.

2) Business to Consumer:

Saves time & money but customer should be provided with safe & secure options.

Advantages:

- Shopping faster & more convenient.
- Offering & prices.
- Call centers can be integrated with the website.
- Broadband telecommunications will enhance the buying experience.

3) Customer to Customer:

E.g. OLX, Quicker etc.

4) Consumer to Business:

E.g. Justdial.

5) Business to Government:

E.g. IT Returns.

6) Business to Employee:

Forman intra-organisational prospective, has provided the means for business to offer online products & services to its employees. E.g. Employee discount.

Key aspects to be considered in implementing e-commerce

→ Implement appropriate policies, guidelines, standards.
→ Cost benefit analysis & risk assessment.
→ Implementing right level of security across all layers & process.
→ Establishing & implementing the right level of baseline controls.
→ Integration of e-commerce with the business process & the physical delivery channels.
→ Providing adequate user training.
→ Performig post implementation review to ensure controls are working as envisaged.

MOBILE COMMERCE

M-commerces is the buying & selling of goods & services through wireless hand held device such as cell phone& Personal Digital Assistants (PDA's).

Industries affected by M-commerce

Financial services like banking.

Telecommunication. E.g. My Vodafone.

Service/retail. E.g. Dominose.

Information services. E.g. Justdial, Zomato.

ELECTRONIC FUND TRANSFER (EFT)

The way by which the business can receive direct deposit of all payments from the financial institution to the company bank account. Example of EFT.

Automated Teller Machines (ATM's)

Uses like deposit, withdrawals ……..

Point of Sale (POS) Transactions

Used when shopping to allow the transfer of funds from the consumers A/c to merchant's A/c.

Preauthorised Transfers

Automatically depositing or withdrawing funds from an individual A/c. E.g. ECS.

Telephone Transfers

Payment from phone.

NETWORK ARCHITECTURES & PROTOCOLS

Network Architecture:

Consisting of the hardware, software, connectivity, communication protocols & mode of transmission such as wired or wireless.

It promotes simple, flexible & efficient telecommunications environment:

- Standard protocols.
- Standard communications hardware & software interfaces.
- Standard multilevel interface between end users & computer systems. E.g. Graphical user interface.

Protocols

It means similar set off rules through which 2 different computers can communicate.

It gives 3 aspects of digital communications.

Syntax: Format of data being exchanged, type of error correction used, type of encoding scheme.

Semantics: Type & order of messages.

Timing: Defines data rate, events during data transfer.

At the sending computer, protocols –

i) Break data down into packets.
ii) Add destination address to the packet.
iii) Prepare data transmission through NIC.

At the receiving computer, protocols –

i) Take data packet off the cable.
ii) Bring packet into computer through NIC.
iii) Strip the packets off any transmitting information.
iv) Copy data to a reassembly.
v) Pass the reassembled data to the application.

The OSI Model (Open System Interconnection)

Seven layers of OSI include:

Layer 7 or Application Layer

Interacts with software applications & provides user services by file transfer etc.

Layer 6 or Presentation Layer

Converts incoming & outgoing data from one presentation format to another.

Layer 5 or Session Layer

Coordinates & terminates conversations, exchanges & dialogs between the application at each it deals with session & connection co-ordination.

(creates, exchanges, terminated conversation of session).

Layer 4 or Transport Layer

Ensures reliable & tranparent transfer of data assembles & disassembles message packets.

Layer 3 or Network Layer

Makes a choice of the physical route.

Layer 2 or Data Link Layer

Makes a choice of the physical route.

Layer 1 or Physical Layer

Is a hardware layer.

Electromagnetic features.

FUNCTIONS & SERVICES PERFORMED BY THE PHYSICAL LAYERS

Establishment & termination of a connection to a communications medium.

The communication resources are effectively shared among multiple users.

Modulation or conversation between the representation of digital data in user equipment & the corresponding signals transmitted over a communications channel.

INTERNET'S TCP/IP

Widely used that it is equivalent to network architecture.

The internet's protocols suite is called transmission control protocol/internet protocol. Consists of five level of TCP/IP includes:

- Application or Process Layer.
- Host-to-Host Transport Layer.
- Internet Protocol (IP).
- Network Interface.
- Physical Layer.

The OSI Model		TCP/IP
Application Layer		Application of
Presentation Layer	→	Process Layer
Session Layer		
Transport Layer	→	Host-to-Host Transport Layer
Network Layer	→	Internet Protocol
Data Link Layer	→	Network Interface
Physical Layer	→	Physical Layer

INFORMATION SYSTEM & TELECOMMUNICATION

Telecommunication gives capability to more info rapidly between distant locations & provide the ability to various users to bring processing power to the point of the application.

Through communication, this value may be

i) An increase in the efficiency of operations.

ii) Improvements in the effectiveness of management.

iii) Innovations in the market place.

Telecommunication may provide these values through the following impacts:

a) Time compression transmits raw data & info quickly & accurately between remote sites.

b) Overcoming geographical dispersion.

c) Restructuring business relationships:
restructre the interactions of people within a firm. E.g. Whatsup, E-mail, Team viewer, etc.

----****----