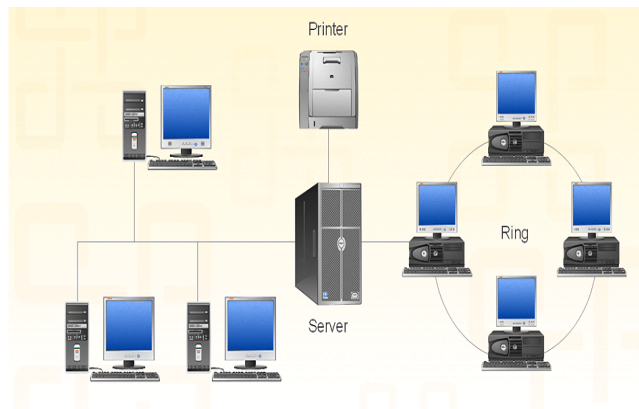# COMMUNICATION AND NETWORK CONCEPTS

## Points to remember

### Network
- ☐ The collection of interconnected computers is called a computer network.
- ☐ Two computers are said to be interconnected if they are capable of sharing and exchanging information.



### Usages of Networking:
- ☐ Resource Sharing
- ☐ Reliability
- ☐ Cost Factor
- ☐ Communication Medium

Resource Sharing means to make all programs, data and peripherals available to anyone on the network irrespective of the physical location of the resources and the user.

**Reliability** means to keep the copy of a file on two or more different machines, so if one of them is unavailable (due to some hardware crash or any other) them its other copy can be used.

**Cost factor** means it greatly reduces the cost since the resources can be shared

**Communication Medium** means one can send messages and whatever the changes at one end are done can be immediately noticed at another.

### Evolution of Networking
1969 - First network came into existence**ARPANET** (ADVANCED RESEARCH PROJECT AGENCY NETWORK)MID 80'S - **NSFNET** (NATIONAL SCIENCE FOUNDATION NETWORK)
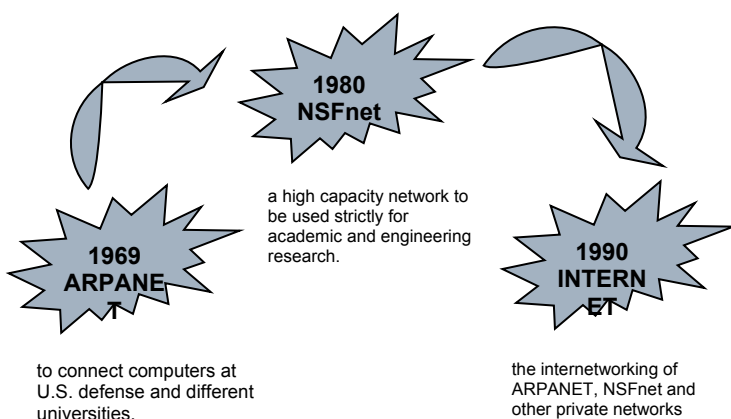


- ☐ **Internet** is the network of networks.

### SWITCHING TECHNIQUES
Switching techniques are used for transmitting data across networks.
Different types are :
- • Circuit Switching

92

- Message Switching
- Packet Switching

## Circuit Switching

- *Circuit switching* is the transmission technology that has been used since the first communication networks in the nineteenth century.
- First the complete <u>physical connection</u> between two computers is established and then the <u>data are transmitted from the source computer to the destination.</u>
- When a <u>call is placed</u> the switching equipment within the system seeks out a physical copper path all the way from the sender to the receiver.
- It is must to setup an end-to-end connection between computers before any data can be sent.
- The circuit is *terminated* when the connection is closed.
- In circuit switching, resources remain allocated during the full length of a communication, after a circuit is established and until the circuit is terminated and the allocated resources are freed.

## Message Switching

- In this the <u>source computer sends data or the message to the switching circuit</u> which stores the <u>data in its buffer</u>.
- Then using any <u>free</u> link to the switching circuit the data is send to the switching circuit.
- Entire message is sent to the destination. It reaches through different intermediate nodes following the <u>"store and forward"</u> approach.
- No dedicated connection is required.

## Packet Switching

- Conceived in the 1960's, *packet switching* is a more recent technology than circuit switching.
- Packet switching introduces the idea of cutting data i.e. at the source entire message is broken in smaller pieces called packets which are transmitted over a network without any resource being allocated.
- Then each packet is transmitted and each packet may follow any rout available and at destination packets may reach in random order.
- If no data is available at the sender at some point during a communication, then no packet is transmitted over the network and no resources are wasted.
- At the destination when all packets are received they are merged to form the original message.
- In packet switching all the packets of fixed size are stored in main memory.

### DATA COMMUNICATION TERMINOLOGIES

| Data channel | • The information / data carry from one end to another in the network by channel. |
|---|---|
| Baud & bits per second (bps) | • It's used to measurement for the information carry of a communication channel**.**<br>Measurement Units :-<br>bit<br>1 Byte= 8 bits<br>1 KBPS ( Kilo Byte Per Second)= 1024 Bytes ,<br>1 Kbps (kilobits Per Second) = 1024 bits,<br><br>1 Mbps ( Mega bits Per Second )=1024 Kbps |
| Bandwidth | • It is amount of information transmitted or receives per unit time.<br><br>It is measuring in Kbps/Mbps etc unit**.** |

### Transmission Media

- data is transmitted over copper wires, fiber optic cable, radio and microwaves. the term 'media' is used to generically refer to the physical connectors, wires or devices used to plug things together.

93

**Basic communications media types**
- Copper
  - unshielded twisted pair (utp)
  - shielded twisted pair (stp)
  - coaxial cable (thinnet, thicknet)
- Fiber optic
  - single-mode
  - multi-mode
- Infrared
- Radio & microwave

## Twisted Pair Cable
- These cables consist of two insulated copper wires twisted around each other in a double helix.
- Twisting of wires reduces crosstalk which is bleeding of a signal from one wire to another.

**Types:**
- Unshielded Twisted Pair (UTP)
- Shielded Twisted Pair (STP

STP offers greater protection from interference and crosstalk due to shielding
But it is heavier and costlier than UTP.

**USE** 1. In local telephone communication
2. For digital data transmission over short distances upto 1 km

**Advantages:**
- Easy to install and maintain
- Simple
- Inexpensive
- Low weight
- Suitable for small (Local)  Networks

**Disadvantages:**
- Not suitable for long distance due to high attenuation.
- Low bandwidth support.
- Low Speed

## Coaxial cable
- Coaxial cable consists of a solid copper wire core surrounded by a plastic cladding shielded in a wire mesh.
- Shield prevents the noise by redirecting it to ground.
- 
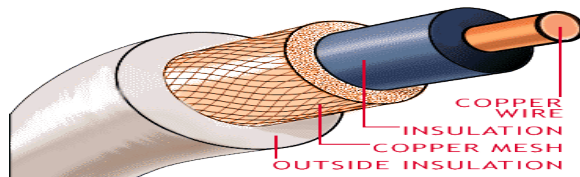
**Types:**
Coaxial cable comes in two sizes which are called *thinnet* and *thicknet.*
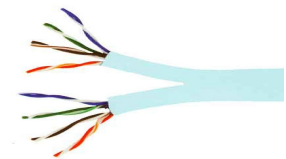- Thicknet : segment length upto 500 m
- Thinnet  : segment length upto 185 m

**USE:**
In TV channel communication

**Advantages:**

- Better than twisted wire cable.
- Popular for TV networks.

94

- Offers higher bandwidth & Speed

- **Disadvantages:**

- Expensive than twisted wires.
- Not compatible with twisted wire cable.

## Optical Fibres
- Thin strands of glass or glass like material designed to carry light from one source to another.
- Source converts (Modulates) the data signal into light using LED (Light Emitting Diodes) or LASER diodes and send it over the Optical fiber.

**It consists of three parts:**
1. The core: glass or plastic through which the light travels.
2. The cladding : covers the core and reflects light back to the core
3. Protective coating : protects the fiber

**Advantages**
- Not affected by any kind of noise.
- High transmission capacity
- Speed of Light
- Suitable for broadband communication

**Disadvantages**
- Installation requires care.
- Connecting two Optical fibers is difficult.
- Optical fibers are more difficult to solder
- Most expensive

## Microwaves
Microwaves are transmitted from the transmitters placed at very high towers to the receivers at a long distance.
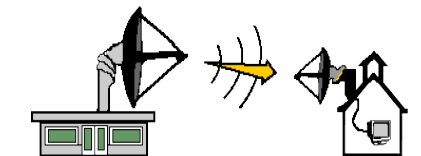


Microwaves are transmitted in line of sight fashion, and also propagated through the surfaces.
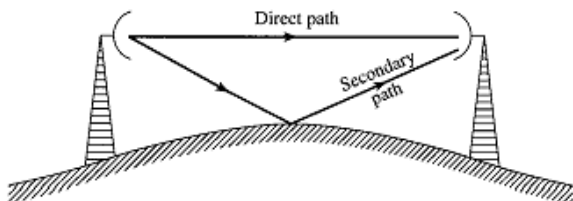


**Advantages**
- Maintenance easy than cables.
- Suitable when cable can not be used.

**Disadvantages**
- Repeaters are required for long distance communication.
- Less Bandwidth available

## Satellite
Geostationary satellites are placed around 36000 KM away from the earth's surface. In satellite communication transmitting station transmits the signals to the satellite. (It is called up-linking). After receiving the signals (microwaves) it amplifies them and transmit back to earth in whole visibility area. Receiving stations at different places can receive these signals. (It is called down-linking).

**Advantage**
- Area coverage is too large

**Disadvantage**
- High investment

## Network devices

### Modem
- A modem is a computer peripheral that allows you to connect and communicate with other computers via telephone lines.
- Modem means Modulation/ Demodulation.
- Modulation: A modem changes the digital data from your computer into analog data, a format that can be carried by telephone lines.
- Demodulation: The modem receiving the call then changes the analog signal back into digital data that the computer can digest.
- The shift of digital data into analog data and back again, allows two computers to speak with one another.

### RJ- 45 Connector
RJ-45 is short for Registered Jack-45. It is an eight wire connector which is commonly used to connect computers on the local area networks i.e., LAN.

### Network Interface Cards (Ethernet Card)
- A network card, network adapter or NIC (network interface card) is a piece of computer hardware designed to allow computers to communicate over a **computer network**. It provides physical access to a networking medium and often provides a low-level addressing system through the use of MAC addresses. It allows users to connect to each other either by using cables or wirelessly.

### Repeaters
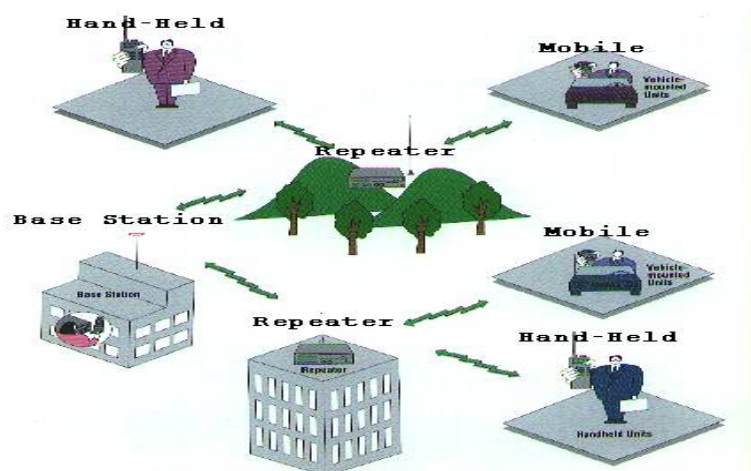


A repeater is an electronic device that receives a signal and retransmits it at a higher level or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable runs longer than 100 meters.

96

### Hubs

A hub contains multiple ports. When a packet arrives at one port, it is copied to all the ports of the hub. When the packets are copied, the destination address in the frame does not change to a broadcast address. It does this in a rudimentary way, it simply copies the data to all of the Nodes connected to the hub.
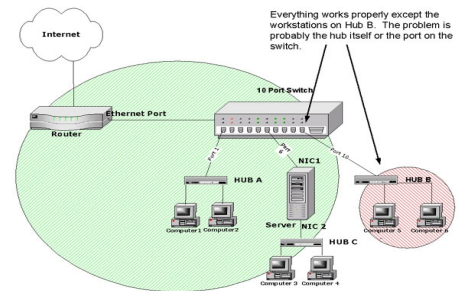
**Bridges** A network bridge connects multiple [network segments](#) at the [data link layer](#) (layer 2) of the [OSI model](#). Bridges do not promiscuously copy traffic to all ports, as hubs do, but learn which [MAC addresses](#) are reachable through specific ports. Once the bridge associates a port and an address, it will send traffic for that address only to that port. Bridges do send broadcasts to all ports except the one on which the broadcast was received.

.
### Switches
Switch is a device that performs switching. Specifically, it forwards and filters OSI layer 2 datagrams (chunk of data communication) between ports (connected cables) based on the Mac-Addresses in the packets. This is distinct from a hub in that it only forwards the datagrams to the ports involved in the communications rather than all ports connected. Strictly speaking, a switch is not capable of routing traffic based on IP address (layer 3) which is necessary for communicating between network segments or within a large or complex LAN.

### Routers
- Routers are networking devices that forward data packets between networks using headers and forwarding tables to determine the best path to forward the packets. Routers work at the [network layer](#) of the TCP/IP model or layer 3 of the [OSI model](#). Routers also provide interconnectivity between like and unlike media ([RFC 1812](#)).
- A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network.

### GATEWAY
A Gateway is a network device that connects dissimilar networks. It established an intelligent connection between a local area network and external networks with completely different structures.
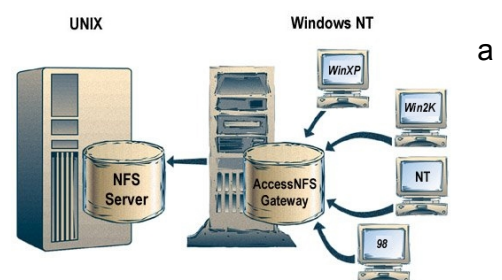
### Network topologies and types
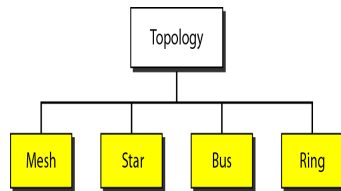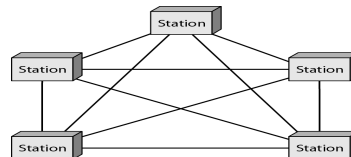
### Network topology

- Computer networks may be classified according to the [network topology](#) upon which the network is based, such as [Bus network](#), [Star network](#), [Ring network](#), [Mesh network](#), [Star-bus network](#), [Tree or Hierarchical topology network](#), etc.
- Network Topology signifies the way in which intelligent devices in the network see their logical

97

relations to one another.



## Mesh Topology

- The value of fully meshed networks is proportional to the exponent of the number of subscribers, assuming that communicating groups of any two endpoints, up to and including all the end points.



## Star Topology

The type of network topology in which each of the nodes of the network is connected to a central node with a point-to-point link in a 'hub' and 'spoke' fashion, the central node being the 'hub' and the nodes that are attached to the central node being the 'spokes' (e.g., a collection of point-to-point links from the peripheral nodes that converge at a central node) – all data that is transmitted between nodes in the network is transmitted to this central node, which is usually some type of device that then retransmits the data to some or all of the other nodes in the network, although the central node may also be a simple common connection point (such as a 'punch-down' block) without any active device to repeat the signals.
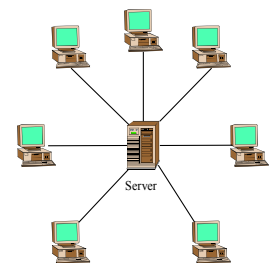


## Bus Topology

- The type of network topology in which all of the nodes of the network are connected to a common transmission medium which has exactly two endpoints (this is the 'bus', which is also commonly referred to as the backbone, or trunk) – all data that is transmitted between nodes in the network is transmitted over this common transmission medium and is able to be received by all nodes in the network virtually simultaneously (disregarding propagation delays).
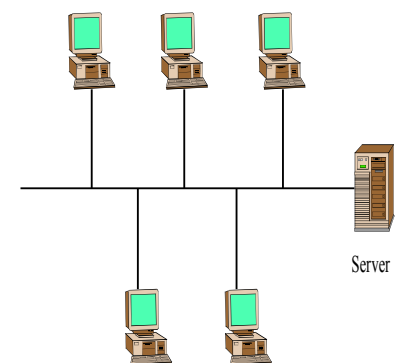


## Ring Topology

The type of network topology in which each of the nodes of the network is connected to two other nodes in the network and with the first and last nodes being connected to each other, forming a ring – all data that is transmitted between nodes in the network travels from one node to the next node in a circular manner and the data generally flows in a single direction only.
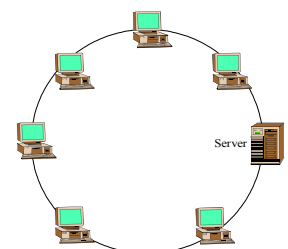


## Compter Networks

A communications network is two or more computers connected to share data and resources are "networked." The simple idea behind computer networking is to allow users to access more

98

information and give them access to devices not directly attached to their "local" system, such as printers or storage devices

## Local Area Network (LAN)

A network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. For example, a library will have a wired or a communications network is two or more computers connected to share data and resources are "networked."  The simple idea behind computer networking is to allow users to access more information and give them access to devices not directly attached to their "local" system, such as **printers or storage devices.**

## Metropolitan Area Network (MAN)

- A Metropolitan Area Network is a network that connects two or more Local Area Networks or Campus Area Networks together but does not extend beyond the boundaries of the immediate town, city, or metropolitan area. Multiple routers, switches & hubs are connected to create a MAN.

## Wide Area Network (WAN)

- WAN is a data communications network that covers a relatively broad geographic area (i.e. one city to another and one country to another country) and that often uses transmission facilities provided by common carriers, such as telephone companies. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

## Network Protocols

## Protocols

- A protocol means the rules that are applicable for a network.
- It defines the standardized format for data packets, techniques for detecting and correcting errors and so on.
- A protocol is a formal description of message formats and the rules that two or more machines must follow to exchange those messages.
- E.g. using library books.
- **Types of protocols are:**
    1. HTTP
    2. FTP
    3. TCP/IP
    4. SLIP/PPP

- **Hypertext Transfer Protocol** (**HTTP**) is a communications protocol for the transfer of information on the intranet and the World Wide Web. Its original purpose was to provide a way to publish and retrieve hypertext pages over the Internet.
- HTTP is a request/response standard between a client and a server. A client is the end-user; the server is the web site.

- **FTP (File Transfer Protocol)** is the simplest and most secure way to exchange files over the Internet. The objectives of FTP are:
- To promote sharing of files (computer programs and/or data).
- To encourage indirect or implicit use of remote computers.
- To shield a user from variations in file storage systems among different hosts.
- To transfer data reliably, and efficiently.

- **TCP/IP (Transmission Control Protocol / Internet Protocol)**

**TCP** - is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

99

**IP** - is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organizations. The organizations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organization to region and then around the world.

- **SLIP/PPP (Serial Line Internet Protocol / Point to Point Protocol)**

SLIP/PPP provides the ability to transport TCP/IP traffic ever serial line between two computers. The home user's computer has a communications link to the internet. The home user's computer has the networking software that can speak TCP/IP with other computers on the Internet. The home user's computer has an identifying address (IP address) at which it can be contacted by other computers on Internet. E.g. dial up connection.

**Telnet-**

It is an older internet utility that lets us log on to remote computer system. It also facilitates for terminal emulation purpose. Terminal emulation means using a pc like a mainframe computer through networking.

(i) Run telnet client- Type telnet in run dialog box.

(ii) Connect to telnet site -specify the host name, port and terminal type.

(iii) Start browsing- surf the shown site with provided instruction.

(iv) Finally disconnect-press Alt+F4.

**Wireless/Mobile Computing**

Wireless communication is simply data communication without the use of landlines. Mobile computing means that the computing device is not continuously connected to the base or central network.

1. **GSM(Global System for Mobile communication):** it is leading digital cellular system. In covered areas, cell phone users can buy one phone that will work any where the standard is supported. It uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.

2. **CDMA(Code Division Multiple Access)**: it is a digital cellular technology that uses spread-spectrum techniques. CDMA does not assign a specific frequency to each user. Instead ,every channel uses the full available spectrum.

3. **WLL(Wireless in Local Loop) :** WLL is a system that connects subscribers to the public switched telephone network using radio signals as a substitute for other connecting media.

4. **Email(Electronic Mail):** Email is sending and receiving messages by computer.

5. **Chat:** Online textual talk in real time , is called Chatting.

6. **Video Conferencing**: a two way videophone conversation among multiple participants is called video conferencing.

7. **SMS(Short Message Service):** SMS is the transmission of short text messages to and from a mobile pone, fax machine and or IP address.

8. **3G and EDGE:** 3G is a specification for the third generation of mobile communication of mobile communication technology. 3G promises increased bandwidth, up to 384 Kbps when a device is stationary.

**EDGE(Enhanced Data rates for Global Evolution )** is a radio based high speed mobile data standard.

## NETWORK SECURITY CONCEPTS

Protection methods

**1 Authorization** - Authorization confirms the service requestor's credentials. It determines if the service requestor is entitled to perform that operation.

**2 Authentication** - Each entity involved in using a web service the requestor, the provider and the broker(if there is one) - is what it actually claims to be.

**3 Encryption** – conversion of the form of data from one form to another form.

**4 Biometric System** - involves unique aspect of a person's body such as Finger-prints, retinal patterns etc to establish his/her Identity.

100

**5 Firewall** - A system designed to prevent unauthorized access to or from a private network is called firewall. it can be implemented in both hardware and software or combination or both.

**There are several types of firewall techniques-**

* **Packet filter-** accepts or rejects of packets based on user defined rules.
* **Application gateway-** security mechanism to specific application like FTP and Telnet servers.
* **Circuit level gateway -** applies security mechanism when a connection is established.
* **Proxy Server -** Intercepts all messages entering and leaving the network.

**Cookies** - Cookies are messages that a web server transmits to a web browser so that the web server can keep track of the user's activity on a specific web site. Cookies have few parameters name, value, expiration date

**Hackers and crackers -**
Hackers are more interested in gaining knowledge about computer systems and possibly using this knowledge for playful pranks.
Crackers are the malicious programmers who break into secure systems.

**Cyber Law -**
It is a generic term, which refers to all the legal and regulatory aspects of internet and the World Wide Web.

## WEB SERVERS

**WWW (WORLD WIDE WEB)**
It is a small part of Internet. It is a kind of Application of internet.It is a set of protocols that allows us to access any document on the Net through a naming system based on URLS. Internet was mainly used for obtaining textual information. But post-WWW the internet popularity grew tremendously because of graphic intensive nature of www.

**Attributes of WWW**
(i) **User friendly**- www resources can be easily used with the help of browser.
(ii) **Multimedia documents**-A web page may have graphic, audio, video, and animation etc at a time.
(iii) **Hypertext and hyperlinks**-the dynamic links which can move towards another web page is hyperlink.
(iv) **Interactive** -www with its pages support and enable interactivity between users and servers.
(v) **frame**-display of more than one section on single web page.
**Web server**- It is a WWW server that responds to the requests made by web browers.
e.g. : Apache, IIS, PWS(Personal web server for Windows 98).
**Web browser**- It is a WWW client that navigates through the World Wide Web and displays web pages. E.g.: FireFox Navigator, Internet Explorer etc.
**Web sites**- A location on a net server where different web pages are linked together by dynamic links is called a web site. Each web site has a unique address called URL.
**Web page** - A document that can be viewed in a web browser and residing on a web site is a web page.
**Home page**- a web page that is the starting page and acts as an indexed page is home page.
**Web portal** - that facilitates various type of the functionality as web site. for e.g. www.yahoo.com,www.rediff.com
**Domain name**- An internet address which is a character based is called a Domain name. Some most common domains are com, edu, gov, mil, net, org, and co.Some domain names are location based also. For e.g. au for Australia, a for Canada, in for India etc.
**UR**L- A URL (uniform resource locator) that specifies the distinct address for each resource on the internet.e.g.http://encycle.msn.com/getinfo/stypes.asp
**Web hosting** - means hosting web server application on a computer system through which electronic content on the internet is readily available to any web browser client.
**HTML -**
It stands for Hyper Text Markup Language that facilitates to write web document that can be

101

interpreted by any web browser. It provide certain tags that are interpreted by the browser how to display and act with the text, graphics etc. tags are specified in <>.

For e.g.

<body bgcolor=green> it is opening tag

</body> it is closing tag.

body is the tag with bgcolor attributes.

## XML (eXtensible Markup Language)

XML is a markup language for documents containing structured information. Structured information contains both content (words, pictures etc.) and some indication of what role content plays.

**DHTML**- It stands for Dynamic Hyper Text Markup Language. DHTML refers to Web content that changes each time it is viewed. For example, the same URL could result in a different page depending on any number of parameters, such as:

 *geographic location

 *time of the day

 *previous pages viewed by the user

 *profile of the reader

**WEB SCRIPTING –** The process of creating and embedding scripts in a web page is known as web-scripting.

**SCRIPT:** A Script is a list of commands embedded in a web page. Scripts are interpreted and executed by a certain program or scripting –engine.

## Types of Scripts:

**1**. **Client Side Script:** Client side scripting enables interaction within a web page.

  Some popular client-side scripting languages are VBScript, JavaScript, PHP(Hyper Text Preprocessor).

**2. Server-Side Scripts:** Server-side scripting enables the completion or carrying out a task at the server-end and then sending the result to the client –end.

Some popula server-side Scripting Languages are PHP, Perl, ASP(Active Server Pages), JSP(Java Server Pages) etc.

## OPEN SOURCE TERMINOLOGIES
### TERMINOLOGY & DEFINITIONS:

■ **Free Software:** The S/W's is freely accessible and can be freely used changed improved copied and distributed by all and payments are needed to make for free S/W.

■ **Open Source Software:** S/w whose source code is available to the customer and it can be modified and redistributed without any limitation .OSS may come free of cost but nominal charges has to pay nominal charges (Support of S/W and development of S/W).

■ **FLOSS (Free Libre and Open Source Software) :** S/w which is free as well as open source S/W. ( Free S/W + Open Source S/W).

■ **GNU (G**NU's **N**ot **U**nix**) :** GNU project emphasize on the freedom and its objective is to create a system compatible to UNIX but not identical with it.

■ **FSF (Free Software Foundation) :** FSF is a non –profit organization created for the purpose of the free s/w movement. Organization funded many s/w developers to write free software.

■ **OSI (Open Source Initiative)** : Open source software organization dedicated to cause of promoting open source software it specified the criteria of OSS and its source code is not freely available.

■ **W3C(World Wide Web Consortium)** : W3C is responsible for producing the software standards for World Wide Web.

■ **Proprietary Software:** Proprietary Software is the s/w that is neither open nor freely available, normally the source code of the Proprietary Software is not available but further distribution and modification is possible by special permission by the supplier.

■ **Freeware:** Freeware are the software freely available , which permit redistribution but not modification (and their source code is not available). Freeware is distributed in *Binary Form* (ready to run) without any licensing fees.

■ **Shareware:** Software for which license fee is payable after some time limit, its source code is not available and modification to the software are not allowed.

102

■ **Localization:** localization refers to the adaptation of language, content and design to reflect local cultural sensitivities .e.g. Software Localization: where messages that a program presents to the user need to be translated into various languages.

■ **Internationalization:** Opposite of localization.

### OPEN SOURCE / FREE SOFTWARE

■ **Linux :** Linux is a famous computer operating system . popular Linux server set of program –LAMP(Linux, Apache, MySQL, PHP)

■ **Mozilla :** Mozilla is a free internet software that includes
  - a web browser
  - an email client
  - an HTML editor
  - IRC client

■ **Apache server:** Apache web server is an open source web server available for many platforms such as BSD, Linux, and Microsoft Windows etc.
  - Apache Web server is maintained by open community of developers of Apache software foundation.

■ **MYSQL :** MYSQL is one of the most popular open source database system. Features of MYSQl :
  - Multithreading
  - Multi –User
  - SQl Relational Database Server
  - Works in many different platform

■ **PostgreSQL :** Postgres SQL is a free software object relational database server . PostgresSQL can be downloaded from www.postgressql.org.

■ **Pango :** Pango project is to provide an open source framework for the layout and rendering of internationalized text into GTK + GNOME environment.Pango using Unicode for all of its encoding ,and will eventually support output in all the worlds major languages.

■ **OpenOffice :** OpenOffice is an office applications suite. It is intended to compatible and directly complete with Microsoft office.
  OOo Version 1.1 includes:
  - Writer (word processor)
  - Calc(spreadsheet)
  - Draw(graphics program)
  - etc

■ **Tomcat :** Tomcat functions as a servlet  container. Tomcat implements the servlet and the JavaServer Pages .Tomcat comes with the jasper compiler that complies JSPs into servlets.

■ **PHP(Hypertext Preprocessor) :** PHP is a widely used open source programming language for server side application and developing web content.

■ **Python: Python** is an interactive programming language originally as scripting language for Amoeba OS capable of making system calls.

### 1or 2 Marks Questions

**1.** Explain function of hub and router.
**Ans:**
 **Hub:** A hub contains multiple ports. When a packet arrives at one port, it is copied to     all the ports of the hub. When the packets are copied, the destination address in the frame does not change to a broadcast address. It does this in a rudimentary way, it simply copies the data to all of the Nodes connected to the hub.
2. **Router :** routers are networking devices that forward data packets between networks using headers and forwarding tables to determine the best path to forward the packets

2. Expand the following terms
   (i) URL (ii) ISP (iii) DHTML (iv) CDMA:
**Ans;**   (i) URL: Unified Resource Locator
     (ii) ISP: Internet Service Provider.

103

(iii) DHTML: Dynamic Hyper Text Markup Language

3. Differentiate between message switching and packet switching
**Ans:** Message Switching – In this form of switching no physical copper path is established in advance between sender and receiver. Instead when the sender has a block of data to be sent, it is stored in first switching office, then forwarded later. Packet Switching – With message switching there is no limit on block size, in contrast packet switching places a tight upper limit on block size.

4. Write two applications of Cyber Law.
**Ans:** Two applications of cyber law are Digital Transaction and Activities on Internet.

5. Explain GSM.
**Ans**: Global system for mobile, communications is a technology that uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency. TDMA is short for Time Division Multiple Access. TDMA technology uses time division multiplexing and divides a radio frequency into time slots and then allocates these slots to multiple calls thereby supporting multiple, simultaneous data channels.

6. Write difference between coaxial and optical cable.
**Ans**: Coaxial cable consists of a solid wire core surrounded by one or more foil or wire shield , each separated by some kind of plastic insulator. Optical fibers consists of thin strands of glass or glass like material which are so constructed that they carry light from a source at one end of the fiber to a detector at the other end.

7. Write two advantage and disadvantage of **RING** topology.
   **Ans:**
**Advantages:**
1. Short cable length.
2. No wiring closet space required.
**Disadvantages:**
1. Node failure causes network failure
2. difficult to diagnose faults

8. Define Open Source Software, Free Software, Freeware, and Shareware**.**
**Ans**:
**Free Software :** The S/W's is freely accessible and can be freely used changed improved copied and distributed by all and payments are needed to made for free S/W.
**Open Source Software :** S/w whose source code is available to the customer and it can be modified and redistributed without any limitation .OSS may come free of cost but nominal charges has to pay nominal charges (Support of S/W and development of S/W).
**Freeware:** Freeware are the software freely available , which permit redistribution but not modification (and their source code is not available). Freeware is distributed in *Binary Form* (ready to run) without any licensing fees.
**Shareware:** Software for which license fee is payable after some time limit, its source code is not available and modification to the software are not allowed.

8. What is the difference between WAN and MAN?
Ans: MAN (Metropolitan Area Network) is the network spread over a city.
    WAN (Wide Area Network) spread across countries.

10. What is the purpose of using FTP?
Ans: (i)To promote sharing of files (computer programs and/or data).
    (ii)To encourage indirect or implicit use of remote computers

11. What is a Modem?

104

Ans: A modem is a computer peripheral that allows you to connect and communicate with other computers via telephone lines.

12. How is a Hacker different from a Cracker?
Ans: Hackers are more interested in gaining knowledge about computer systems and possibly using this knowledge for playful pranks.
Crackers are the malicious programmers who break into secure systems

13. Expand the following terms with respect to Networking:
(i) Modem (ii) WLL (iii) TCP/IP (iv) FTP
Ans: (i) Modem : Modulator/Demodulator
    (ii) WLL: Wireless in Local Loop
    (iii) TCP/IP: Transmission Control Protocol/Internet Protocol
        iv) FTP: File Transfer Protocol

14. What are Protocols?
Ans: A protocol means the rules that are applicable for a network.
    It defines the standardized format for data packets, techniques for detecting and   correcting errors and so on.
    A protocol is a formal description of message formats and the rules that two or more machines must follow to exchange those messages.
    E.g. using library books.

    Types of protocols are:
    1.  HTTP
    1.  FTP
    2.  TCP/IP
    3.  SLIP/PPP

15. What is the difference between Repeater and a Bridge?                    1
Ans: A Repeater is a network device that amplifies and restores signals for long distance transmission where as a Bridge is a network device that established an intelligent connection between two local networks with the same standard but with different types of cables.

## HOTS (HIGHER ORDER THINKING SKILLS)
**4 Marks Questions**
**1.** Knowledge Supplement Organization has set up its new centre at Mangalore for its  office and web based activities. It has four building as shown in the diagram below                    4
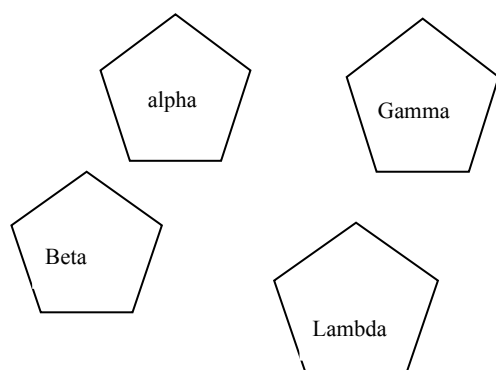
Centre to Centre distance between various buildings

| Alpha | 25 | |
|---|---|---|
| Alpha to Beta | 50 | 50m |
| Beta | | |
| Beta to gamma | 125 | 150m |
| Gamma | | |
| Gamma to Lambda | 10 | 25m |
| Lambda | | |
| Alpha to Lambda | | 170m |
| Beta to Lambda | | 125m |

105

| Alpha to Gamma | 90m |
|---|---|

(a) Suggesting a cable layout of connection between building state with justification where Server, Repeater and hub will be placed.                                    2

(b)  The organization is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed?

**Ans:** (i)The most suitable place to house the server of this organization would be building Gamma , as this building contains the maximum number of computers , thus decreasing the cabling cost for most of the computers as well as increasing the efficiency of the maximum computers in the network Distance between alpha to gamma and beta to gamma is large so there repeater will require and hub is necessary for all premises because it is used in local networking.
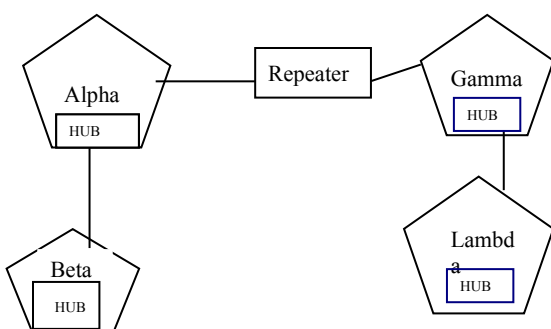


(ii) The most economic way to connect it with a reasonable high speed would be to use radio wave transmission, as they are easy to install, can travel long distances, and penetrate buildings easily, so they are widely used for communication, both indoors and outdoors. Radio waves also have the advantage of being omni directional, which is they can travel in all the directions from the source, so that the transmitter and receiver do not have to be carefully aligned physically.

**2.** Software Development Company has set up its new center at Jaipur for its office and web based activities. It has 4 blocks of buildings as shown in the diagram below:



Center to center distances between various blocks

| Black A to Block B | 50 m |
|---|---|
| Block B to Block C | 150 m |
| Block C to Block D | 25 m |
| Block A to Block D | 170 m |
| Block B to Block D | 125 m |
| Block A to Block C | 90 m |

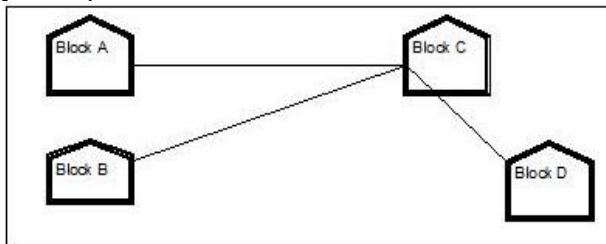Number of Computers

106

| Black A | 25 |
| Block B | 50 |
| Block C | 125 |
| Block D | 10 |

e1) Suggest a cable layout of connections between the blocks.

e2) Suggest the most suitable place (i.e. block) to house the server of this company with a suitable reason.

e3) Suggest the placement of the following devices with justification
  (i) Repeater
  (ii) Hub/Switch

e4) the company is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed?
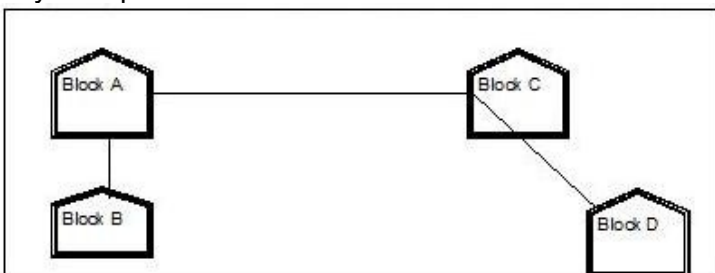
**Ans:**

**(e1)** (Any of the following option)

Layout Option 1



Layout Option 2



**(e2)** The most suitable place / block to house the server of this organization would be Block C, as this block contains the maximum number of computers, thus decreasing the cabling cost for most of the computers as well as increasing the efficiency of the maximum computers in the network.

**(e3)**

(i) For Layout 1, since the cabling distance between Blocks A and C, and that between B and C are quite large, so a repeater each would ideally be needed along their path to avoid loss of signals during the course of data flow in these routes.
For layout 2, since the distance between Blocks A and C is large so a repeater would ideally be placed in between this path.
(ii) In both the layouts, a hub/switch each would be needed in all the blocks, to Interconnect the group of cables from the different computers in each block.

**(e4)** The most economic way to connect it with a reasonable high speed would be to use radio wave transmission, as they are easy to install, can travel long distances, and penetrate buildings easily, so they are widely used for communication, both indoors and outdoors. Radio waves also have the advantage of being omni directional, which is they can travel in all the directions from the source, so that the transmitter and receiver do not have to be carefully aligned physically.

3. Ram Goods Ltd. has following four buildings in Ahmedabad city.
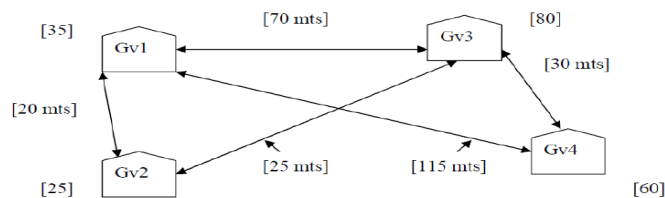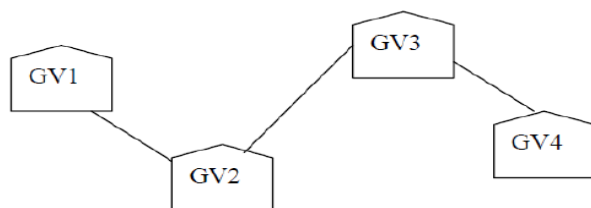
[ ]  — Shows computers in each building

⟶  -   Shows distance

Computers in each building are networked but buildings are not networked so far. The company has now decided to connect building also.

(a) Suggest a cable layout for these buildings.

(b) In each of the buildings, the management wants that each LAN segment gets a dedicated bandwidth i.e. bandwidth must not be shared. How can this be achieved?

(c) The company also wants to make available shared Internet access for each of the buildings. How can this be achieved?

(d) The company wants to link its head office in GV1 building to its another office in Japan.

(i) Which type of transmission medium is appropriate for such a    link?

(ii) What type of network would this connection result into?

**Ans:**

(a) Total cable length required for this layout = 75 mts



(b)  To give dedicated bandwidth, the computers in each building should be connected via switches as switches offer dedicated bandwidths.

(c)  By installing routers in each building, shared internet access can be made Possible.

(d)  (i) Satellite as it can connect offices across globe.

(ii) WAN (Wide Area Network)

108