Computer Networking

Computer network:

A computer network is a collection of interconnected computers and other devices which are able to communicate with each other and share hardware and software resources.

Advantages are:

1. Resource Sharing
2. Cost saving
3. Collaborative user interaction
4. Time saving
5. Increased storage

Transmission Media

A transmission medium is a medium of data transfer over a network. It can be wired or wireless.

Wired Media-

A number of various types of cables are used to transfer data over computer networks. These are Twisted Pair Cable, Co-axial Cable, and Optical Fiber Cable.

Wireless Media:

Electromagnetic waves are used for wireless communication over computer networks. Frequencies of waves are measured in Hertz (Hz). As the frequencies of electromagnetic waves change, their properties also change. Based on their frequencies, electromagnetic waves are categorized into various categories.

Network Security

Computer networks are communication highways on which the data travels. Data traveling over a network is vulnerable to attacks and thefts.

Network Security:-

- Login Password
- Firewall:
- Anti Virus Software:
- File Permissions:

Types of Network:

A computer On the basis of area covered computer networks are classified as:

1. PAN - Personal Area Network
2. LAN - Local Area Network
3. MAN - Metropolitan Area Network
4. WAN -Wide Area Network

Network Devices

Server *A server is a computer program or device that provides a service to another devices program and its user called "clients".*

*A **Node** is a device, which is directly connected to a computer network. It can be a computer or any other device like printer, scanner etc.*

*A **Switch** is an intelligent device that connects several nodes to form a network and redirects the received information only to the intended node(s).*

*A **Hub** is an electronic device that connects several nodes to form a network and redirects the received information to all the connected nodes in broadcast mode.*

*A **Repeater** is a device that is used to regenerate a signal which is on its way through a communication channel. A repeater regenerates the received signal and re-transmits it to its destination.*

***Bridge**:* Bridges *are used to connect two subnetworks that use interchangeable protocols. It combines two LANs to form an extended LAN.*

***Router**: A router is a device that connects two or more packet-switched networks or subnetworks.*

*A **Gateway** is a device, which is used to connect different types of networks and perform the necessary translation so that the connected networks can communicate properly.*

*An **NIC** (Network Interface Card) is a device that enables a computer to connect to a network and communicate.*

***A MAC (Media Access Control)** address is a unique 12 digit (6 digits for manufacturer code and 6 digits for serial number) hexadecimal number assigned to each NIC. MAC address of an NIC never changes.*

MAC addresses are usually written in one of the following two formats:

MM:MM:MM:SS:SS:SS

*An **IP (Internet Protocol)** address is a unique 4 digit hexadecimal number assigned to each node on a network. IP address settings of a node can be changed by the user.*

Network Topologies

*A **Topology** is an arrangement of physical connections among nodes in a network.*

Bus Topology:

In bus topology all the nodes are connected to a main cable called backbone. A small device called terminator is attached at each end of the backbone.

Characteristics of Bus topology:

- It is easy to install.
- It requires less cable length and hence it is cost effective.
- In case of cable (backbone) or terminator fault, the entire network breaks down.
- Fault diagnosis is difficult.
- At a time only one node can transmit data.

Star Topology:

In star topology each node is directly connected to a hub/switch. If any node has to send some information to any other node, it sends the signal to the hub/switch.

Characteristics of Star topology:

- It is more efficient topology as compared to bus topology.
- It is easy to install
- It is easy to diagnose the fault in Star topology.
- It is easy to expand depending on the specifications of central hub/switch
- It requires more cable length as compared to bus topology.

Tree Topology:

Tree topology is a combination of bus and star topologies. It is used to combine multiple star topology networks. All the stars are connected together like a bus.

Network Protocols

A **network protocol** is a set of rules for communication among networked devices. Protocols generally includes rules of how and when a device can send or receive the data, how is the sent data packaged, and how it reaches its destination. There are a number of protocols defined for computer networks. Here we discuss three of them - HTTP, TCP/IP, PPP.

HTTP (Hyper Text Transfer Protocol):

TCP/IP (Transmission Control Protocol / Internet Protocol):

PPP (Point to Point Protocol):

SMTP Simple Mail Transfer Protocol (SMTP)? SMTP is used to send and receive email.

FTP **File Transfer Protocol**" and refers to a group of rules that govern how computers transfer files from one system to another over the internet.

Domain Name:

So, whenever we have to communicate with a computer on internet, we can do so by using its IP address. But it is practically impossible for a person to remember the IP addresses of all the computers one may have to communicate with. Therefore, a system has been developed which assigns names to some computers (web servers) and maintains a database of these names and corresponding IP addresses. These names are called Domain Names. Examples of some domain names are cbse.nic.in, sikkimipr.org, indianrailway.gov.in etc. Domain names are used in URLs to identify particular Web servers. For example, in the URL *http://www.cbse.nic.in/welcome.htm*, the domain name is *www.cbse.nic.in*.

these are divided into two categories: Generic Domain Names and Country-Specific Domain Names. For example: ·**com** - commercial business ·**edu** - Educational institutions

Country Specific Domain Names:

.in – India ·**au** – Australia ·**ca** – Canada **.ch** – China

DNS: Domain Name Resolution *is the process of getting corresponding IP address from a domain name.*

URL - Uniform Resource Locator*. A URL is nothing more than the address of a given unique resource on the Web. In theory, each valid URL points to a unique resource.WWW and its* applications.

Web*: The Web is the common name for the World Wide Web, a subset of the Internet consisting of the pages that can be accessed by a Web browser.*

Email :- Electronic mail*, messages transmitted and received by electronic media through a network.*

Chat : *refer to any kind of communication over the Internet that offers a real-time transmission of text messages from sender to receiver.*

VoIP: *Voice over Internet Protocol that describes the method to place and receive phone calls over the internet.*

Website*: a set of related web pages located under a single domain name, typically produced by a single person or organization.*

Difference between a website and webpage:

The webpage is a single document on the web using a unique URL, while a website is a collection of multiple webpages in which information on a related topic or another subject is linked together under the same domain address.

static vs dynamic web page

A static website is one with stable content, where every user sees the exact same thing on each individual page. On the other hand, a dynamic website is one where content is pulled on-the-fly, allowing its content to change with the user

Web server and hosting of a website:

A web hosting service is a type of Internet hosting service that hosts websites for clients, i.e. it offers the facilities required for them to create and maintain a site and makes it accessible on the World Wide Web. Companies providing web hosting services are sometimes called web hosts

Web Browsers: is *application software for accessing the World Wide Web or a local website.*
Commonly used browsers:- *Google Chrome, Apple's Safari, Microsoft Edge, and Firefox*

Browser settings: Every Internet browser has settings you can change, including privacy options, security settings, search engine preferences, autofill and autocomplete behavior, and more.

Add-ons and plug-ins: A plug-in, which can also be called an add-on or an extension, is third-party software that adds new functions to a host program on a computer, without altering the host program. Basically, they allow you to add new components to a host program or extend its capabilities beyond its original design.

Cookies: Cookies are small pieces of text sent to your browser by a website you visit. They help that website remember information about your visit, which can both make it easier to visit the site again and make the site more useful to you.