Computer Networks

What is a computer Network?

- A computer network refers to a group of computing devices linked together to share data and resources.
- The main aim of computer networks is to facilitate communication between the interconnected devices.
  - Examples of shared resources are printers and file servers.
- A Network has any of the following Components Interconnected:
  - personal computers, mobile phones, electronic gadgets, smart Television, printer, Switches, etc.
  - In networking all these interconnected devices are known as nodes

Cont.

- This image shows how a computer network looks like

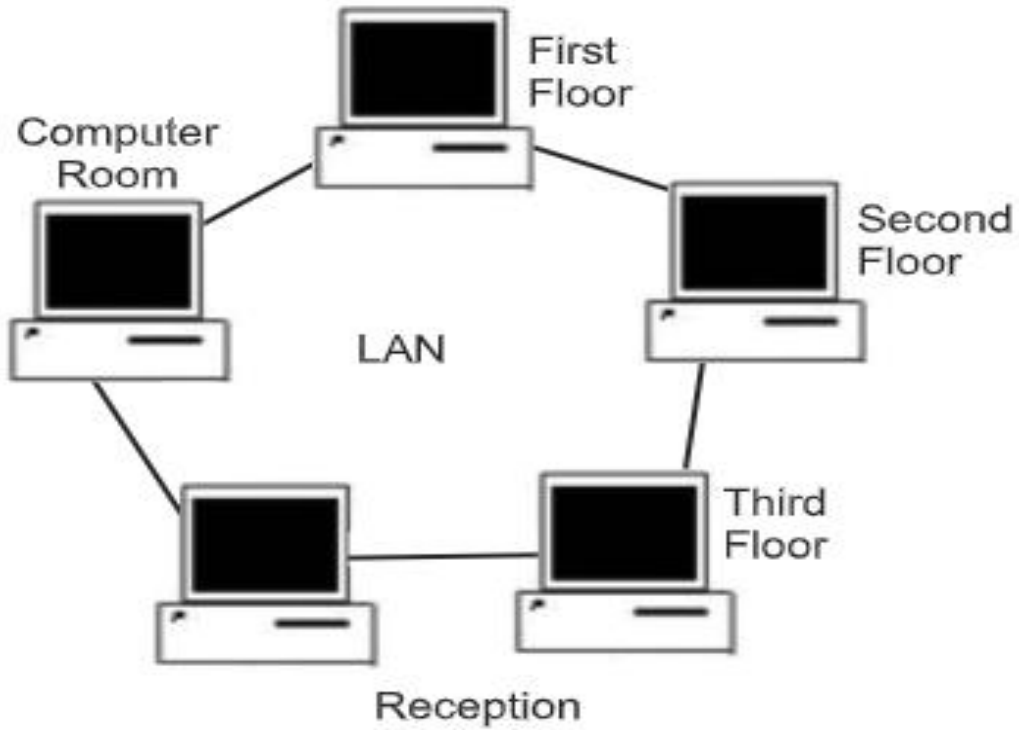
Types of Computer Networks

- We can classify networks according to how geographically dispersed network components are.
- This results to the following Network classifications.
  - Local Area network (LAN)
  - Wide Area Network (WAN)
  - Metropolitan Area Network (MAN)
  - Personal Area Network (PAN)
  - Campus Area Network (CAN)

Local Area Network (LAN)

- Refers to a computer network which spans a fairly small space.
  - Oftentimes, the LAN is restricted to one room, building or cluster of buildings, though, one LAN may be attached to other LANs across any distance through phone networks and radio waves.
- Majority of LANs are connected to workstations and PCs.
- Every node (single computer) in a LAN is also capable of accessing and implementing data anywhere across the LAN.
  - It means that most users are able to share otherwise costly devices, such as data and laser printers.
  - Additionally, they might use LAN to network with each other through sending emails or participating in chat sessions.

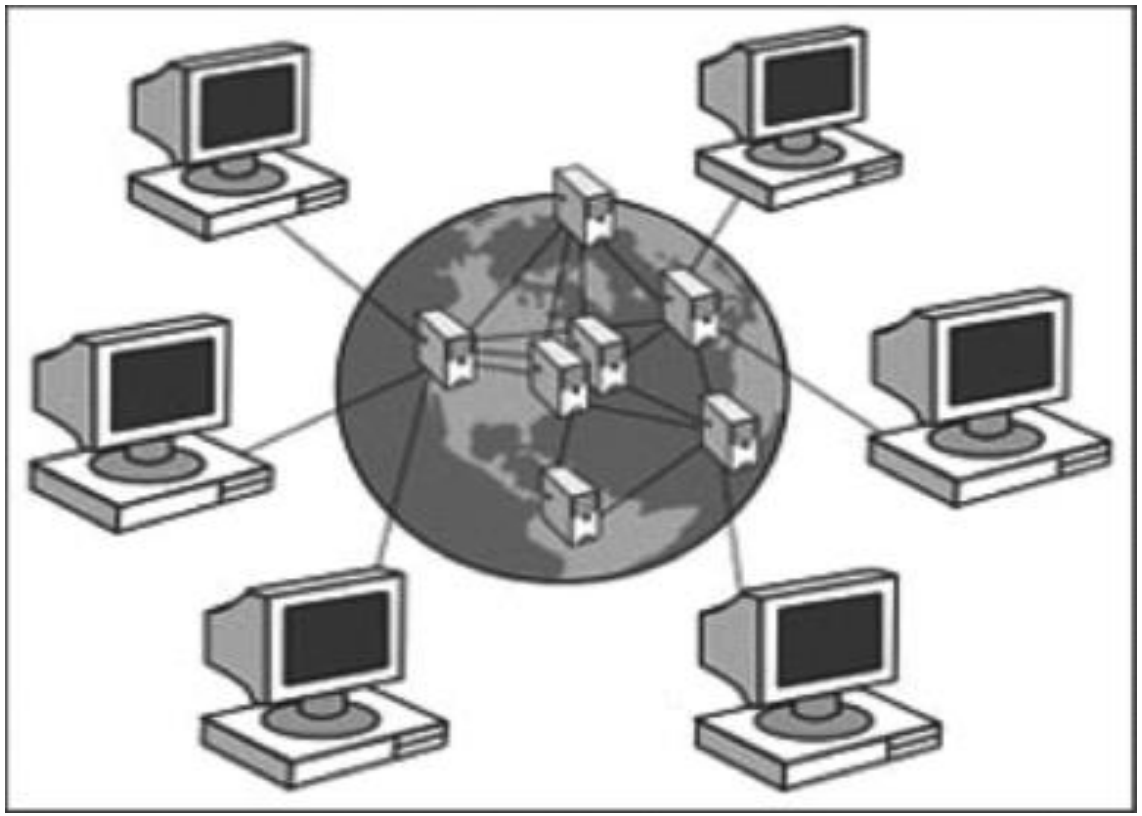
Sample LAN Network



Wide Area Network (WAN)

- Interconnects network components that are Geographically separated.
  - For example, a Corporate Headquarters might have multiple WAN connections to remote office sites.
- It covers a wide geographical area comprising a region, a country, a continent, or even the whole world.
- WAN includes the technologies to transmit multi-media information over long distance and among different LANs and MANs.

Sample Diagrammatic Representation of WAN



The Distinguishing features of WAN are;

- WANs have a large capacity, connecting a large number of computers over a large area, and are inherently scalable.
- They facilitate the sharing of regional resources.
- They provide uplinks for connecting LANs and MANs to the Internet.
- Communication links are provided by public carriers like telephone networks, network providers, cable systems, satellites etc.
- Typically, they have low data transfer rate and high propagation delay, i.e. They have low communication speed.
- They generally have a higher bit error rate.

- Examples
  - The internet

Personal Area Network (PAN)

- A personal area network, also known as PAN, is created when several computers or mobile phones network with each other wirelessly across a short expanse, normally less than around 30-feet.
- Typically, these networks are wireless and consists of data transmission between portable devices or to a central server being the network that permits additional linking to the Web.
- Physical cables such as Universal Serial Bus (USB) are also used in PAN. Advances in the field of PANs are mainly managed through the IEEE 802.15 operations group.

Sample PAN

- The diagram below shows a sample PAN

Characteristics of a Personal Area Network

- It is mostly a personal device's network equipped within a small area.
- It allows you to deal with information devices interconnected with a single user environment.
- PAN includes mobile phones, tablets, and laptops.
- It is possible to connect wirelessly to the Internet called WPAN.
- Devices used for PAN: wireless mice, keyboards, and Bluetooth systems
- Short-range communication
- It requires very low power
- Low cost

Metropolitan Area Network

- A metropolitan area network (MAN) is a large computer network that usually spans a city or a large campus.
- A MAN Network is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities.
- MAN, Networks are formed by connecting multiple LANs.
  - Thus, MAN Networks are larger than LANs but smaller than wide-area networks (WAN).
- The purpose of MAN (Metropolitan Area Network) is to provide the link to the internet in the long run.
  - MAN Network provides Internet connectivity for LANs in a metropolitan region, and connect them to wider area networks like the Internet. ” **It can also be used in cable television.**

Characteristics of MAN

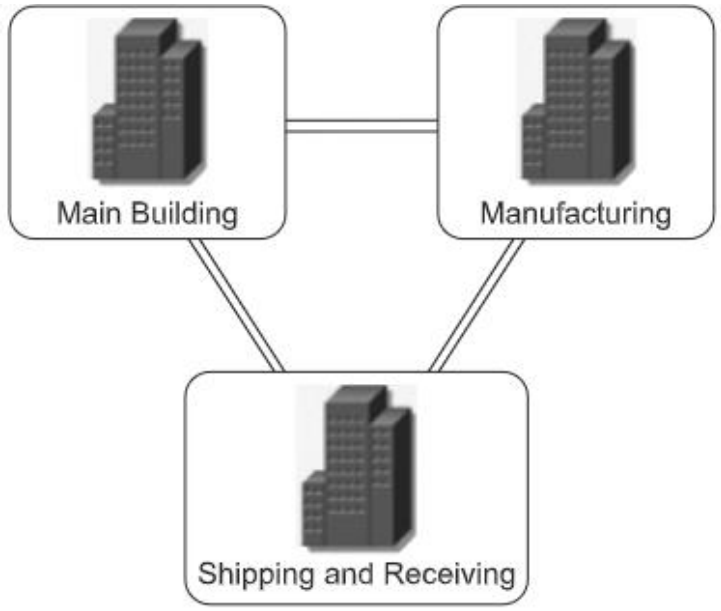
- Network size generally ranges from 5 to 50 km. It may be as large as covering the whole city.
- In general, a MAN is either owned by a user group or by a network provider who sells service to users, rather than a single organization as in LAN.
- Data rates are moderate to high.
- It facilitates the sharing of regional resources.
- They provide uplinks for connecting LANs to WANs and the Internet.

Examples of areas where MAN is used

- Digital cable television
- Used in government agencies
- University campuses
- Used to connect several branches of the local school
- In hospital (for communication between doctors, research offices, labs)
- A network of fire stations
- In airports
- Networking between community colleges within the country

Example of MAN

- Think of a manufacturing company that has its Factory in Ruiru, its office headquarters in Westlands, and its shipping and receiving center in Embakasi. The network of such a company that interconnects all these sites is known as MAN.

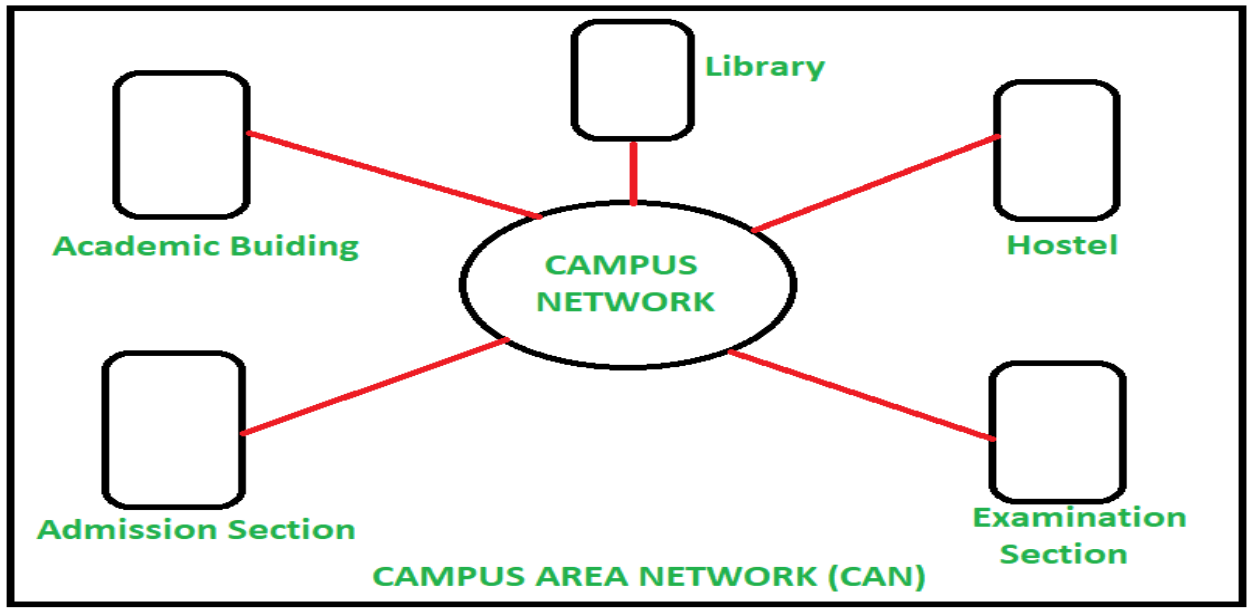


Campus Area Network (CAN)

- It is a group of interconnected LANs within a limited geographical area:
  - like school campus, university campus, military bases, or organizational campuses and corporate buildings etc.
- A Campus Area Network is larger than Local Area Network but smaller than Metropolitan Area Network (MAN) and Wide Area Network (WAN).
- Sometimes this network is also referred as Residential Network or ResNet as it is only used by residents of specific campus only.

Cont.

- Campus Area Network covers areas of around 1 to 5 km range and it can be both wired or wireless connectivity.



Computer Networks and The Internet

- The internet is actually a network of networks that connects billions of digital devices worldwide.
- Standard protocols allow communication between these devices.
- Those protocols include hypertext transfer protocol (the ‘http’ in front of all website addresses).
- Internet protocol (or IP addresses) are the unique identifying numbers required of every device that accesses the internet.
- IP addresses are comparable to your mailing address, providing unique location information so that information can be delivered correctly.

Cont.

- Internet Service Providers (ISPs) and Network Service Providers (NSPs) provide the infrastructure that allows the transmission of packets of data or information over the internet.
- Every bit of information sent over the internet doesn’t go to every device connected to the internet.
- It’s the combination of protocols and infrastructure that tells information exactly where to go.
- The linkage between computers is possible through cabling, most importantly the Ethernet cable, and or WiFi (wireless).

Cont.

- This diagram shows the internet technology

Electronic Mail (E-Mail)

- **Electronic Mail** (e-mail) is one of most widely used services of Internet.
- This service allows an Internet user to send a **message in formatted manner (mail)** to the other Internet user in any part of world.
- Message in mail not only contain text, but it also contains images, audio and videos data.
- The person who is sending mail is called **sender** and person who receives mail is called **recipient**.
- It is just like postal mail service.
- **Components of E-Mail System :** The basic components of an email system are : User Agent (UA), Message Transfer Agent (MTA), Mail Box, and Spool file.

Cont.

- **User Agent (UA) :** The UA is normally a program which is used to send and receive mail. Sometimes, it is called as mail reader.
  - It accepts variety of commands for composing, receiving and replying to messages as well as for manipulation of the mailboxes.
- **Message Transfer Agent (MTA) :** MTA is actually responsible for transfer of mail from one system to another. Example of MTA is Gmail
- **Spool file :** This file contains mails that are to be sent. User agent appends outgoing mails in this file using SMTP. MTA extracts pending mail from spool file for their delivery.

Parts of an Email

- **The recipient address:** This is the top most part of an email message, it allows the sender to input the email address of the intended recipient.
  - In this section, the sender can also send copies of the message to other people by clicking CC and then adding the email address of the recipients who are intended to get a copy.
- **The subject:** Here the sender indicates the subject/ the heading of the email. It should be brief and representative of the email message.
  - It should not be more than one line.
  - For Example, if you are writing an email to submit an assignment for this unit, then your subject should be; “Digital Literacy Assignment Submission”
- **The body:** This is where you type the message that you want to send.
- **Attachment:** This is where you attach relevant materials such as images, videos, audios, that are aimed at supplementing the message in the body.

Example of Email Service providers

- Google- Gmail
- Microsoft- outlook
- Yahoo- yahoo
- Customized corporate emails- this is where organizations partner with MTA's such as Gmail and they have a mail component embedded in their website. For example: info@mut.ac.ke note that mut.ac.ke is the university website so this helps in official communications within and outside the organization.

The End

Thank YOU