Unit 4 Computer Networks

1. What is a network

A network is a system that sends and receives data and messages enabling two or more computers to communicate with each other

Networks typically allow computers to share files, share printers and send messages to each other

The typical hardware devices that from part of a network are:

- Personal computers used as terminals
- One or more central processing units acting as dedicated file servers or print servers
- Disk drives
- Scanners
- Printers

2. Types of network

There are two types of network:

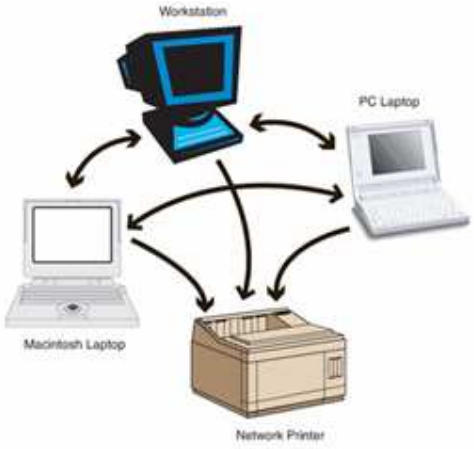
LAN – Local Area Network

A network contained within one building or site called a Local Area Network (LAN).

WAN – Wide Area Network

A network that spans several sites across a city, country or even the world is called Wide Area Network (WAN).

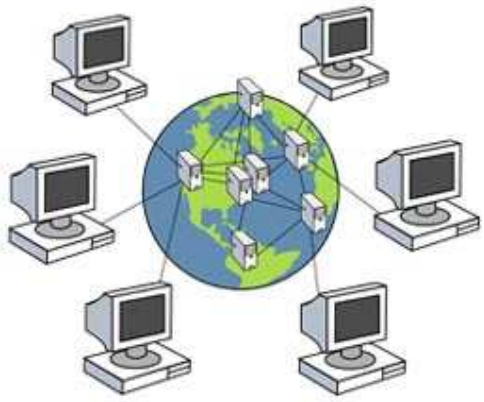
a) Local Area Network (LAN)



A LAN is a Local Area Network covering a small area such as one building e.g. in a scholl or college.

Within a LAN, computers and other hardware devices are connected to the file server. This allows the computers to share resources.

b) Wide Area Network (WAN)



A WAN is a Wide Area Network covering a large geographical area. A wide area network is not confined to one building. The hardware that forms part of the network can spread around the world.

Within a WAN, many terminals are connected to the host computers. This allows networks to cover a large geographical area.

The Internet is a WAN. It is most famous and widely used Wide Area Network which contains many thousands of servers and many millions of clients right across the world. Example: a network of banks cash dispensers is a WAN.

LANs are often connected to WANs, for example a school network could be connected to the Internet. Telephone lines are often used to connect WANs. LANs used dedicated cables or wireless technology.

c) Wireless Local Area Network (WLAN)

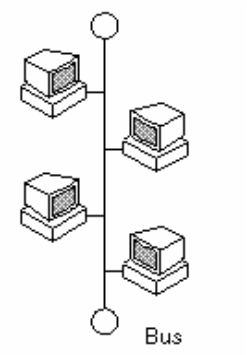
LAN stands for Local Area Network, so a wireless LAN (WLAN) is simply a network linking two or more computers without wires (cables)

In many offices today, computers communicate with each other and with printers and other devices by sending information along wires. Using newer technology, computers can be linked by the same method as your cordless telephone operates in your home – by transmitting the signal through air. Just as your cordless telephone frees you to make a phone call from anywhere in your home, the wireless LAN permits workers to use their computers anywhere in the network area.

3. Network Topology

There are 3 main network topologies, called bus (line), ring and star.

a) Bus (line) topology



In a bus network, the computers are connected in a line.

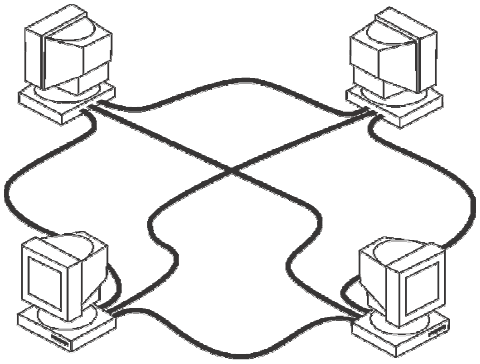
Advantages:

- Easy and cheapest to install and extend (least amount of cable required)
- Well suited for temporary networks (quick to setup)
- Simpler than a ring topology to troubleshoot if there a cable failure

Disadvantages:

- Unreliable because if the main cable fails, a number of computers beyond the failure will be affected
- Performance of the network slows down with more users or heavy network traffic
- Limited cable length and number stations
- Low security (all computers on the bus can see all data transmissions)

b) Ring topology



A ring network is a bus network with two ends joined up

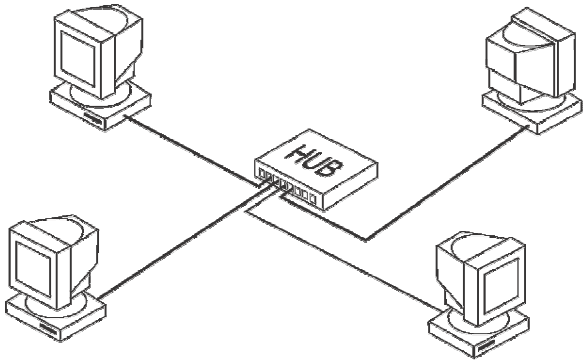
Advantages:

- A ring network provides the fastest form of local area networking because the data only flows in one direction so there are no collisions with data having to be re-sent
- Adding additional devices has very little impact on data transfer speed
- Relatively cheap to install and expand

Disadvantages:

- The least reliable topology as there is total dependence upon the one cable. If it fails, all the workstations will be affected
- The hardest topology to troubleshoot if there is a cable failure
- Because all stations are wired together, to add a station you must shut down all the network temporarily
- In order for all computers to communicate with each other, all the computers must be turned on

c) Star topology



In a star network all the computers are connected separately to the hub or server

Advantages:

- The most reliable because cable failure does not affect other users
- Good performance because there is a direct path from the central controller to each terminal
- Easy to set up and expand

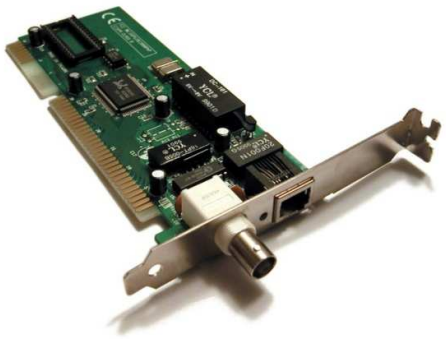
Disadvantages:

- Uses a lot of cable which is expensive to install
- Extra hardware required such as hubs and/or switches
- As the central machine controls the whole system, the whole system will be affected if it breaks down

5. Formation of a network

A network is not just a number of computers connected by cables. The components found in a typical network are:

a) **Network software**
   This may be part of the Operating Software or it can be software designed specifically to manage a network
b) **Cables**
   Connecting cables are usually used to connect devices on a network, although some networks make use of radio and microwaves to provide the link. Cables vary in performance and cost.
c) **Connectors**
   Connectors are used to connect network cables to terminal or others
d) **Network cards**
   If a personal computer is to be used as a terminal in a network a device called a network card must be build into it.



The network card looks like a small circuit board and slots into one of the connectors on the main circuit board (called the motherboard) inside the computer. Network cards have connectors on them from the network cables.

6. Internet

The Internet has been described as “a network of networks”. It started in 1969 in the USA to link up centres in the event of nuclear attack. Gradually more networks joined connecting commercial, government and educational networks.

To access the Internet a user needs:

- A modem
- Software (web browser/e-mail package)
- Internet Software Provider (ISP)

a) Advantages

1. Information is contributed by several millions of people all over the world
2. Addition of data and updating of data is rapid and allowing the data to reach a huge audience
3. Can be used for online shopping and e-commerce

b) Disadvantages

1. Redundant information makes it more difficult to find what we want
2. Much of the information is misleading or has not been checked for accuracy
3. It is not regulated, therefore offensive and illegal material exists
4. Security is important (hackers)

c) Routers

A user connects networks and forwards data from one network to another. A Wi-Fi router connects a cable LAN to a wireless network. It communicates with Wi-Fi devices close by.

d) Hubs and Switches

Hubs and switches connect devices together in a LAN segment. The hub broadcasts messages from one device to the others. A switch increases the amount of material passing through the system and passes messages from one device to another.

e) Bridges

Bridges connect two different LAN segments. The bridge remembers the address of the devices in each segment. It passes messages from one segment to the other. For example, if there was a LAN segment in two different buildings, the bridge transfers the messages from one building to the other.

f) Wi-Fi

Wi-Fi is used in a wireless LAN. It allows the wireless exchange of data over a distance of 10 to 20 metres and at a data transfer rate of 50 to 450 Mbps (megabits per second). It is useful for laptops, game consoles, televisions, printers and digital cameras.

g) Bluetooth

Bluetooth is used for wireless connections over a short distance, e.g. only a few metres. It does not use much power, and the rate of data transfer is low (between one and tree Mbps). It

is typically used to connect battery-powered devices, e.g. ear-pieces, mobile phones or MP3 players, with computers.

h) Proxy servers

Proxy servers are most frequently used on the Internet to improve the performance of Web services to multiple clients. For example, in a school or large office, all client browsers can be connected to a proxy server. The proxy server requests pages from the desired Web sites and returns them to the client. However, it remembers or caches these pages so that if a different client requests the same page, it will be returns immediately from its cache rather than requesting it again from the original Web site.