

# Networks

A *network* is a combination of hardware and software that allows computers to exchange data and share software and devices, such as printers. Networks are widely used by businesses, universities, and other organizations because a network:

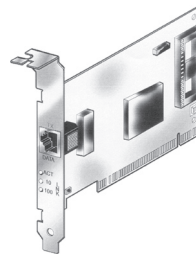
- allows users to reliably share and exchange data
- can reduce costs by sharing devices such as printers
- offers security options including password protection to restrict access to certain files
- simplifies file management through centralized software updates and file backups
- provides e-mail for network users

## ***MAN and HAN***

A MAN (Metropolitan Area Network) and a HAN (Home Area Network) are network technologies classified by the size of a network. A MAN is a high-speed network that typically connects LANs within a city or town. A HAN is used to connect personal devices within the home.

Networks are classified by their size, architecture, and topology. A common size classification is LAN (Local-Area Network), which is a network used to connect devices within a small area such as a building or a campus. A WAN (Wide-Area Network) is used to connect devices over large geographical distances. A WAN can be one widespread network or it can be a number of LANs linked together.

The computers and other devices in a LAN each contain an expansion card called a *network interface card*:



A cable plugs into the adapter card to connect one device to another to form a LAN. Cables are not required for network cards that have wireless capabilities. Network interface cards are available for desktop and mobile computers and take various other forms including an adapter card, a PC card, or a Flash memory card.

## ***Transmission Media***

Computers must be connected in order to transmit data between the nodes. Cable transmission media includes twisted-pair wiring, coaxial cable, and fiber optic cable.

Wireless transmission media includes infrared signals, broadcast radio, cellular radio, microwaves, and communications satellites.

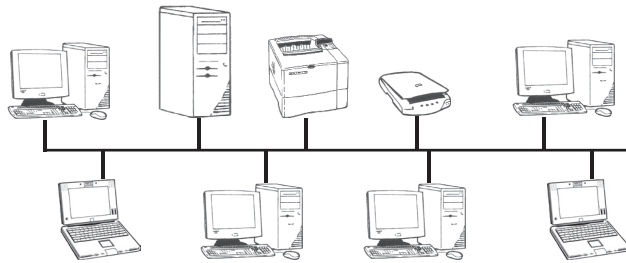
The amount of data and the speed at which data can travel over a media is called bandwidth, which is measured in bits per second (bps). Each transmission media has a specific length or range restriction, data transmission rate, and cost.

Along with the physical, or hardware, aspects of setting up a network, there is also the software aspect. A *network operating system* is software that allow users and devices to communicate over the network. A *networked environment* refers to a set of networked computers running an OS that can handle the communication between the computers. The operating system installed must be capable of supporting networking functions, such as security access features and support for multiple users. Operating systems capable of network functions are available for Linux, Windows, Unix, and Mac. The network architecture, discussed next, must also be considered when choosing a network OS.

*Network architecture* includes the type of computers on the network and determines how network resources are handled. Two common models are peer-to-peer and client/server. In a *peer-to-peer* network, each computer on the network is considered equal in terms of responsibilities and resource sharing. A *client/server* network consists of a group of computers, called *clients*, connected to a server. A *server* is a computer with more RAM, a larger hard disk, and sometimes multiple CPUs that is used to manage network functions.

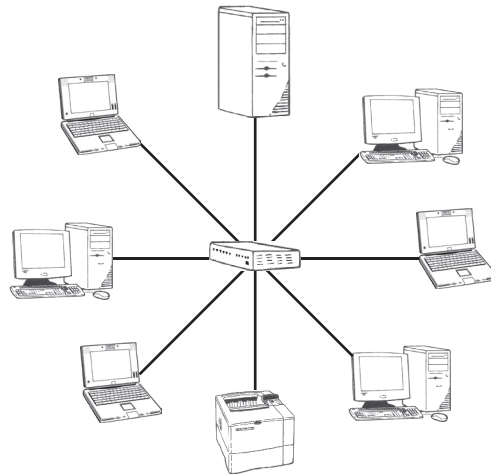
*Physical topology* refers to the arrangement of the nodes on a network. A *node* is a location on the network with a device capable of processing information, such as a computer or a printer. There are three common physical topologies:

- The *bus topology* is a physical LAN topology that uses a single central cable, called the *bus* or backbone to attach each node directly:



*LAN using a bus topology*

- In a *star topology*, each node is attached to a *hub*, which is a device that joins communication lines at a central location on the network:



*LAN using a star topology*

- In a *ring topology*, each node is connected to form a closed loop. A LAN with a ring topology can usually cover a greater distance than a bus or star topology:

**Ethernet**  
The Ethernet LAN protocol was developed by Bob Metcalfe in 1976. Ethernet uses a bus or star topology with twisted-pair wiring, coaxial cable, or fiber optic cable transmission media. Newer protocols include Fast Ethernet, which operates at 100 Mbps, Gigabit Ethernet which operates at 1 Gbps, and 10G Ethernet, which operates at 10 Gbps.

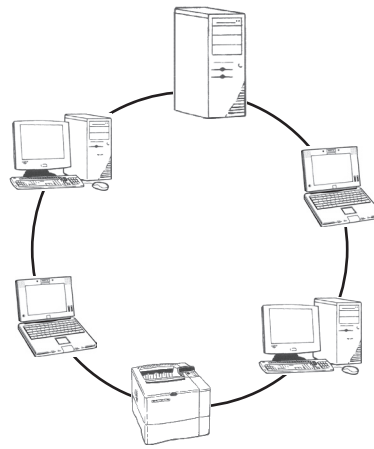
**Baseband and Broadband Technology**  
Most LANs use baseband technology which means the transmission media carries one signal at a time. Broadband technology allows for data transmission of more than one signal at a time and is found in cable television transmission.

### **Bluetooth**

Bluetooth is a wireless technology used to allow mobile computing devices to communicate.

### **Wi-Fi**

Wi-Fi (Wireless Fidelity) is a term used to describe an 802.11 network, which is a specification or protocol for wireless networks.



*LAN using a ring topology*

- *Wireless networks* use high frequency radio waves or infrared signals instead of cables to transmit data. A router/wireless access point device is used to allow nodes to transfer data through the air.

Another type of topology is *logical topology*, which refers to the way data is passed between the nodes on a network. A LAN's logical topology is not always the same as its physical topology.

Network users are given a user name and password to log on to a network through a computer connected to the network. Users are also assigned a level of access to maintain security. Network users should follow a certain etiquette referred to as *netiquette*:

- Do not attempt to access the account of another user without authorization.
- Do not share your password, and change it periodically.
- Use appropriate subject matter and language, and be considerate of other people's beliefs and opinions.