

## 6-2 Controlling Data Flow with Communications Software

**Communications Software** enables computers to communicate with one another. The software controls transmission by indicating the (1) speed of transmission, (2) direction of data, (3) method of transmission, (4) number of bits in the computer code, (5) type of parity, if any.

The rules and procedures for exchanging information between computers are called the *communications protocol*.

Transmission speeds set by communications software indicate how fast data can travel accurately across specific communications channels. Transmission speed is related to the bandwidth of a channel. There are two common types of bandwidths - *baseband & broadband* – which determine the capacity of a channel to transmit data.

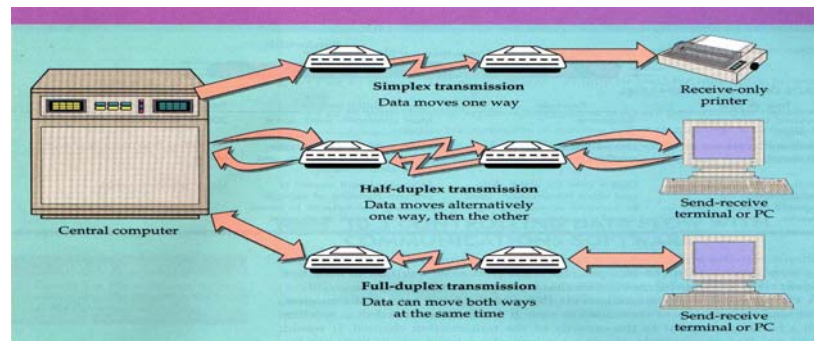
### 6-2-1 Speed of Transmission

The speed at which data is sent is commonly expressed as a **baud rates**, measured in bits per second (bps). Most modems operate at 2400, 9600, 28.800 or 56.000 bps. The computer code for just a character itself typically requires seven or eight bits. Sometimes start, stop bits are added along with a parity bit to control and regulate transmission. In all, a transmission may require ten bits per character. Hence, we say that a 9600 bps modem transmits approximately 960 characters per second.

### 6-2-2 Direction of Data Flow

Communications software sets the transmission protocols that indicate the way data will flow over a communications channel. Electronic impulses can move in one of three following ways (as illustrated in flg. fig.):

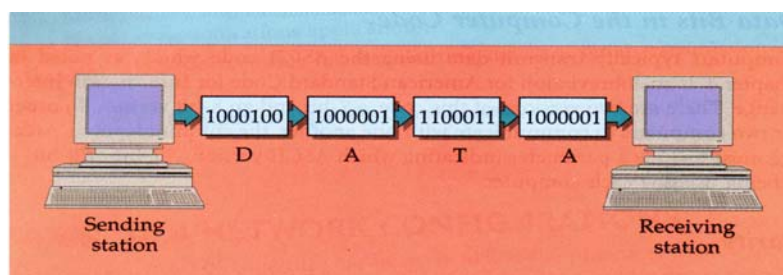
1. **Simplex lines** allow data to flow in one direction only, for example, from the CPU to the monitor.
2. A **half- duplex line** permits data to move in two directions, but not at the same time.
3. A **full- duplex line** can transmit data in both directions at the same time.



### 6-2-3 Serial and parallel Transmission

Another factor specified by the communications software package is the method of transmission. There are two basic methods for transmitting data: Serial and parallel.

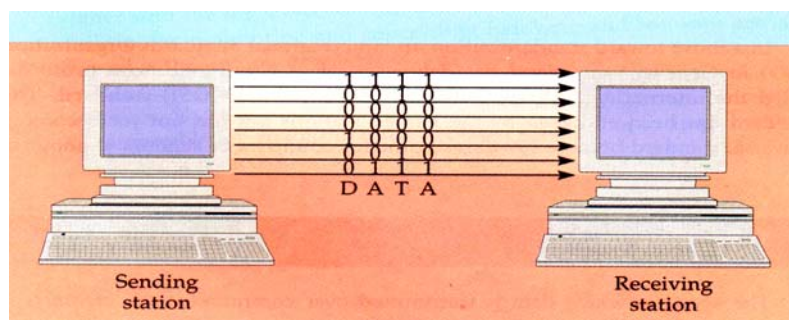
- ❖ **Serial Transmission:** In this method, each bit is transmitted one at a time in sequence over a single channel. See flg. fig.



Most peripherals communicate with computers in serial mode through a standard serial interface that attaches to modems. There 2 types of serial modes:

- **Asynchronous transmission:** one character at a time is transmitted. The transfer of data is controlled by start & stop bits. It is the least expensive method of transmission.

- **Synchronous transmission** enables blocks of characters called packets to be transmitted in timed sequences. A stop bit indicates the end of data. It is much faster (than asynchronous transmission), and more widely used.
- ❖ **Parallel transmission:** It is faster method of transmission in which all bits are transmitted simultaneously (See fig. Fig.). Parallel transmission is more expensive than serial one because of the large number of cables needed and usually limited to communicate over relatively short distances.



### ❖ Data Bits in Computer Code

Computers typically transmit data using the ASCII\* code. There are two versions of this code, a 7-bit & 8-bit version. In order for two computers to communicate with one another, the communication package must include a parameter indicating which ASCII version – 7-bit or 8-bit – is being used by each computer.

### ❖ Parity

Parity bits are added to computer codes to minimize the risk of transmission errors. For example, even-parity computers, require each character being transmitted to have an even number of bits on at all times. Some computers use even parity and some use odd parity; other computers do not use parity bits at all. The type of parity

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\* America Standard Code for Information Interchange

–odd, even, none– must be specified by the communication S/W used for interfacing with another computer.

## ❖ Protocols

A protocol is a set of rules and procedures for formatting and regulating the speed of data transmitted from one device to another. Error handling is also under the control of a protocol.

Communications programs for PCs offer a variety of protocols to transfer files. On networks, protocols are part of the network S/W. The TCP/IP (Transmission Control Protocol/ Internet Program) is a set of protocols used for transmission over the Internet for PCs.

### *SELF-TEST*

- 1. The speed at which data is transmitted over communications channels is expressed as a \_\_\_\_\_.*
- 2. (T or F) A 14,400 bps modem transmits approximately 1440 characters per second.*
- 3. (Simplex/half-duplex/full-duplex) channels are the most frequently used ones in data communications applications.*
- 4. The two basic methods for transmitting data are serial transmission and \_\_\_\_\_.*
- 5. (T or F) Computers typically communicate with one another using the EBCDIC code.*

### *Solutions*

- 1. baud rate, or bits per second (bps).*
- 2. T*
- 3. Full-duplex.*
- 4. Parallel transmission.*
- 5. F – They typically use the ASCII code.*

## 6-3 Network Configurations

Networks consist of computer H/W as well as the programs to link the H/W. Full connectivity of office equipment – telephones, fax machines, and printers, as well as computers– can be achieved through a network configuration. There are two basic categories of networks: local area network, and wide area network.

### 6-3-1 The Local Area Network (LAN)

It is the most common configuration. It is used when computer devices are in relatively close proximity to one another. Although some LANs can connect devices as far as 50 miles, most LANs connect devices within 1 – 2 miles of one another. Most often, these LANs have coaxial or fiber optic cables for linkages, but telephone lines or wireless radio waves could be used.

LANs enable organizations to share resources such as S/W, H/W, and data. LANs used in this way have a file server, which is linked to each station or node. This file server may be microcomputer or workstation, or minicomputer or mainframe depending on the complexity of the jobs it must perform.

#### ***Physical Components of a LAN:***

1. **File Server** or **Host** that stores the data and S/W and controls access to resources.
2. **Nodes**, which may be input/output devices or micros.
3. **Interface Cards** inserted in an expansion slot of the nodes that enable these devices to communicate with other devices.
4. **Network Cables** or **Links** such as coaxial cables or wireless radio waves that connect nodes to a host or file server.

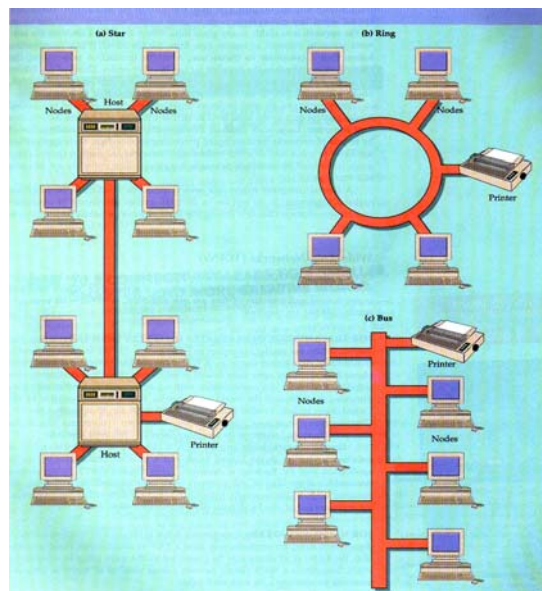
5. **Cable Interface Unit** in a separate device that enables signals to be sent and received on the network cables.

### 6-3-2 LAN Software

LAN software interfaces with application S/W and controls resources. It must contain an operating system or operating system interface that enables a variety of different programs to be used on the LAN. It also contains communication programs that permit all devices to communicate with the file server or with each other.

### 6-3-3 Network Topologies: Ring, Star, Bus

The specific type of network configuration is called the *network topology*. The 3 basic types of network topologies – ring, star, bus – are illustrated in flg. Fig.



### **Star**

A *Star Network* has a central (hub) computer that is responsible for managing the network. All messages routed through the hub computer, which acts as a traffic cop to prevent collisions. Any connection failure between a node and the hub will not affect the overall system. However, if the hub computer fails, the network fails.

This topology is ideal for networks where branch offices need to communicate with the main office.

### ❖ **Ring**

A *Ring Network* links all nodes together in circular chain. Data travel in only one direction around the ring. Each node examines any data that passes by to see whether that node is the addressee; if not, the data is passed to the next node in the ring.

Since data travels in only one direction, there is no danger of data collision. However, if one node fails, the ring is broken and the entire network fails.

### ❖ **Bus**

A *bus network* has a single line (the bus) to which all network nodes are attached. Computers on the network transmit data in the hope it will not collide with the data transmitted by other node; if this happen, the sending node simply tries again. Nodes can be attached to or detached from the network without affecting the network. Furthermore, if one node fails, it does not affect the rest of the network.

*Ethernet*, a popular type of LAN that interconnects PCs via coaxial cable, has a bus topology.

## **6-3-4 Wide Area Networks (WANs)**

They are used where local area transmission and transfer of files are not sufficient:

### ❖ **For Transmission Over Greater Distances Than LANs**

WANs are similar in concept to LANs except that the technology permits transmission over greater distance. A WAN typically uses telephone lines and fiber optic cables as well as microwave relays and satellites so that individuals at nodes can communicate (with a host or with each other) over long distances, even around the world.

For example, MasterCard's worldwide has a private WAN (called Banket). It consists of 14 switching centers. Using this WAN, banks around the world that are MasterCard members settle their accounts daily by making electronic funds transfer (EFT) i. e. they transmit transaction data electronically.

❖ **For Networking LANs:** Sometimes a WAN is simply a network of LANs.

**Gateways, Bridges, and Routers connect LANs to WANs and LANs to LANs:**

LANs linked to WANs or other LANs requiring special device, usually a computer, along with special software. Gateways bridges, and routers are devices that route messages from one LAN to another or from a LAN to a WAN. They can select the best route based on traffic, transmission speed, and cost.

Routers with high-speed buses may serve as an Internet backbone connecting numerous networks.

***SELF-TEST***

1. *(T or F) Microcomputers cannot be used as terminals in a network*
2. *(T or F) All networks must have a host or file server.*
3. *(T or F) A wide area network can consist of a network of LANs.*
4. *(T or F) It is possible to connect nodes and LANs that have different technologies.*
5. *(T or F) WANs are used for transmitting data over greater distances than can be handled by LANs.*



*Solutions:*

1. *F*
2. *F-A ring network connects a series of devices where there is no central computer.*
3. *T*
4. *T-This can be accomplished with a gateway.*
5. *T*

### **CHAPTER SELF-TEST**

1. *The term \_\_\_\_\_ refers to electronically transmitting data from one location to another by means of communications channels.*
2. *What kind of transmission waves do wireless LANs use?*
3. *A \_\_\_\_\_ distributes resources in a network.*
4. *The \_\_\_\_\_ is a series of networks accessible to users of subscriber services as well as people in education, business, and government.*
5. *Most simple data communications systems use either \_\_\_\_\_ or \_\_\_\_\_.*
6. *\_\_\_\_\_ cable is the fastest and most expensive communications link available for data transmission.*
7. *High-speed data communications typically use \_\_\_\_\_ stations and \_\_\_\_\_.*
8. *The speed of a communications channel is called the \_\_\_\_\_ rate.*
9. *When transmission is permitted both to and from a CPU over the same communications line but not at the same time, the line is called \_\_\_\_\_.*
10. *What is the device that converts signals in digital form to analog form for transmission over telephone lines?*

*Solutions:*

- 1. Connectivity or Networking.*
- 2. Radio*
- 3. Host computer or file server.*
- 4. Internet*
- 5. A telephone line.*
- 6. Fiber optic.*
- 7. Microwave; satellite*
- 8. Baud*
- 9. Half-duplex*
- 10. Modem.*