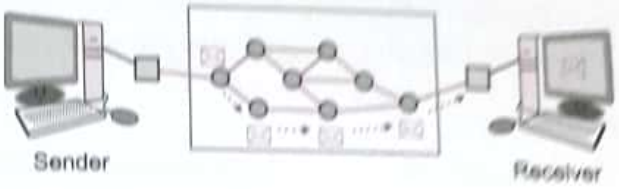
10.5.2 Message Switching

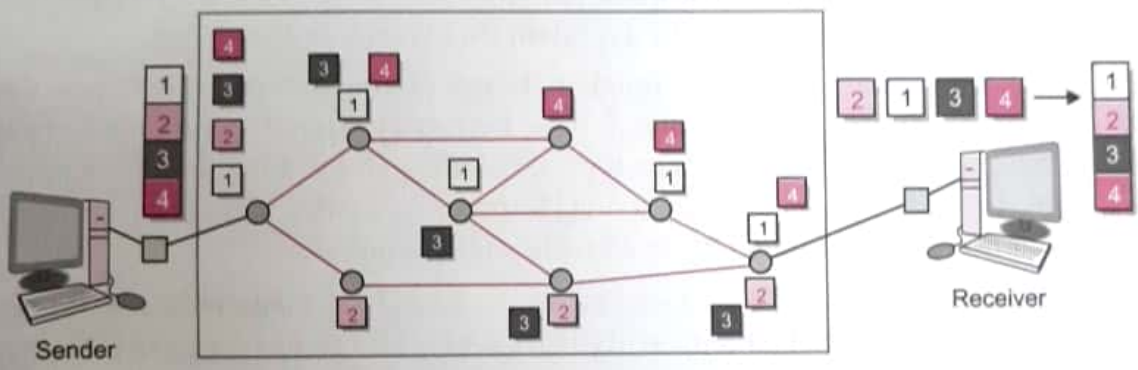
In this technique, the source computer sends data or the message to the switching office first, which stores the data in its buffer. It then looks for a free link to another switching office and then sends the data to this office. This process is continued until the data are delivered to the destination computers. Owing to its working principle, it is also known as *store and forward*. That is, store first (in switching office), forward later, one jump at a time.



(*b*) Message switching – full message travel across different intermediate hops or switching offices.

10.5.3 Packet Switching

With message switching, there is no limit on block size, in contrast, packet switching places a tight upper limit on block size. A fixed size of packet which can be transmitted across the network is specified. Another point of its difference from message switching is that data packets are stored on the disk in message switching whereas in packet switching, all the packets of fixed size are stored in main memory. This improves the performance as the access time (time taken to access a data packet) is reduced, thus, the throughput (measure of performance) of the network is improved.



(*c*) Packet switching – message is divided into packets and packets travel across hops.

Figure 10.6 Switching Techniques

10.6 DATA COMMUNICATION TERMINOLOGIES

Let us now talk about some common data communication Terminologies.

1. Data Channel

Channel is the medium used to carry information or data from one point to another.

2. Baud

It is the unit of measurement for the information carrying capacity of a communi- cation channel. The baud is synonymous with bps (bits per second), another unit of measuring data transfer rates.

3. Bits Per Second (bps)

It refers to the speed at which data transfer is measured. It is generally used to measure the speed of information through a high speed phone lines or modems.

Bytes per second are denoted as **Bps** – notice the capital B. Small b *i.e.*, **bps** stands for *bits per second*.

- The rate of a *thousand* ***bits*** *per second* is known as kbps *i.e.*, kilo bits per second. (*Small k in kbps*).

- A rate of a *thousand* ***bytes*** *per second* is denoted by **Kbps** (*Kilo bytes per second*). Notice capital K.
- A rate of a *million* ***bits*** *per second* is denoted through **mbps** – mega bits per second. (*Small m in mbps*).
- A rate of a *million* ***bytes*** *per second* is denoted as **Mbps**. (*Capital M in Mbps*).

4. Bandwidth

Technically, the bandwidth refers to the difference between the highest and lowest frequency of a transmission channel. Or in other words, the bandwidth refers to the width of allocated band of frequencies to a channel.

Generally speaking, bandwidth is directly proportional to the amount of data transmitted or received per unit time. In a qualitative sense, bandwidth is proportional to the complexity of the data for a given level of system performance. For example, it takes more bandwidth to download a photograph in one second than it takes to download a page of text in one second. Large sound files, computer programs, and animated videos require still more bandwidth for acceptable system performance.

High bandwidth channels are called **broadband** channels and low bandwidth channels are called **narrowband** channels.

In digital systems, bandwidth is data speed in *bits per second* (*bps*). Thus, a modem that works at 57,600 bps has twice the bandwidth of a modem that works at 28,800 bps.

In analog systems, bandwidth is defined in terms of the difference between the highest frequency signal component and the lowest-frequency signal component. Frequency is measured in *cycles per second i.e.*, ***hertz***. A typical voice signal has a bandwidth of approximately three kilohertz (3 kHz); an analog television (TV) broadcast video signal has a bandwidth of six megahertz (6 MHz) – some 2,000 times as wide as the voice signal.

A **kilohertz (kHz)** represents a *thousand cycles per second* ; a **megahertz (MHz)** represents a *thousand kHz* ; a **gigahertz (GHz)** represents a *thousand MHz* ; and a **terahertz (THz)** represents a *thousand GHz*.

5. Data Transfer Rates

The data transfer rate represents the amount of data transferred per second by a communications channel or a computing or storage device.

Data rate is measured in units of *bits per second* (**bps**), *bytes per second* (**Bps**), or **baud**.

When applied to data rate, the multiplier prefixes "kilo-", "mega-", "giga-", "tera-" etc. (and their abbreviations, "k", "M", "G", "T" etc.) always denote powers of 1000. For example, 64 kbps is 64,000 bits per second. This contrasts with units of storage where they stand for powers of 1024, *e.g.*, 1 KB = 1024 bytes.

Similarly, **1 MB** = 1024 *kilobytes* ; **1 GB** = 1024 *megabytes* ; **1 TB** = 1024 *gigabytes*

10.7 TRANSMISSION MEDIA

By *transmission media* or *communication channels* of network, it is meant that the 'connecting cables' or '*connecting media*' are being talked about. The cables that connect two or more workstations are the communication channels.

In LANs (*Local Area Networks i.e.*, very small networks) many different types of media are in use. Copper conductors in the form of twisted pair or coaxial are by far the most common.