Computer Network

Lecture-2

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Effectiveness of a Data Communication System

The effectiveness of a data communications system depends on four fundamental characteristics: delivery, accuracy, timeliness, and jitter.

1. Delivery: The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.

2. Accuracy: The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.

Effectiveness of a Data Communication System

3. Timeliness: The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.

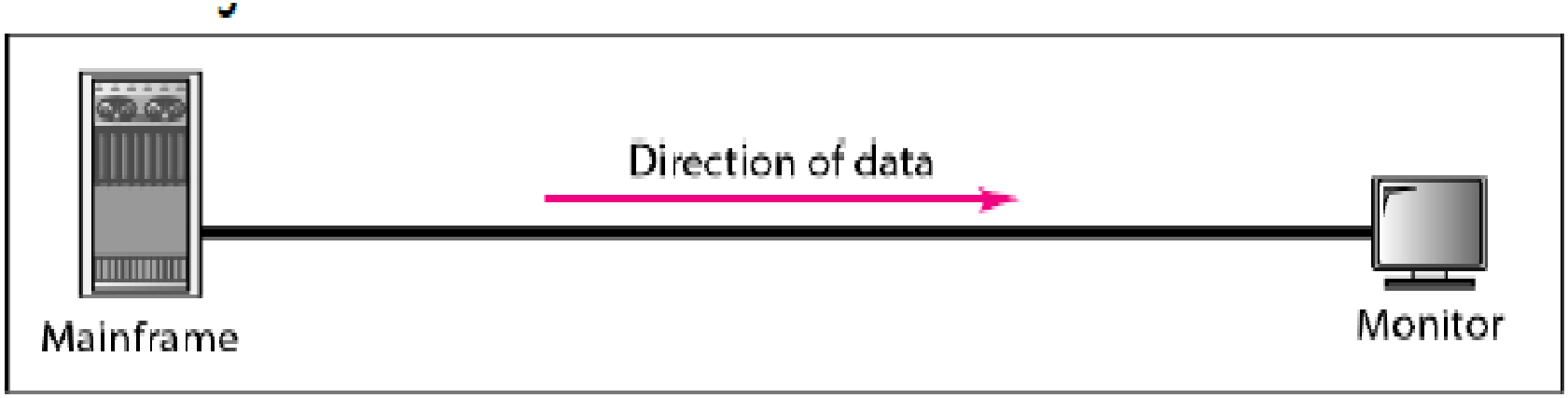
4. Jitter: Jitter refers to the variation in the packet arrival time. It is the uneven delay in the delivery of audio or video packets. For example, let us assume that video packets are sent every 30 ms. If some of the packets arrive with 30 ms delay and others with 40 ms delay, then an uneven quality in the video is the result.

Data Flow

Communication between two devices can be simplex, half-duplex, or full-duplex.

Simplex Communication

In simplex mode, the communication is unidirectional, as on a one-way street. Only one of the two devices on a link can transmit; the other can only receive.



Keyboards and traditional monitors are examples of simplex devices.

Data Flow

Half-Duplex Communication

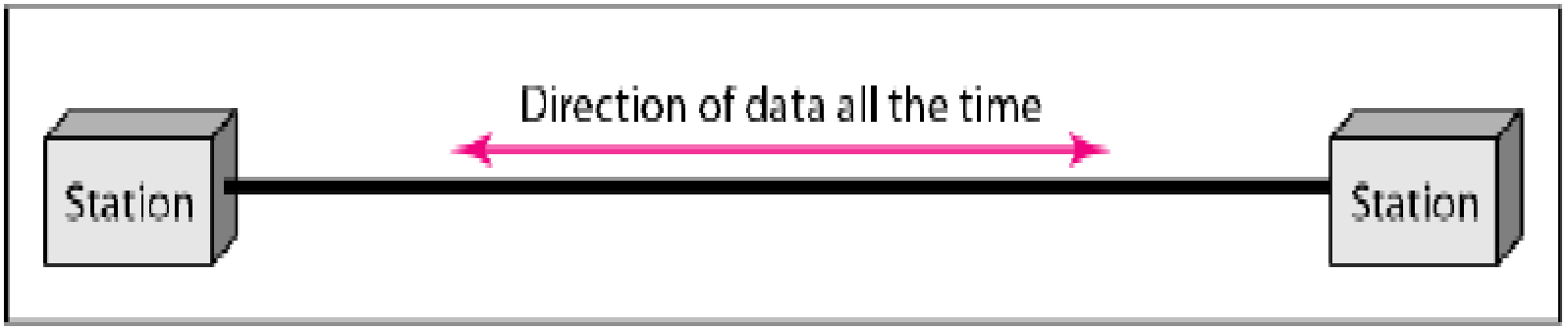
In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive, and vice-versa.

Walkie-talkies and CB (citizens band) radios are both half-duplex systems.

Data Flow

Full-Duplex Communication

In full-duplex, both stations can transmit and receive simultaneously. One common example of full-duplex communication is the telephone network. When two people are communicating by a telephone line, both can talk and listen at the same time. The full-duplex mode is used when communication in both directions is required all the time.



Network Criteria

A network must be able to meet a certain number of criteria. The most important of these are performance, reliability, and security.

Performance

- Performance can be measured in many ways, including transit time and response time.
  - Transit time is the amount of time required for a message to travel from one device to another.
  - Response time is the elapsed time between an inquiry and a response.
- The performance of a network depends on a number of factors, including the number of users, the type of transmission medium, the capabilities of the connected hardware, and the efficiency of the software.
- Performance is often evaluated by two networking metrics: throughput and delay. We often need more throughput and less delay.
- However, these two criteria are often contradictory. If we try to send more data to the network, we may increase throughput but we increase the delay because of traffic congestion in the network.

Network Criteria

Reliability: In addition to accuracy of delivery, network reliability is measured by the frequency of failure, the time it takes a link to recover from a failure, and the network's robustness in a catastrophe.

Security: Network security issues include protecting data from unauthorized access, protecting data from damage and development, and implementing policies and procedures for recovery from breaches and data losses.

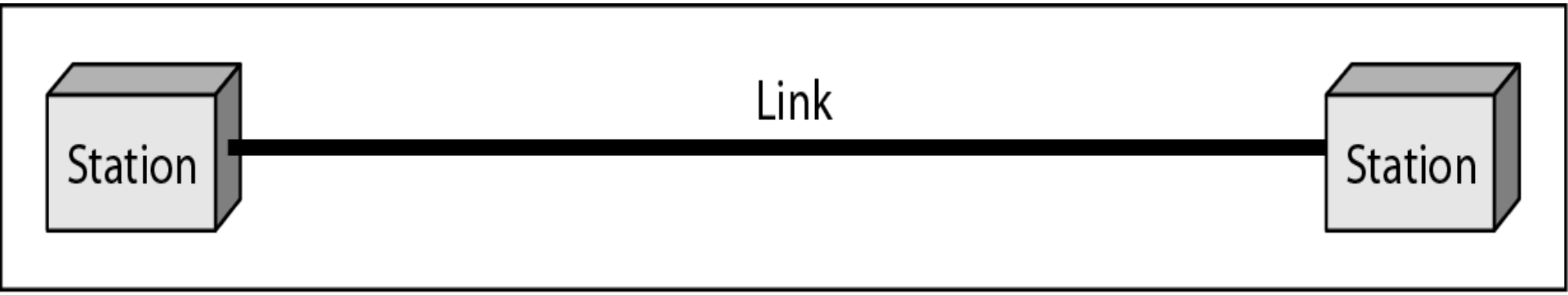
Type of Connection

A network is two or more devices connected through links. A link is a communications pathway that transfers data from one device to another. There are two possible types of connections: point-to-point and multipoint.

Point-to-Point Connection

A point-to-point connection provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices. Most point-to-point connections use an actual length of wire or cable to connect the two ends, but other options, such as microwave or satellite links, are also possible.

When you change television channels by infrared remote control, you are establishing a point-to-point connection between the remote control and the television's control system.



Type of Connection

Multipoint Connection

A multipoint (also called multi-drop) connection is one in which more than two specific devices share a single link.

In a multipoint environment, the capacity of the channel is shared, either spatially or temporally. If several devices can use the link simultaneously, it is a spatially shared connection. If users must take turns, it is a timeshared connection.