

Computers I

4. Data and Network Communications

Data communication is the exchange of data between two devices through a form of transmission medium such as a wire cable.

Businesses rely on the networks to function properly everyday.

4.1 Communication System Effectiveness

For this communication to occur, the communication devices have to be part of a system made up of hardware and software.

The effectiveness of a data communication system is rated on four characteristics.

1. **Delivery** – The system must deliver data to the correct destination.

Only the intended device or user and only that device or user must receive data.

Can you imagine sending an e-mail to a specific person, and instead everyone in your neighborhood receives it?

2. **Accuracy** – The system must deliver the data accurately.

What this means is that in the process of being sent, data should not be altered, or destroyed. Sometimes these situations do occur, but it is up to a good system to detect an error in transmission and correct or retransmit the data.

3. **Timeliness** – The data must be delivered within a reasonable amount of time.

In a world where we are used to nearly everything being instant, it is crucial that messages arrive quickly. If we send a message informing that we are running 10 minutes late it should not arrive 30 minutes later.

This however, does not only apply to text. When transmitting data such as video and audio, timing is everything especially with real-time transmission. **Real time transmission** is the delivering of data as they are produced, in the same order that they are produced, and without significant delay.

In real time transmission, a lot of delay can equal lag in a video.

4. **Jitter** – the amount of jitter should be minimal.

If packets of video are sent every 30ms and sometimes a lot of packets are sent with 40ms the delay will give you an uneven quality in the video result.

Another term exchangeable with this is lag.

In online games lag occurs when the latency of a motion performed is observed at a later time.

4.2 Communication System Components

Data communication systems have 5 components.

1. Message – the data to be communicated.

Data includes

- Text
- Numbers
- Pictures
- Audio
- Video

2. Sender – the device that sends the original message.

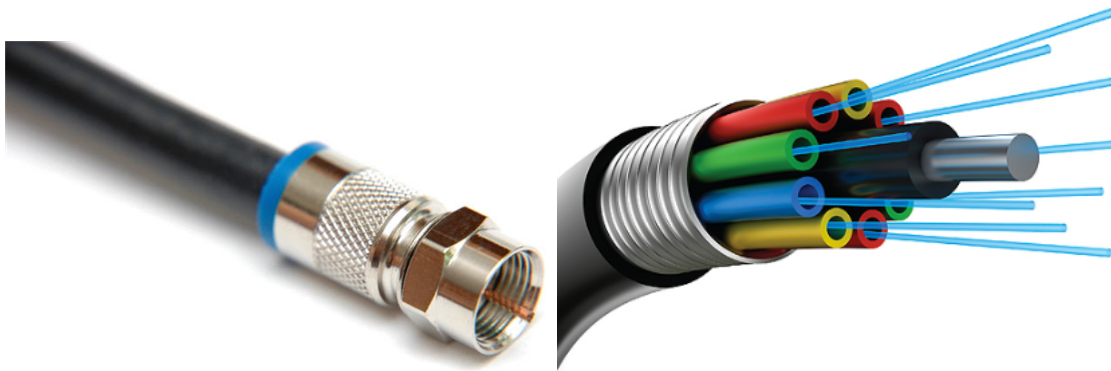
Senders include

- Computer
- Workstation
- Telephone
- Video Camera

3. Receiver – The device that receives the message.
Receiver examples are the same as those of the sender
4. Medium – The medium refers the transmission medium or the physical path that the message travels through.

Mediums include

- Coaxial Cable
- Fiber Optic Cable
- Radio Waves
- Twisted-pair wire

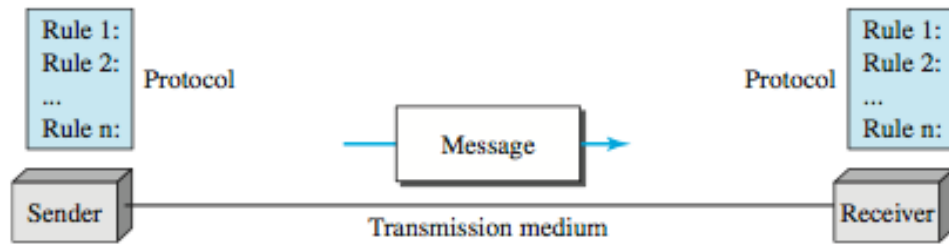


5. Protocol – the last component is the protocol. A protocol is a set of rules that govern the communication of data. Protocols are the agreement between two devices.

It is easy to understand protocols this way.

A person that only speaks French cannot communicate with a person that only speaks Spanish.

However, if a person that speaks French and a person that speaks Spanish both also speak English than they can communicate. In this example, English is the protocol that allows for the communication between devices.



4.3 Data Flow Types

There are three types of data flow for communication between two devices

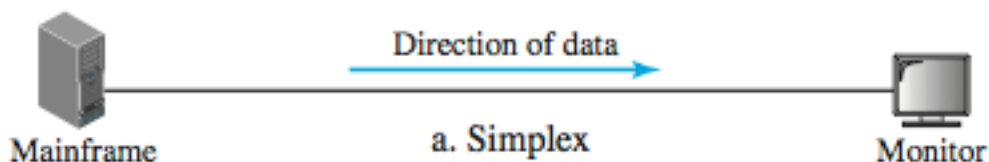
1. Simplex – Unidirectional like a one-way street

In this type of communication one device transmits, and one device receives.

An example of this is a keyboard and a monitor.

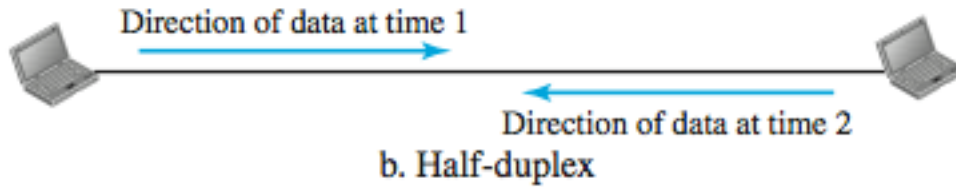
The keyboard can only create input and the monitor can only accept the output.

Because it is only going in one direction, the sender can use the full capacity of the channel to send the data.



2. Half-duplex – in this communication type each device can both transmit and receive, however, they can not do it at the same time,

An example of a half-duplex is a walkie-talkie, while one person is talking the other cannot, but when the person finishes the other can send a message of their own.

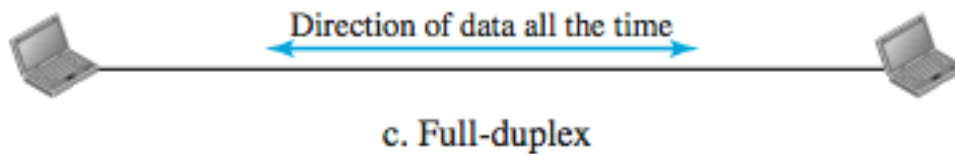


3. Full-duplex – In this type of communication allows both devices to communicate simultaneously.

Think of a full-duplex as a two-way street with traffic going in both directions. Due to the fact that the signals are simultaneous, the devices must share the capacity of the link.

A classic example of a full-duplex data flow is a telephone network.

When communicating by phone, both people can talk and listen at the same time.



4.4 Network Criteria

Just like A Data Communication System, every Network must have 3 components of its own.

1. Performance – measured by throughput and delay.

In other words, the amount of time it takes for a message to travel from one device to another and the amount of time that passes before a response is made.

Performance in a network depends on

- Number of users
- Medium

- Hardware capabilities
 - Software efficiency
2. Reliability – A network must be reliable, this is measured by the frequency of failure, or how often it fails, and how quickly it can recover from a failure.
 3. Security – A network must be secure to avoid data loss and breach. The PlayStation Network is a good example of a Network that failed in some of these aspects.