(*) Introduction

^ The largest computer network, the INTERNET, has billions of users in the world who use WIRED and WIRELESS transmission media to connect small and large computers.

DATA refers to INFORMATION presented in whatever FORM is agreed upon by the parties CREATING and USING it.

DATA COMMUNICATIONS is the exchange of DATA between two devices via a combination of HARDWARE (physical equipment) and SOFTWARE (programs).

The EFFECTIVENESS of a data communications system depends upon :-

1. DELIVERY -

   Delivery must be ensured ONLY to the CORRECT destination.

2. ACCURACY -

   Data ALTERED during transmission must be CORRECTED.

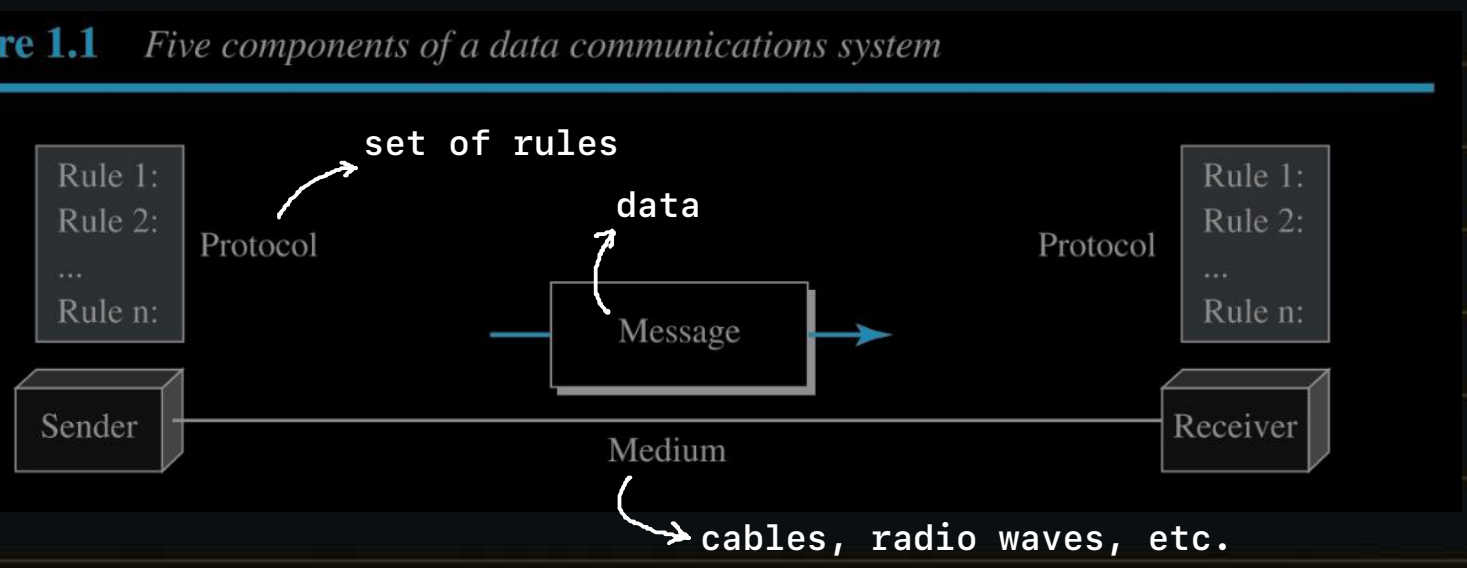
3. TIMELINESS -

   Data must be delivered AS they are produced, in the same ORDER that they are produced, and without significant DELAY.

4. JITTER -

   The variation in the ARRIVAL RATE of data must be minimized.

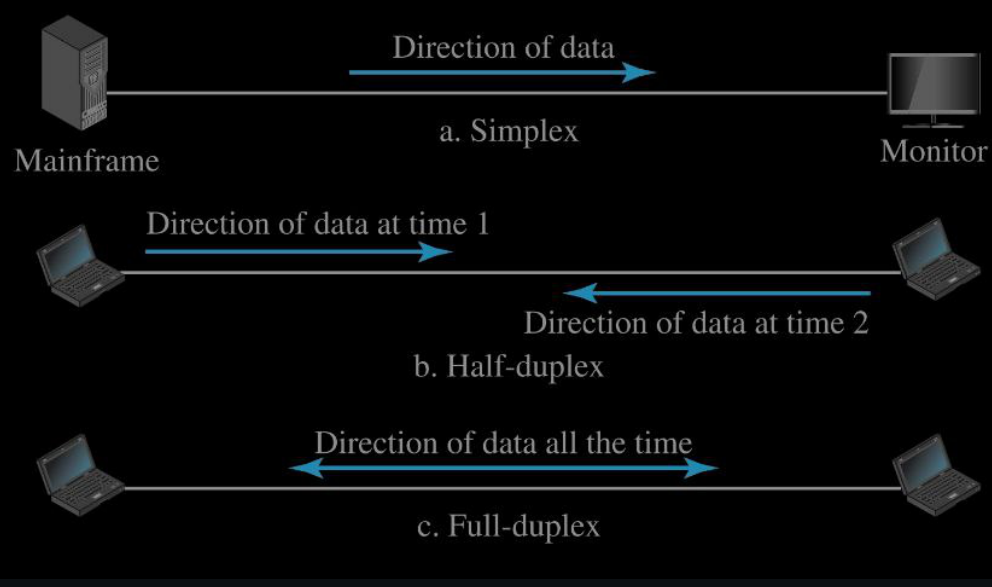
^ **Figure 1.1** *Five components of a data communications system*



Without a PROTOCOL, two devices may be CONNECTED but not able to COMMUNICATE, just as a person speaking French cannot be understood by a person who only speaks Japanese.

Data/Information can come in different FORMS, such as text, numbers, images, audio and video.

Figure 1.2 *Data flow (simplex, half-duplex, and full-duplex)*



1. SIMPLEX –

   The communication is UNIDIRECTIONAL. Only one of the two devices on a link can TRANSMIT; the other can only RECEIVE. For eg., keyboards and traditional monitors.

2. HALF-DUPLEX –

   Each station can both TRANSMIT and RECEIVE, but NOT at the same time. For eg., walkie-talkies.

3. FULL-DUPLEX –

   Both stations can TRANSMIT and RECEIVE SIMULTANEOUSLY. For eg., telephone network.

^ A NETWORK is the interconnection of a set of DEVICES capable of COMMUNICATION, where a device can be a HOST (for eg., desktop) or a CONNECTING DEVICE (for eg., router).

Network criteria :-

1. PERFORMANCE –

   For eg., TRANSIT TIME (amount of time required for a MESSAGE to travel from one DEVICE to another), RESPONSE TIME (elapsed time between an INQUIRY and a RESPONSE), etc.

   These depend upon a number of FACTORS, for eg., the number of USERS, the TYPE of TRANSMISSION MEDIUM, etc.

2. RELIABILITY –

   For eg., the frequency of FAILURE, RECOVERY time, etc.

3. SECURITY –

   For eg., protection from UNAUTHORIZED access, protection from DAMAGE, policies for recovery from BREACHES, etc.

^ In a network, devices are connected through LINKS. A link is a COMMUNICATION pathway that TRANSFERS data from one DEVICE to another. For communication to occur, two devices must be connected in some way to the SAME LINK at the SAME TIME.