

TOPIC 1: INTRODUCTION TO DATA COMMUNICATION

Data communication – the exchange of data between two (or more) devices via some form of transmission medium. Data communication may be considered local or remote.

Note: In computer information systems, data are represented by binary information units (bits) produced and consumed in the form of 0s and 1s.

The efficiency of a data communication system depends on **three fundamental characteristics**:

1. Delivery
2. Accuracy
3. Timeliness

Components of a Data Communication System

1. Message – information (data) to be communicated.
2. Sender – the device that sends the data message.
3. Receiver – the device that receives the message.
4. Medium – a path by which message travels from sender to receiver
5. Protocol – a set of rules (conventions) that govern all aspects of information communication. It represents an agreement between the communicating devices.

Network – collection of computers, printers, and other devices (nodes) that is able to communicate with each other over some transmission medium

Network Criteria

1. Performance – depends on a number of factors like
 - Number of users
 - Type of transmission medium
 - Hardware
 - Software

2. Reliability – measured by
 - Frequency of failure
 - Recovery time of a network after a failure
 - Catastrophe
3. Security – protection of data from
 - Unauthorized access
 - Viruses

Applications

- electronic messaging
- directory services
- information services
- teleconferencing
- cellular telephone
- cable television
- marketing and sales
- financial services
- electronic data interchange
- manufacturing

Key Elements of a Protocol

1. Syntax – refers to the structure or format of the data
2. Semantics – refers to the meaning of each section of bits
3. Timing – refers to two characteristics: when data should be sent and how fast they can be sent.

Standards

A standard provides a model for development that makes it possible for a product to work regardless of the individual manufacturer.

Categories of Data Communication Standards

1. De jure standards – those that have legislated by an officially recognized body
2. De facto standards – can be further subdivided into classes: *proprietary and non-proprietary*. Proprietary standards are those originally invented by a commercial organization as basis for operation of its products. Nonproprietary standards are those originally developed by groups or committees that have passed them into the public domain.

Standards Organization

Standards are developed by cooperation among standards creation committees, and government regulatory agencies.

Standards Creation Committees

1. **International Standards Organization (ISO)** – an organization dedicated to worldwide agreement on international standards in a variety of fields.
2. **International Telecommunications Union – Telecommunication Standards Sector (ITU-T)** – formerly known as CCITT; an international standards organization related to the United Nations that develops standards for organizations.
Best known ITU-T standards:
 - a) **V - series** – define data transmission over phone lines
 - b) **X- series** – define transmission over the public digital networks (PDN)
 - c) **Integrated Services Digital Network (ISDN)** – defines emerging international digital network.
3. **American National Standards Institute (ANSI)** – a non-profit organization; the U.S. voting representative to both the ISO and the ITU-T.

4. **Institute of Electrical and Electronics Engineers (IEEE)** – the largest national professional group involved in developing standards for computing, communication, electrical engineering and electronics.
5. **Electronic Industries Association (EIA)** – an association of electronics manufacturers in the United States; a non-profit organization devoted to the promotion of electronics manufacturing concerns.
6. **Internet Activities Board (IAB)** – a group of internetwork researchers who discuss issues pertinent to the Internet and set Internet policies through decisions and task forces. The IAB designates some Request for Comments (RFC) documents as Internet standards like the TCP/IP

Forums

Forums consist of representatives from corporations that test, evaluate and standardize new technologies.

Regulatory Agencies

All communications technology is subject to regulation by government agencies like the Federal Communications Commission (FCC) in the US. Specific responsibilities include:

- to review rate and service-charge applications made by telegraph and telephone providers
- to review technical specifications of communications hardware
- to divide and allocate radio frequencies
- to assign carrier frequencies for radio and television broadcasts.