



Applications of Information and Communication Technology(ICT)

Lecture 4

Mr. Noor Ul Arfeen



Lecture Outline

- Data Communication
- Components of data communication
- Communication Protocol
- Data Transmission
- Satellite and Mobile Communication
- Data Communication types



Data Communication

- The term telecommunication means communication at a distance.
- The word data refers to information presented in whatever form is agreed upon by the parties creating and using the data.
- Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable.
- Communication Systems are the combination of hardware (physical equipment's) and software (programs).
- Data communication is the process of transferring data from one place to another or between two locations. It allows electronic and digital data to move between two networks, no matter where the two are located geographically, what the data contains, or what format they are in



Components of Data Communication

- A Communication System has five basic components:
 - **Message:** The data to be transmitted or communicated, which can include numbers, text, photos, sound, or video.
 - **Sender:** The computer or device (e.g., phone, tablet) that sends the message.
 - **Receiver:** The computer or device that receives the message, which can be different from the sender.
 - **Transmission Medium:** The channel through which the message is carried from sender to receiver, such as twisted pair wire, coaxial cable, fiber optic cable, or wireless.
 - **Protocol:** The set of rules that govern the communication between computers. These rules are followed by both the sender and receiver.



Communication Protocol

- Communication protocols are sets of rules and conventions that govern the exchange of data between devices or systems. They ensure that data is transmitted accurately and efficiently across networks. Here are some common communication protocols:
1. **TCP/IP (Transmission Control Protocol/Internet Protocol):** The foundation of the internet and most networks. TCP handles the actual data transmission while IP handles addressing and routing.
 2. **HTTP (Hypertext Transfer Protocol):** Used for transferring hypertext requests and information on the World Wide Web. HTTPS is a secure version of HTTP that uses encryption.



Communication Protocol (Conti.)

3. **FTP (File Transfer Protocol):** Used for transferring files between a client and server on a computer network.
4. **SMTP (Simple Mail Transfer Protocol):** Used for sending email messages between servers.
5. **POP3 (Post Office Protocol version 3) and IMAP (Internet Message Access Protocol):** Protocols used by email clients to retrieve emails from a mail server.
6. **DNS (Domain Name System):** Translates domain names to IP addresses, allowing users to access websites using human-readable names.
7. **SSH (Secure Shell):** Provides secure remote login and command execution over an insecure network.



Data Transmission

- Data transmission refers to the process of sending and receiving data from one point to another. It's a fundamental aspect of modern communication systems, enabling the exchange of information between devices and networks. Here's a breakdown of key aspects:
- Medium: Data can be transmitted over various mediums:
 - Wired: Includes cables such as copper wires, fiber optics, and twisted pair cables.
 - Wireless: Uses electromagnetic waves to transmit data, including technologies like Wi-Fi, Bluetooth, and cellular networks.



Data Transmission (Conti.)

❖ **Satellite Communication:**

- **Principle:** In satellite communication, signals are transmitted between an earth station (ground-based antenna) and one or more satellites in orbit around the Earth.
- **Components:**
- **Ground Station:** Facilities equipped with antennas and equipment to transmit and receive signals to and from satellites.
- **Satellite:** Orbiting spacecraft equipped with transponders to receive, amplify, and retransmit signals back to Earth.



Data Transmission (Conti.)

- **Applications of Satellite Communication:**
- **Telecommunication:** Long-distance voice calls, data transfer, and internet access in remote regions.
- **Broadcasting:** Direct-to-home (DTH) television, satellite radio.
- **Navigation:** GPS (Global Positioning System) for location tracking and navigation.
- **Remote Sensing:** Weather forecasting, environmental monitoring, and earth observation.



Data Transmission (Conti.)

❖ Mobile Communication

- **Principle:** Mobile communication involves the exchange of voice and data between mobile devices (such as cell phones, tablets, and IoT devices) via wireless networks.
- **Components:**
- **Base Station:** Transmits and receives signals to and from mobile devices within its coverage area.
- **Mobile Devices:** End-user devices equipped with transceivers for wireless communication.



Data Transmission (Conti.)

- **Applications of Mobile Communication:**
- **Voice Calls:** Cellular networks enable voice communication between mobile devices.
- **Messaging:** SMS (Short Message Service), MMS (Multimedia Messaging Service), and instant messaging apps.
- **Internet Access:** Mobile data services provide access to websites, email, social media, and online services.
- **IoT Connectivity:** Enables communication between various IoT devices for applications like smart homes, healthcare monitoring, and industrial automation.



Types of Data Communication

1. Simplex Communication:

- In simplex communication, data is transmitted in only one direction, from the sender to the receiver.
- The receiver can only passively listen or receive data and cannot send any feedback or response back to the sender.
- Examples of simplex communication include television broadcasting, where the TV station sends signals to viewers, and one-way paging systems.



Types of Data Communication (Conti.)

2. Half-Duplex Communication:

- In half-duplex communication, data can be transmitted and received, but not simultaneously.
- Devices can switch between sending and receiving modes, but they cannot perform both operations simultaneously on the same communication channel.
- Communication occurs in both directions, but not at the same time, resembling a two-way radio or walkie-talkie system.
- To communicate, one device must finish transmitting before the other device can start transmitting.
- Half-duplex communication is common in systems where both parties need to take turns speaking, such as in a conversation.



Types of Data Communication (Conti.)

3. Full-Duplex Communication:

- In full-duplex communication, data can be transmitted and received simultaneously.
- Both sender and receiver can communicate with each other at the same time over the same communication channel.
- This mode allows for bidirectional communication, resembling a telephone conversation where both parties can speak and listen simultaneously.
- Full-duplex communication requires separate channels for sending and receiving data or sophisticated techniques to enable simultaneous transmission and reception on the same channel, such as frequency division or time division duplexing.
- Examples of full-duplex communication include traditional telephone networks and modern Ethernet networks.



Digital and Analog Transmission

❖ Analog Transmission:

- Uses continuous signals.
- Signal represented by varying amplitude or frequency.
- Commonly used in traditional telephone lines and AM/FM radio broadcasts.
- Susceptible to interference and noise.
- Lower quality compared to digital transmission.



Digital and Analog Transmission (Conti.)

❖ Digital Transmission:

- Uses discrete binary digits (0s and 1s).
- Offers higher quality and reliability.
- Commonly used in modern telecommunications systems like internet connections, digital TV, and cellular networks.
- Less susceptible to interference and noise.
- Allows for efficient use of bandwidth and integration of various data types.



Note for the Students

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- Link: <https://cslearnerr.com/applications-of-information-and-communication-technologyict/>