

Computer Networks

Physical Layer

- The **physical layer** is concerned with transmitting raw bits over a communication channel or physical medium.
- The physical layer is responsible for moving individual bits from one (node) to the next.
- It deals with the mechanical and electrical specifications of the interface and transmission media.
- It also defines the procedures and functions that physical devices and interfaces have to perform for transmission to occur.

The physical layer is also concerned with the following:

Physical Layer

☐ **Physical characteristics of interfaces and media**

- The physical layer defines the characteristics of the interface between the devices and the transmission media.
- It also defines the type of transmission media.

Physical Layer

□ Representation of bits

- The physical layer data consists of a stream of **bits** (sequence of 0s or 1s) with no interpretation.
- To be transmitted, bits must be encoded into **signals**—electrical or optical. The physical layer defines the type of **encoding** (how 0s and 1s are changed to signals).

Physical Layer

□ Data rate

- The number of bits sent each second—is also defined by the physical layer.
- In other words, the physical layer defines the duration of a bit, which is how long it lasts.

Physical Layer

☐ **Synchronization of bits**

The sender and receiver must not only use the same bit rate but must also be synchronized at the bit level. In other words, the sender and the receiver clocks must be synchronized.

Physical Layer

□ Line configuration

The physical layer is concerned with the connection of devices to the media. In a **point-to-point configuration**, two devices are connected together through a dedicated link. In a **multipoint configuration**, a link is shared between several devices.

Physical Layer

□ Physical topology

The physical topology defines how devices are connected to make a network. Devices can be connected using a **mesh topology** (every device connected to every other device), a **star topology** (devices are connected through a central device), a **ring topology** (each device is connected to the next, forming a ring), or a **bus topology** (every device on a common link).

Physical Layer

□ Transmission mode

The physical layer also defines the direction of transmission between two devices: simplex, half-duplex, or full-duplex. In the **simplex mode**, only one device can send; the other can only receive. The simplex mode is a one way communication. In the **half-duplex mode**, two devices can send and receive, but not at the same time. In a **full-duplex** (or simply duplex) **mode**, two devices can send and receive at the same time.

Frame Relay

- Frame relay is a **packet-switching** telecommunication service designed for cost-efficient data transmission for intermittent traffic between local area networks (LANs) and between endpoints in wide area networks (WANs).
irregular
- **Frame Relay** is a standardized wide area network (WAN) technology that specifies the **physical** and **data link** layers of digital telecommunications channels.
- No wastage of bandwidth.
- its most important application is **interconnecting LANs at multiple company offices**.
- It uses a technology called **fast packet** in which error checking does not occur in any intermediate node of the transmission but done at the **ends**.
- It makes it **more efficient than X.25**, and a higher process speed achieved (it can transmit over 2,044 Mbps).

Cell Relay

- In computer networking, **cell relay** refers to a method of statistically **multiplexing** small fixed-length packets, called "cells", to transport data between computers or kinds of network equipment.
- It is an **unreliable, connection oriented** packet switched data communications protocol.

