



# LAN-Connection

## LAN Technology:

- LAN (Local Area Network) technology is used within a company for connecting devices and sharing data.
- Ethernet LAN: It uses cables (like copper, fiber optic, or coaxial) to connect devices together.
- Wireless LAN: It uses radio waves instead of cables to establish connections.

## Ethernet Standards

- Ethernet defines different standards for transmitting data over cables, including cable types and speeds.
- Common Ethernet connections involve using RJ45 connectors and ports.
- Ethernet standards specify the cable type (coaxial, optical fiber, or copper) and the speed, ranging from 100 Mbps to 400 Gbps.

### --> Twisted Pair Cable (UTP):

- UTP cables transmit data over electrical circuits using twisted pairs of copper wires.



- The wires are twisted to reduce interference and ensure better data transmission.

### --> **Fiber Optic Cable:**

- Fiber optic cables transmit data using light signals through fiberglass strands.
- They require protective layers, including an outer jacket, cladding, and a core.
- Two types of fiber optic cables are:
  - Multimode fiber: Allows light to travel in multiple angles, suitable for shorter distances.
  - Single-mode fiber: Allows light to travel in a single angle, suitable for longer distances.

### --> **Ethernet Addressing:**

- Ethernet uses Media Access Control (MAC) addresses, which are unique 48-bit binary numbers (often represented as 12-digit hexadecimal).
- MAC addresses have an Organizationally Unique Identifier (OUI) and a Vendor-assigned portion.



- Ethernet supports different addressing modes, such as unicast (one-to-one), multicast (one-to-many), and broadcast (one-to-all).

#### --> **Ethernet Data-Link Protocol:**

- Ethernet data-link protocols define the structure of Ethernet frames (data packets).
- Frames include fields like preamble (for synchronization), start frame delimiter, destination and source addresses, type field, and more.
- The type field identifies the network layer protocol used, such as IPv4 or IPv6.

#### --> **Error Detection with FCS:**

- Frame Check Sequence (FCS) is an Ethernet trailer field used for error detection.
- FCS helps identify if the frame bits have changed during transmission.
- Mathematical formulas are applied to verify the integrity of the received frame.

#### --> **Full Duplex and Half Duplex:**

- Full duplex enables devices to send and receive data simultaneously.



- Half duplex requires devices to take turns for sending and receiving to avoid collisions.
- Half duplex is used in LAN hubs, while switches support full duplex.