# Data Link Layer

📕 CCNA1v7 Module 6 Data Link Layer

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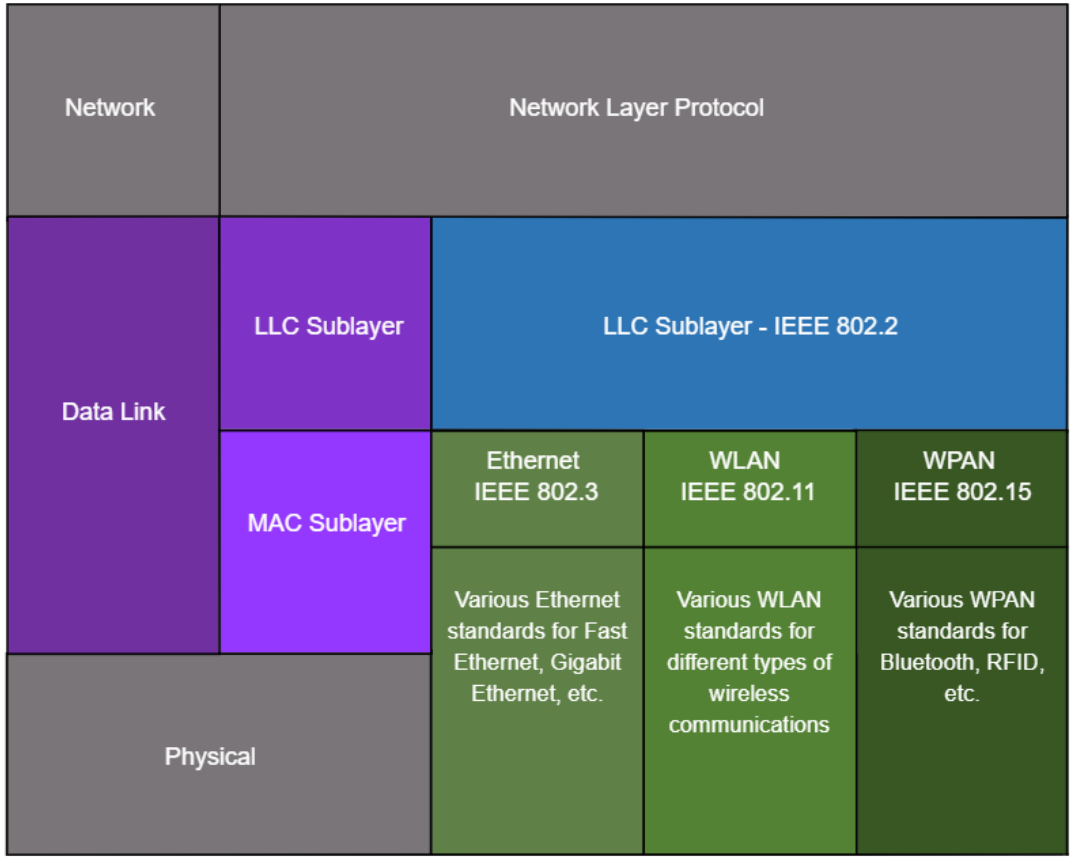
# The Data Link Layer

- Encapsulate Layer 3 packets into Layer 2 Frames
- Performs **error detection** and **rejects corrupt frames**



# Providing Access to Media and Standards

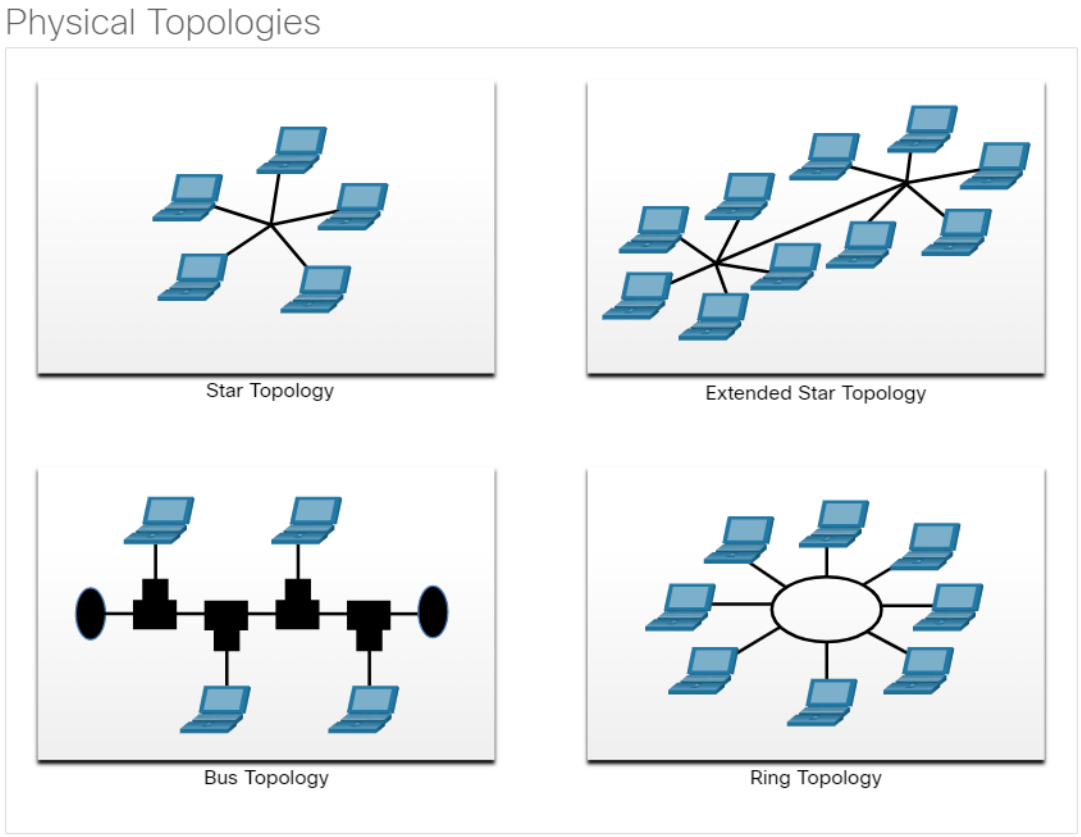
At each hop along the path, a router performs four basic Layer 2 functions:

- 1️⃣ Accepts a frame from the network medium.
- 2️⃣ De-encapsulates the frame to expose the encapsulated packet.
- 3️⃣ Re-encapsulates the packet into a new frame.
- 4️⃣ Forwards the new frame on the medium of the next network segment.

**Standards:** IEEE, ITU, ISO, ANSI

# Topologies

- **WAN:** Point-to-point, Hub and spoke, Mesh
- **LAN:** Star, Extended Star, Bus and Ring



# Half and Full Duplex Communication

**Half-duplex communication:**

- Only allows one device to send or receive at a time on a shared medium.
- Used on WLANs and legacy bus topologies with Ethernet hubs.

**Full-duplex communication:**

- Allows both devices to simultaneously transmit and receive on a shared medium.
- Ethernet switches operate in full-duplex mode.

# Access Control Methods

**Contention-based access:**

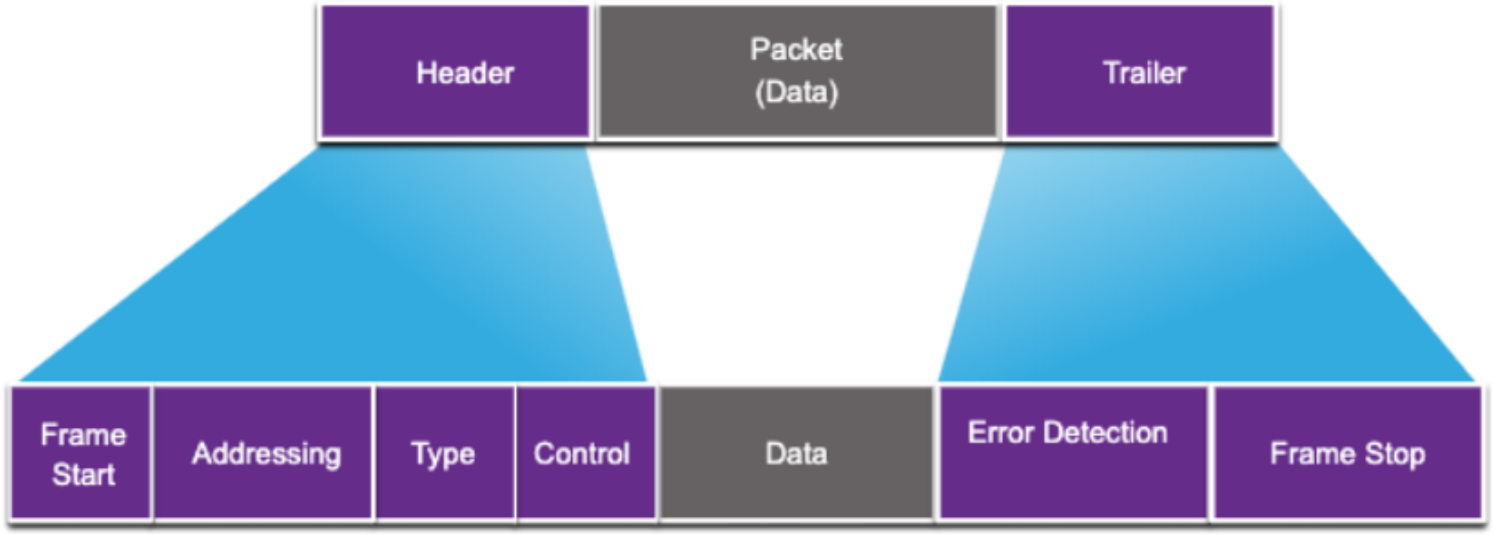
All nodes operating in half-duplex, competing for use of the medium.

- **Carrier Sense Multiple Access with Collision Detection (CSMA/CD)**
  - **Half-duplex. Use:** Legacy bus-topology Ethernet LANs. Devices detect the collission and wait a period of time and retransmit data.
- **Carrier Sense multiple access with collision avoidance (CSMA/CA)**
  - **Half-duplex. Use:** WLAN. Devices when transmitting include the time duration needed for the transmission. Other devices know how long the medium is unavailable.

**Controlled access:**

Deterministic access where each node has its own time on the medium. Used on legacy networks such as Token Ring and ARCNET.

# Frame Fields




| Field | Description |
|---|---|
| Frame Start and Stop | Identifies beginning and end of frame |
| Addressing | Indicates source and destination nodes |
| Type | Identifies encapsulated Layer 3 protocol |
| Control | Identifies flow control services |
| Data | Contains the frame payload |
| Error Detection | Used for determine transmission errors |