# What is The Data Link Layer?

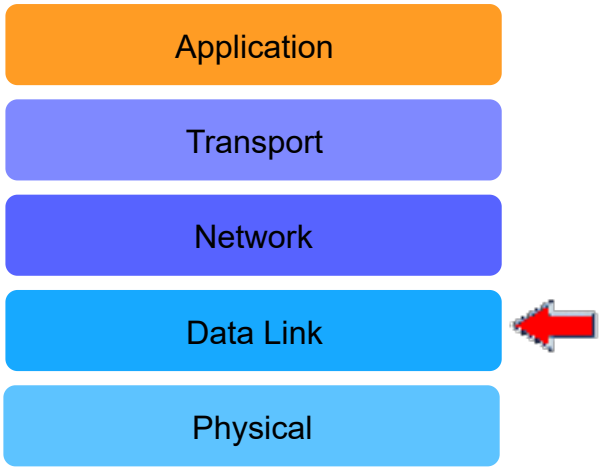
This lesson will give us a quick introduction to the data link layer!

WE'LL COVER THE FOLLOWING



## You Are Here! #

Let's zoom out and have a look at the big picture.




## Responsibilities of The Data Link Layer #

The data link layer receives packets from the network layer and deals with **providing hop to hop communication** or communication between entities that are **directly connected by a physical link**.

In other words, it makes intelligible communication possible over a physical link that just transports 0s and 1s between two directly connected hosts.

# Types of Data Link Layers #

The data link layer is the lowest layer of the reference model that we will discuss in detail. Data link layer protocols exchange **frames** that are transmitted through the physical layer. There are **three main types of data link layers**:

1. The *simplest* data link layer type is one that has only **two communicating systems connected directly through the physical layer** also known as the **point-to-point data link layer**. This type of layer can either provide an unreliable service or a reliable service. The unreliable service is frequently used above physical layers (e.g., optical fiber, twisted pairs) that have a low bit error ratio, while reliability mechanisms are often used in wireless networks to recover locally from transmission errors.

2. The second type of data link layer is the one used in Local Area Networks (LAN) called **Broadcast multi-access**. Both end-systems and routers can be connected to a LAN.

    - An important difference between point-to-point data and Broadcast multi-access is that in a Broadcast multi-access, **each communicating device is identified by a unique data link layer address**. This address is usually embedded in the hardware of the device and different types of LANs use different types of data link layer addresses. However, since there is only one party at the “other end of the wire,” in point-to-point, there is no ambiguity what entity should receive a frame that is transmitted, thus there is no need for addressing.

    - A communicating device attached to a LAN can send a data link frame to any other communication device that is attached to the same LAN.

    - Most LANs also **support special broadcast and multicast data link layer addresses**. A frame sent to the broadcast address of the LAN is delivered to all communicating devices that are attached to the LAN. The multicast addresses are used to send a frame to one specific group.

3. The third type of data link layer is used in **Non-Broadcast Multi-Access (NBMA) networks**. These networks are used to interconnect devices like a LAN. All devices attached to an NBMA network are identified by a unique data link layer address.
    - The main difference between an NBMA network and a traditional LAN is that the NBMA service **only supports unicast** and **supports neither broadcast nor multicast**.
    - ATM, Frame Relay and X.25 are examples of NBMA.

>  **Note** You may be wondering why some functions are repeated at multiple layers. The reason is that different network stacks may implement different services at each layer. So, it is possible that a data link layer implementation may only provide unreliable frame transport. Furthermore, suppose that the network implements IP. In such a case, in order to have reliable data transport, the transport layer must provide its own reliability.

## What To Expect #

This chapter is organized as follows.

1. We will first discuss the principles of the data link layer as well as the services that it uses from the physical layer.
2. We'll then describe in more detail several **Medium Access Control algorithms** that are used in Local Area Networks to regulate the access to the shared medium.
3. Finally, we'll discuss Ethernet, the ubiquitous data link layer type.

## Quick Quiz! #

1 What is the name of a data link layer message?

Let’s study some key principles of the link layer next!