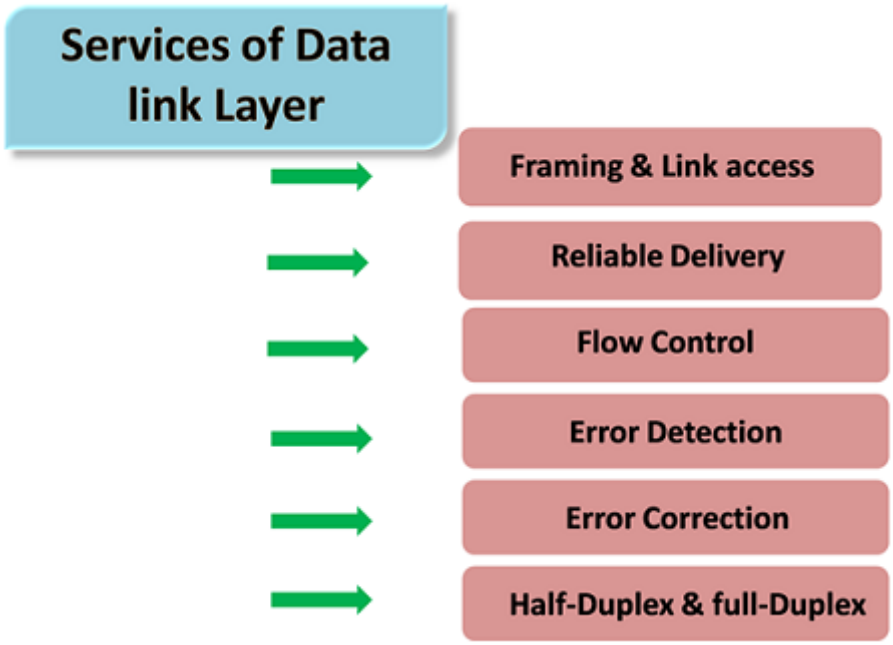
Data Link Layer

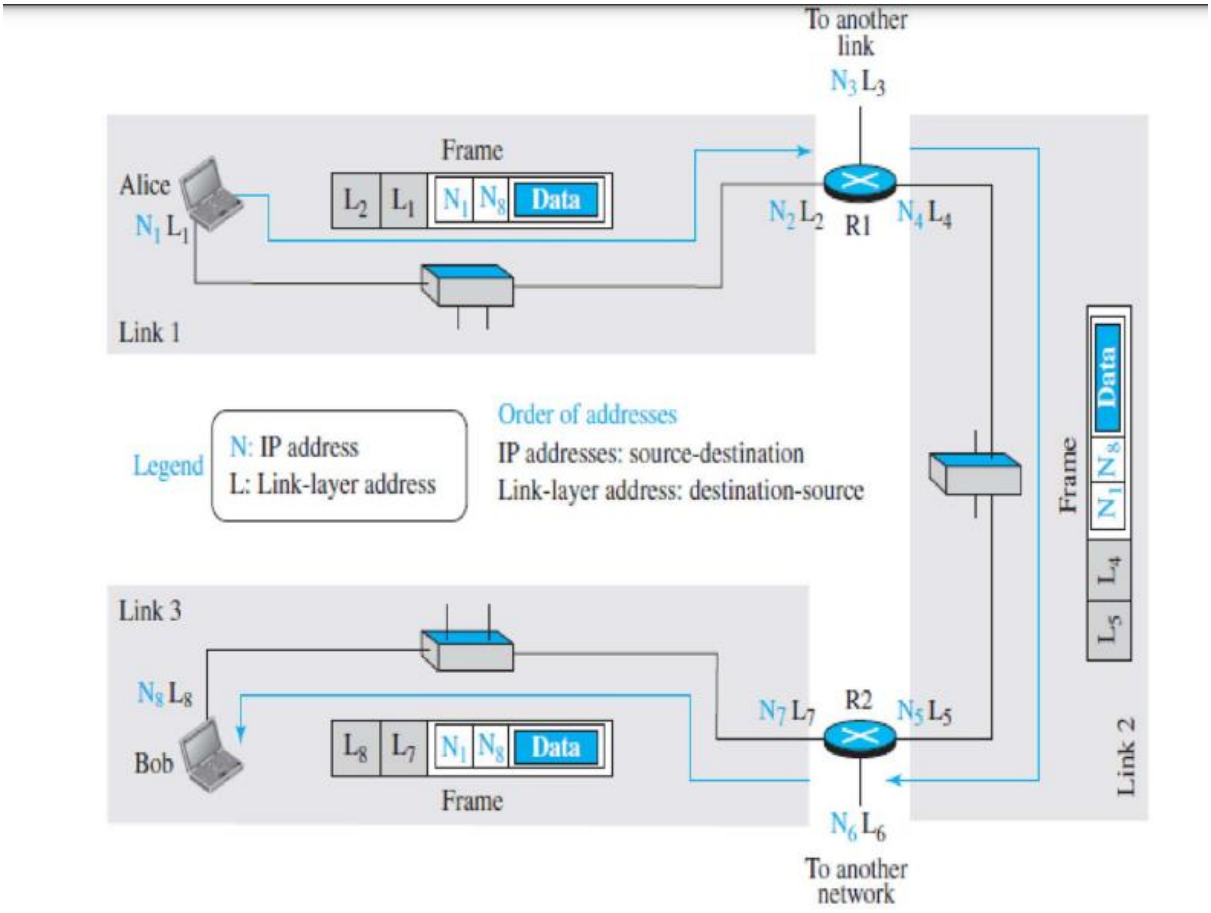
The data link layer takes the data bits and "frames," and creates packets of the data to guarantee reliable transmission. This layer adds source and destination addresses to the data stream as well as information to detect and control transmission errors.



Link Layer Addressing

A MAC address, which stands for Media Access Control Address, is a physical address that works at the Data Link Layer.

A link-layer address is called a link address, called a physical address, and sometimes a MAC address. Since a link is controlled at the data-link layer, the addresses need to belong to the data-link layer. When a datagram passes from the network layer to the data-link layer,the datagram will be encapsulated in a frame and two data-link addresses are added to the frame header.These two addresses are changed every time the frame moves from one link to another.



Here we have three links and two routers. We have two hosts: Alice (source) and Bob (destination). For each host, we have shown two addresses, the IP addresses (N) and the link-layer addresses (L).

We have three frames, one in each link.Each frame carries the same datagram with the same source and destination addresses (N1 and N8), but the link-layer addresses of the frame change from link to link. In link 1, the link-layer addresses are L1 and L2.

In link 2, they are L4 and L5. In link 3, they are L7 and L8. Note that the IP addresses and the link-layer addresses are not in the same order. For IP addresses, the source address comes before the destination address; for link-layer addresses, the destination address comes before the source.

Unicast Address

Each host or each interface of a router is assigned a unicast address. Unicasting means one to-one communication. A frame with a unicast address destination is destined onlyf or one entity in the link. Example

The unicast link-layer addresses in the most common LAN, Ethernet, are 48 bits (six bytes) that are presented as 12 hexadecimal digits separated by colons;

for example, the following is a link-layer address of a computer.

A3:34:45:11:92:F1

Multicast Address Some link-layer protocols define multicast addresses. Multicasting means one-to many communication.

Example The multicast link-layer addresses in the most common LAN,Ethernet, are 48 bits (six bytes) that are presented as 12 hexadecimal digits separated by colons.The second digit, needs to be an even number in hexadecimal.

The following shows a multicast address:

A2:34:45:11:92:F1

Broadcast Address Some link-layer protocols define a broadcast address. Broadcasting means one-to-all communication. A frame with a destination broadcast address is sent to all entities in the link. Example

The broadcast link-layer addresses in the most common LAN,Ethernet, are 48 bits, all 1s, that are presented as 12 hexadecimal digits separated by colons. The following shows a broadcast address: FF:FF:FF:FF:FF:FF .