



# Computer Networks I

3<sup>rd</sup> stage

Lecture No. 6

## Network –Datalink- Physical Layer

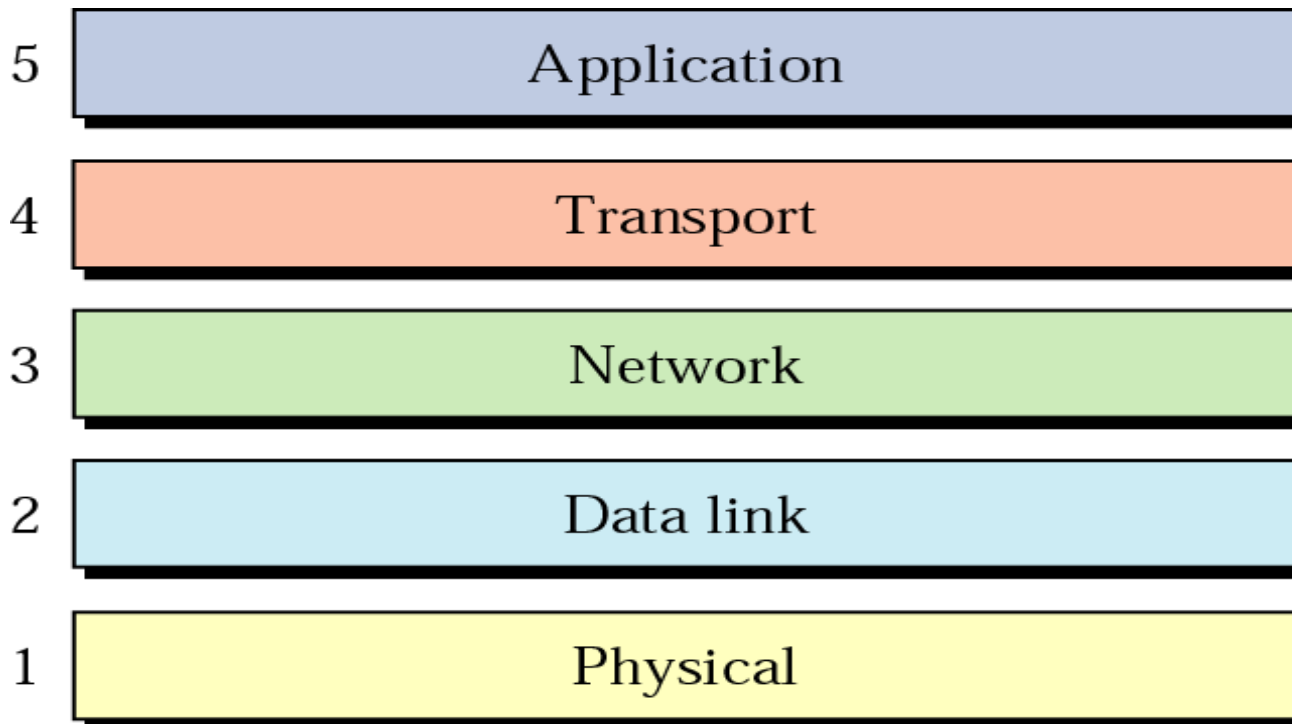
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# *Internet layers*

*The layers in the **TCP/IP protocol** suite is made of five layers:  
physical, data link, network, transport, and application.*



***Layer:** A grouping of related tasks involving the transfer of information  
.Each layer addresses an essential networking tasks*

# *Organization of the layers*

- **Network support layer :**

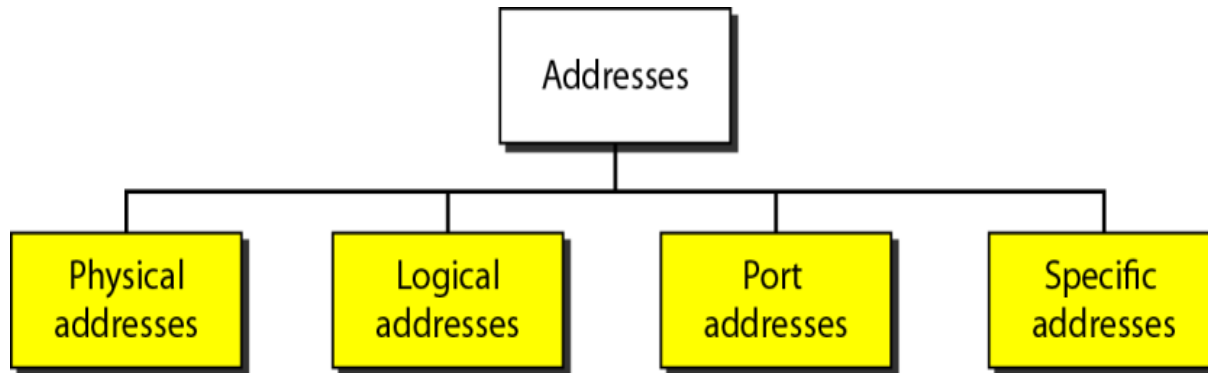
Deal with the physical aspects of moving data from one device to another such as :electrical specifications , physical connections, physical addressing, transport timing and reliability. Includes **Layers 1, 2 and 3**

- **User support layer:**      Application layer

**Layer 4 (transport layer)** links the two subgroups to insure that what the lower layers have transmitted is in form the upper layer can use.

# ADDRESSING

Four levels of addresses are used in an internet employing the TCP/IP protocols: **physical**, **logical**, **port** and **Specific addresses**



## Specific addresses:

examples:

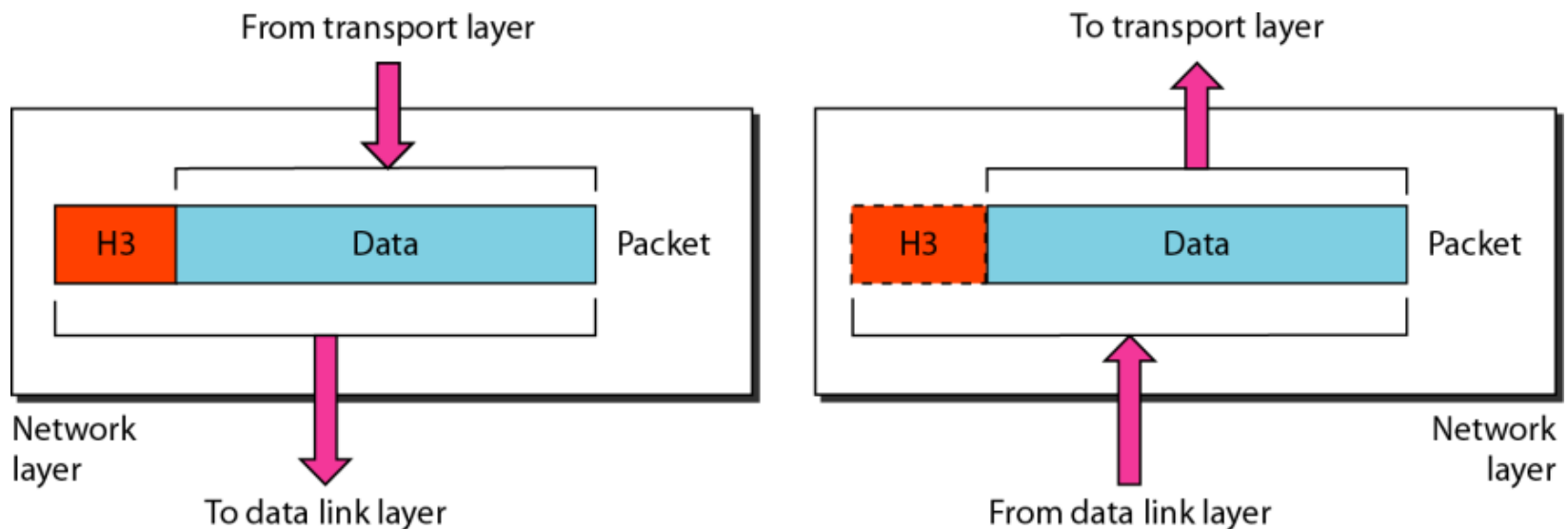
**e-mail** addresses ( gihanagib @yahoo.com) to define the recipient of an e-mail

**URL** addresses ( www.Mhhe.com) to find a document on the world wide web

The addresses get changed to the corresponding **port** and **logical** addresses by the sending computer

# Network layer source to destination delivery

- The network layer is responsible for the delivery of individual packets from the source host to the destination host across multiple network.
- If two system are connected to the same link (network), no need for this layer.



## *Duties of network layer ( internetwork layer)*

### ▪ **Logical addressing**

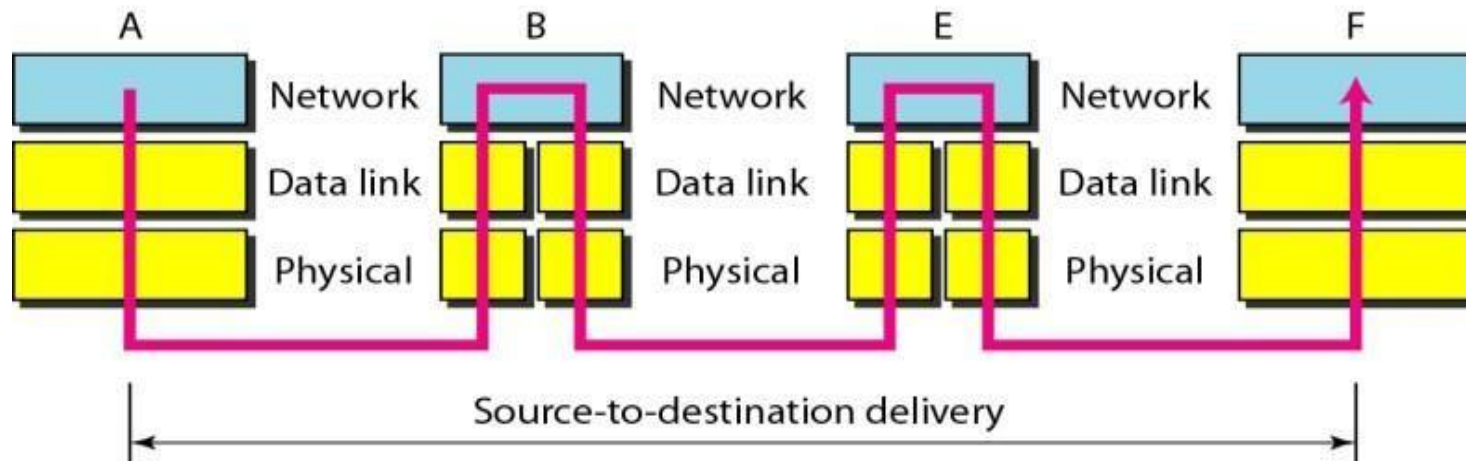
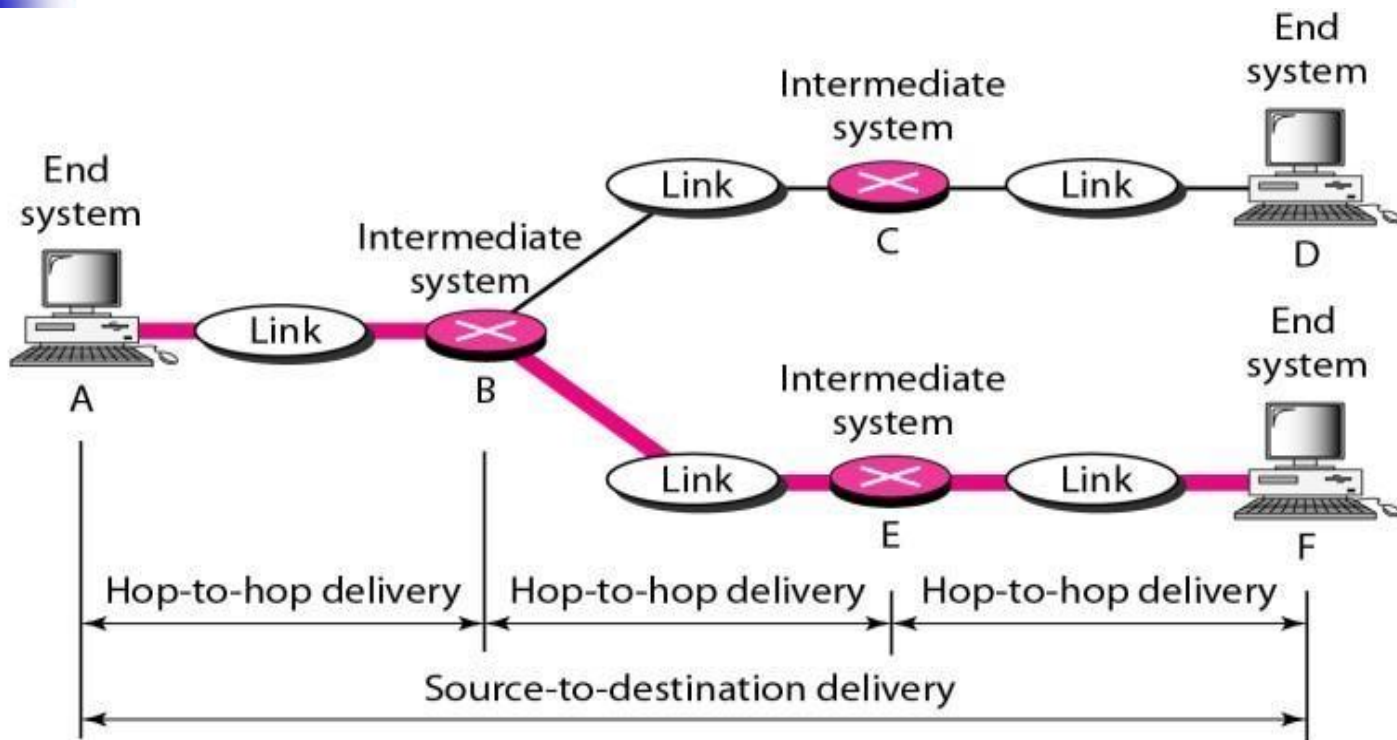
- In contrast to physical addressing implemented by data link layer handling the addressing problem locally. Network layer adds unique identifier ( IP or logical address) to the packet.
- These unique identifier( as tel. no, each tel. has unique number ) **enable special devices called router** to make sure the packet get to correct system.

### **Routing:**

Provide the routing mechanism for the **router** which route the packet to their final destination.

**Routers** : devices used when independent networks are connected to create an internetworking ( network of networks).

# Source-to-destination delivery





## *Logical Addresses (IP)*

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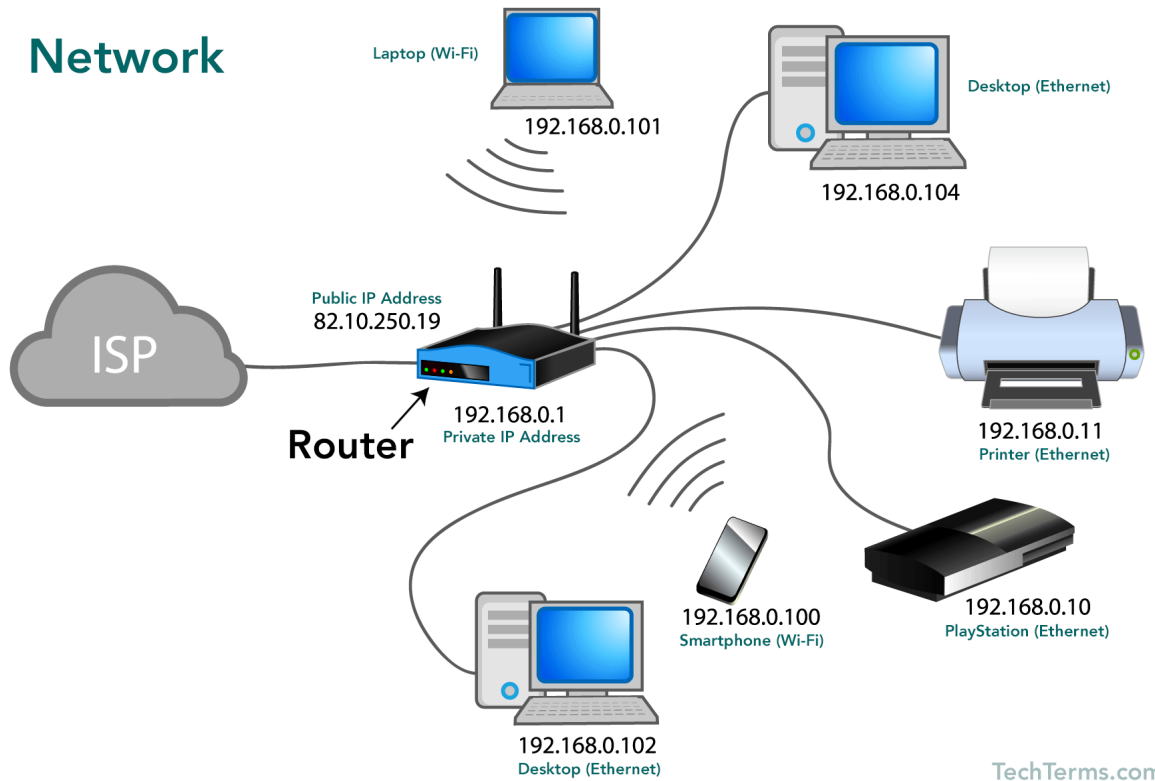
- IP addresses are necessary for universal communications that are independent of physical network.
- No two host address on the internet can have the same IP address
- **IP addresses 32-bit address that uniquely define a host connected to the Internet**

*The physical addresses will change from hop to hop, but the logical addresses remain the same.*

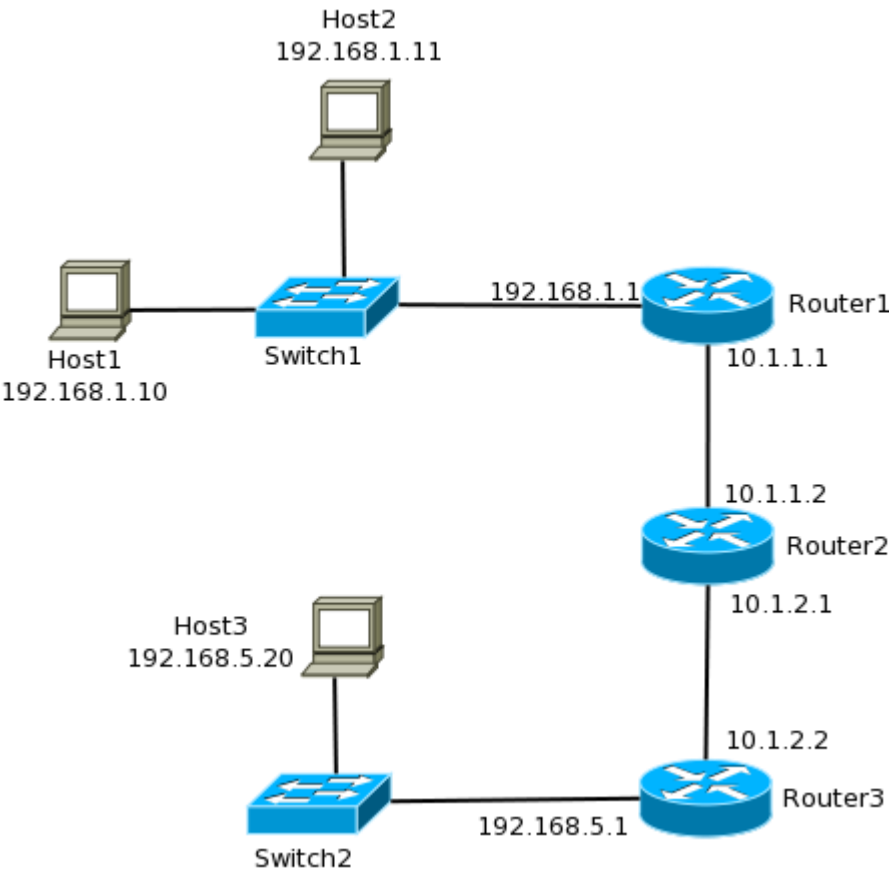


# Logical Addresses (IP)

## Network

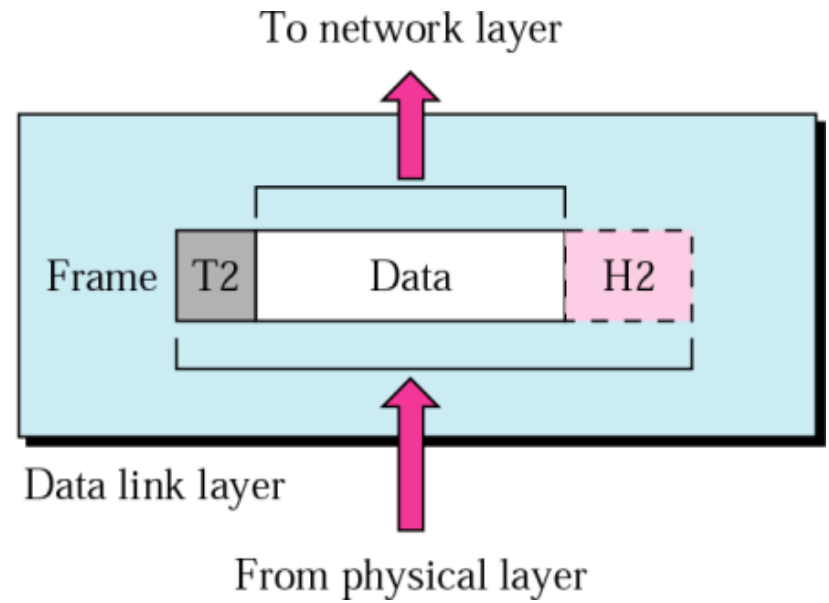
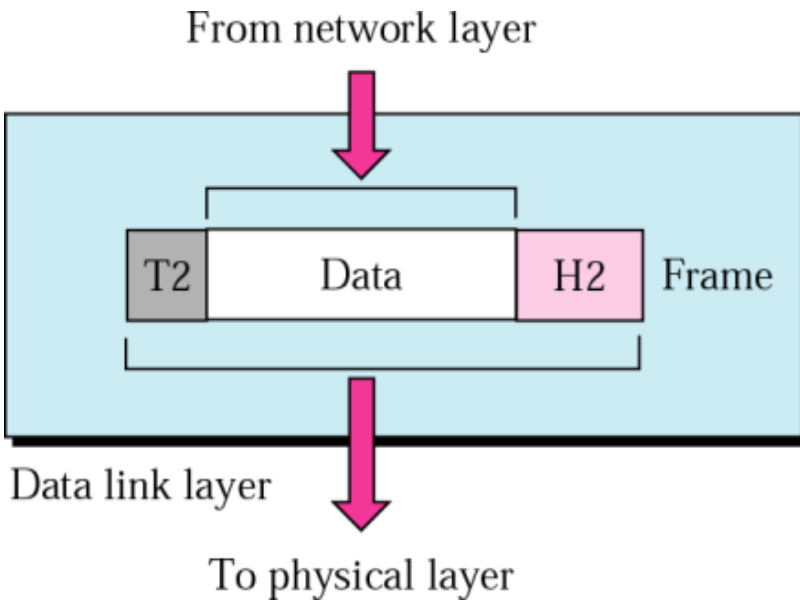


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# *Data link layer hop to-hop delivery*

**The data link layer is responsible for moving frames from one hop (node) to the next.**



# *Duties of data link layer*

## **Framing:**

- Divide the stream of bits received from network layer into data units called **frames**

## **Physical addressing:**

- It adds a header to the frame to define the sender and receiver of the frame.
- If the frame for a system outside the sender's network the **receiver address**: is the address of the connecting device that connects the network to next one (Router/switch).

## **Flow control:**

- It imposes a flow control mechanism, if the data rate at the receiver is less than produced by sender the data link layer imposes a flow control to avoid overwhelming the receive

# *Duties of data link layer*

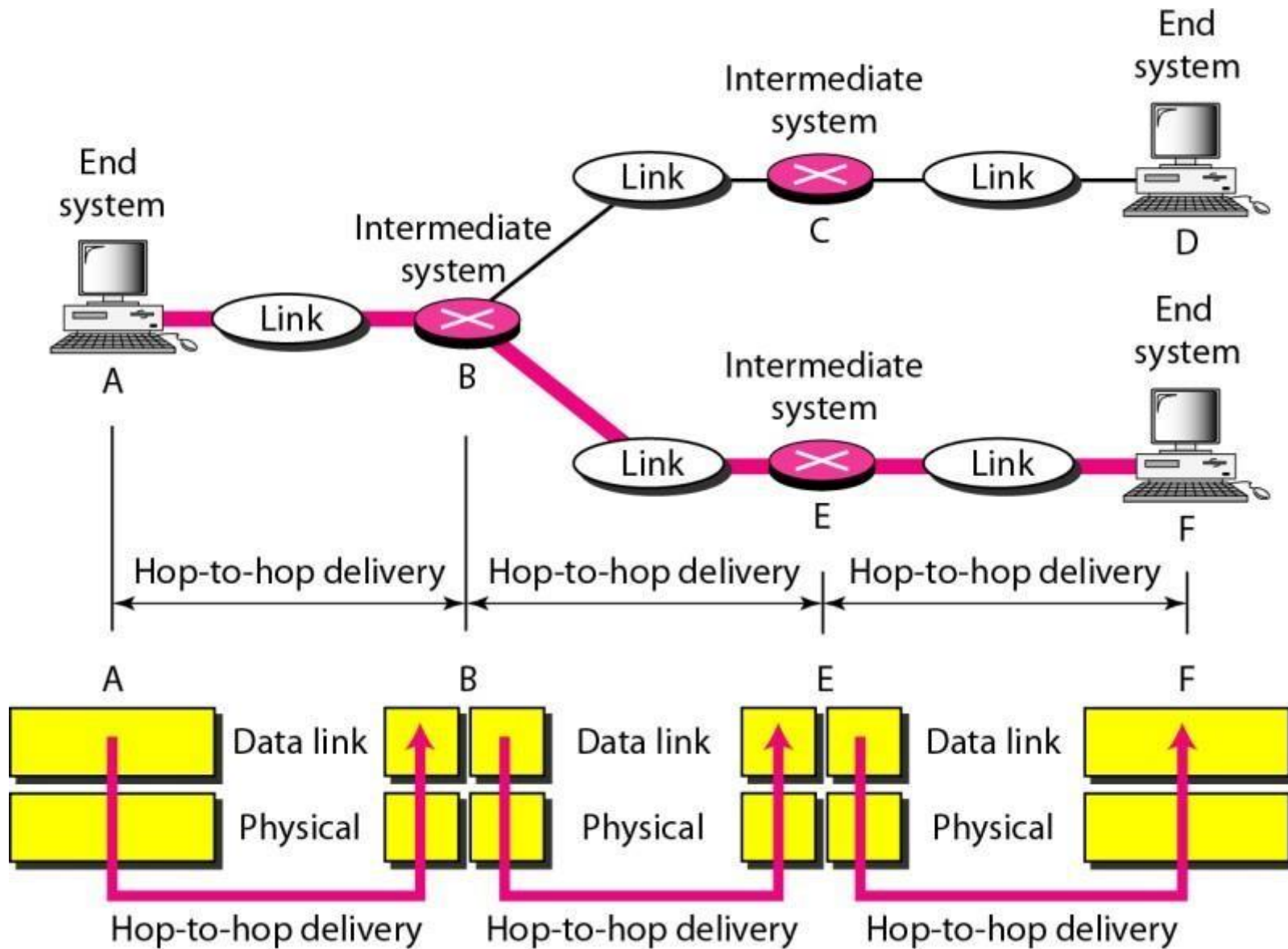
## **Error control:**

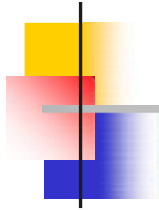
- Add mechanisms to detect and retransmit damaged or lost frames.
- Prevent also duplication of frames.
- Error control is normally achieved through a trailer added to the end of frame.

## **Access control:**

- When two or more devices than one devices are connected to the same link, data link layer protocols are necessary to determine which device has control over the link at given time.

# Hop-to-hop delivery





## *Physical address*

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- Known also as the **MAC** or link address
- Is the address of a node as defined by its LAN or WAN
- It is included in the frame used by data link layer (Header)
- Ethernet uses 6-bytes (48-bits) physical address **that imprinted on the NIC**

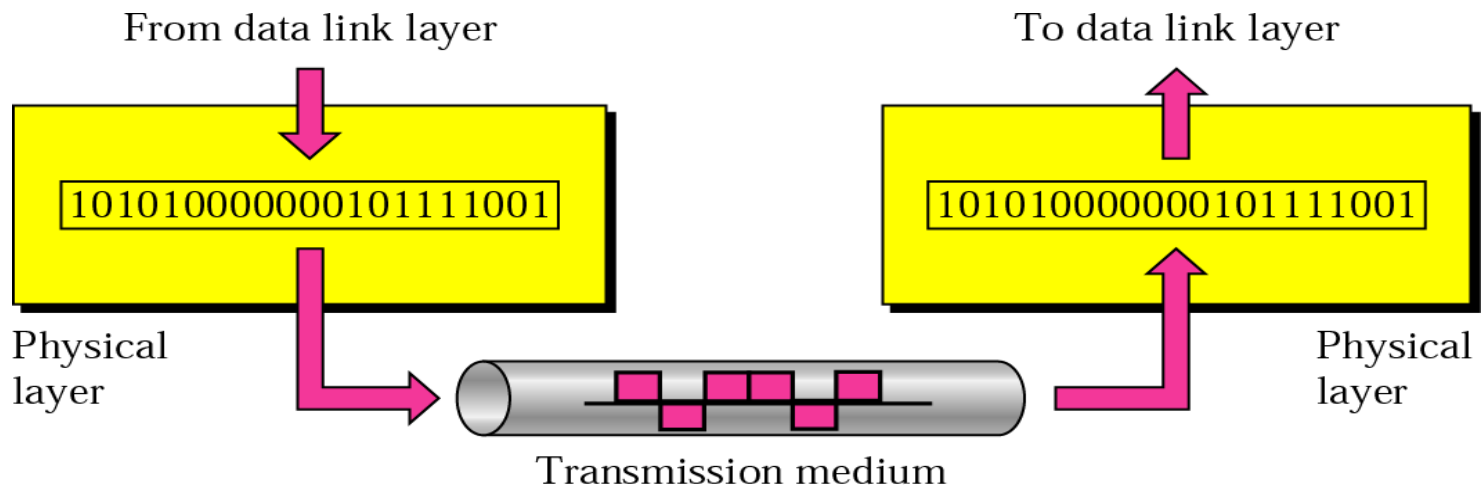
# *Physical address (MAC)*



MAC Addresses  
are physically  
attached to a  
hardware device.

# *Physical layer*

**The physical layer is responsible for movements of individual bits from one hop (node) to the next.**





# *Duties of physical layer*

## Physical characteristic of interfaces and media:

- It defines the characteristic of the interface between devices and media. It also define the type of transmission media

## Representation of bits:

- The bit stream must be encoded into signals. It defines the type of representation ( how 0, 1 are changed to signal).

## Data rate:

- It defines the number of bits sent per second and also the duration of bits.

## Synchronization of bits

- The sender and receiver must be use the same bit rate also the receiver clock must be synchronized

# *Duties of physical layer*

## Line Configuration

- Physical layer is concerned with the connection of devices to the media ( **point-to point or multipoint**)

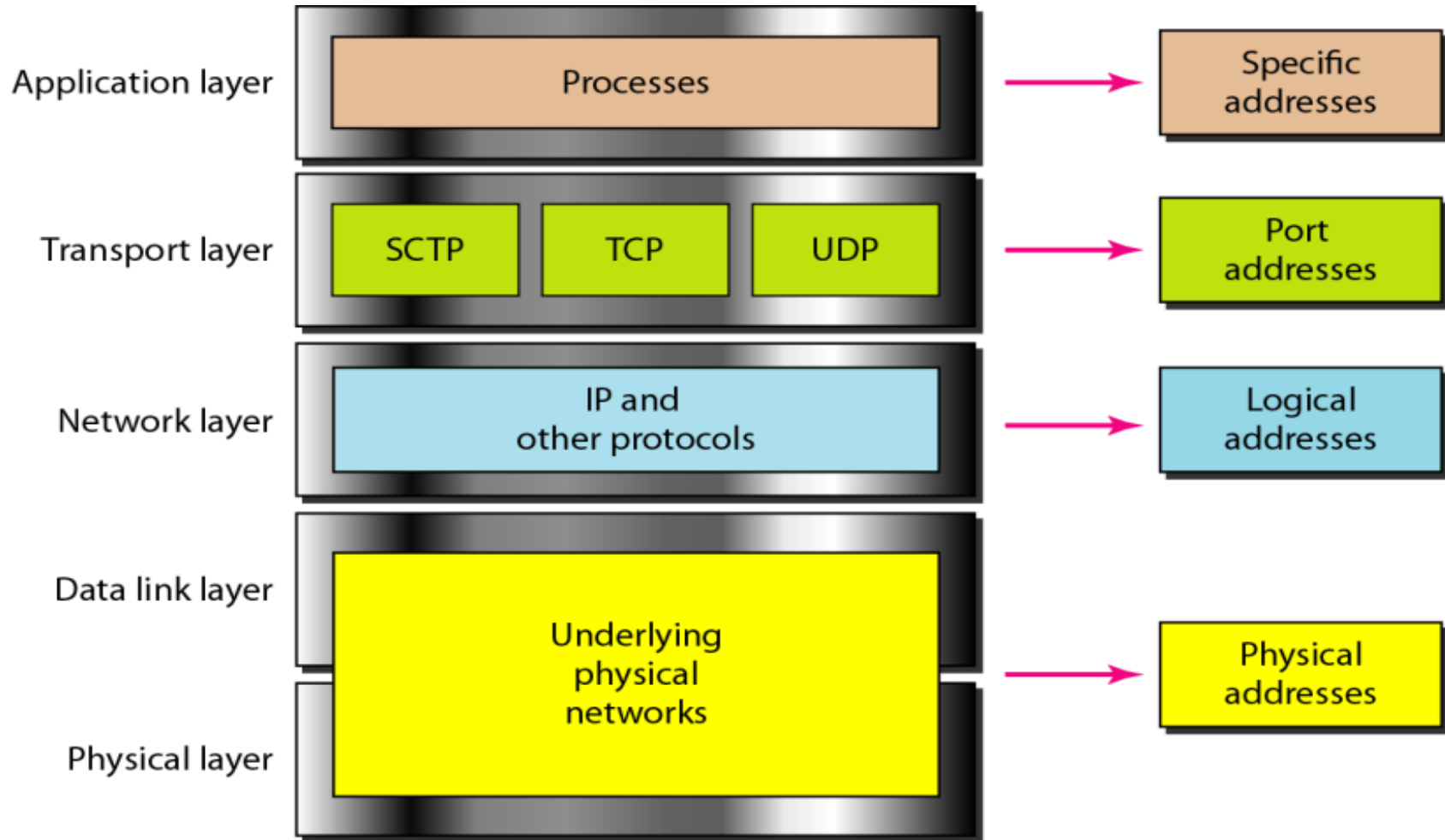
## Physical topology:

- How devices connected to make a network
- Devices can connected by using **Star, mesh , bus, ring or hybrid topology**

## Transmission mode:

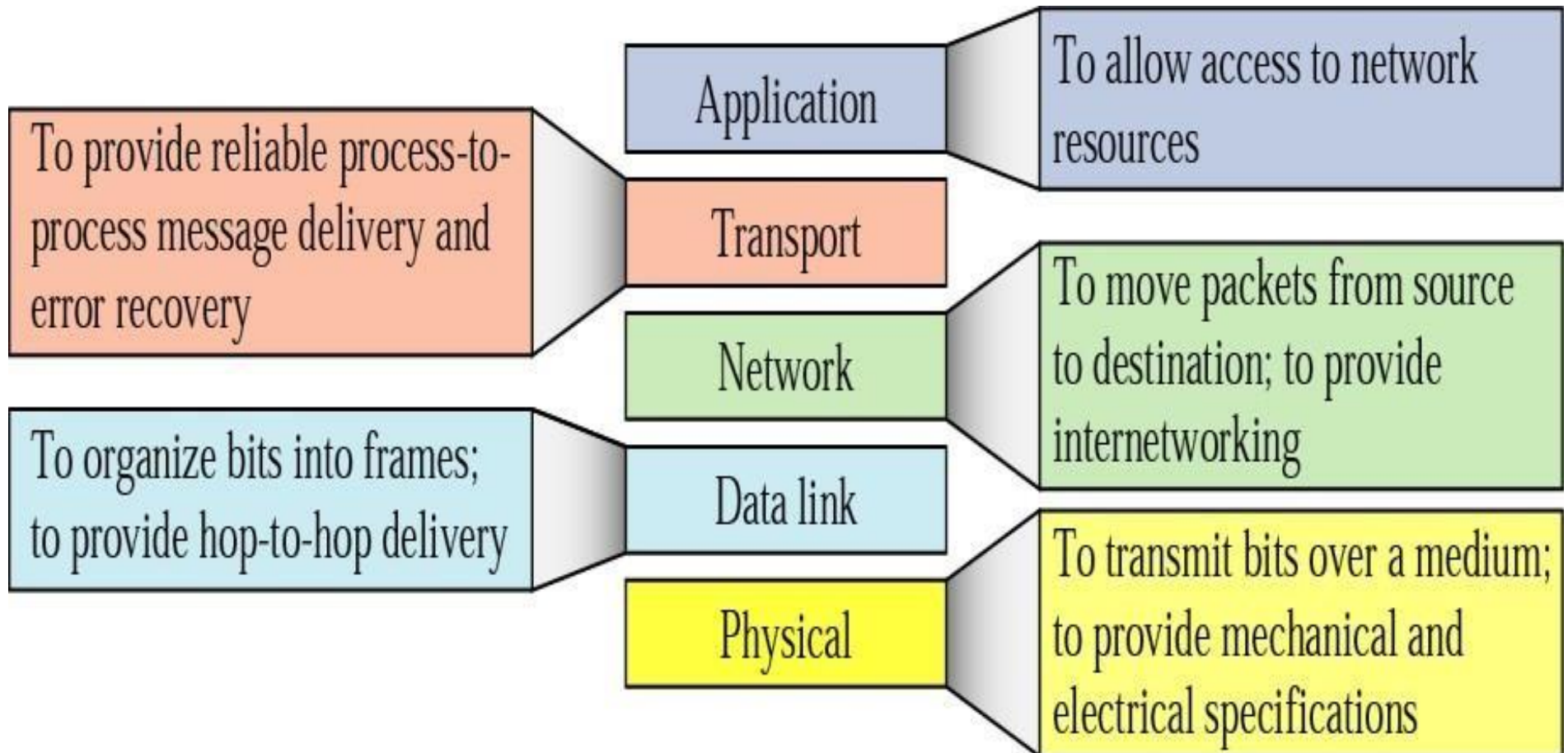
- It defines the direction of transmission between two devices (**simplex, half-duplex, or full duplex**)

# Relationship of layers and addresses in TCP/IP





# *Summary of duties*



*Thank you for listening*

*Taqwa Altameemi*