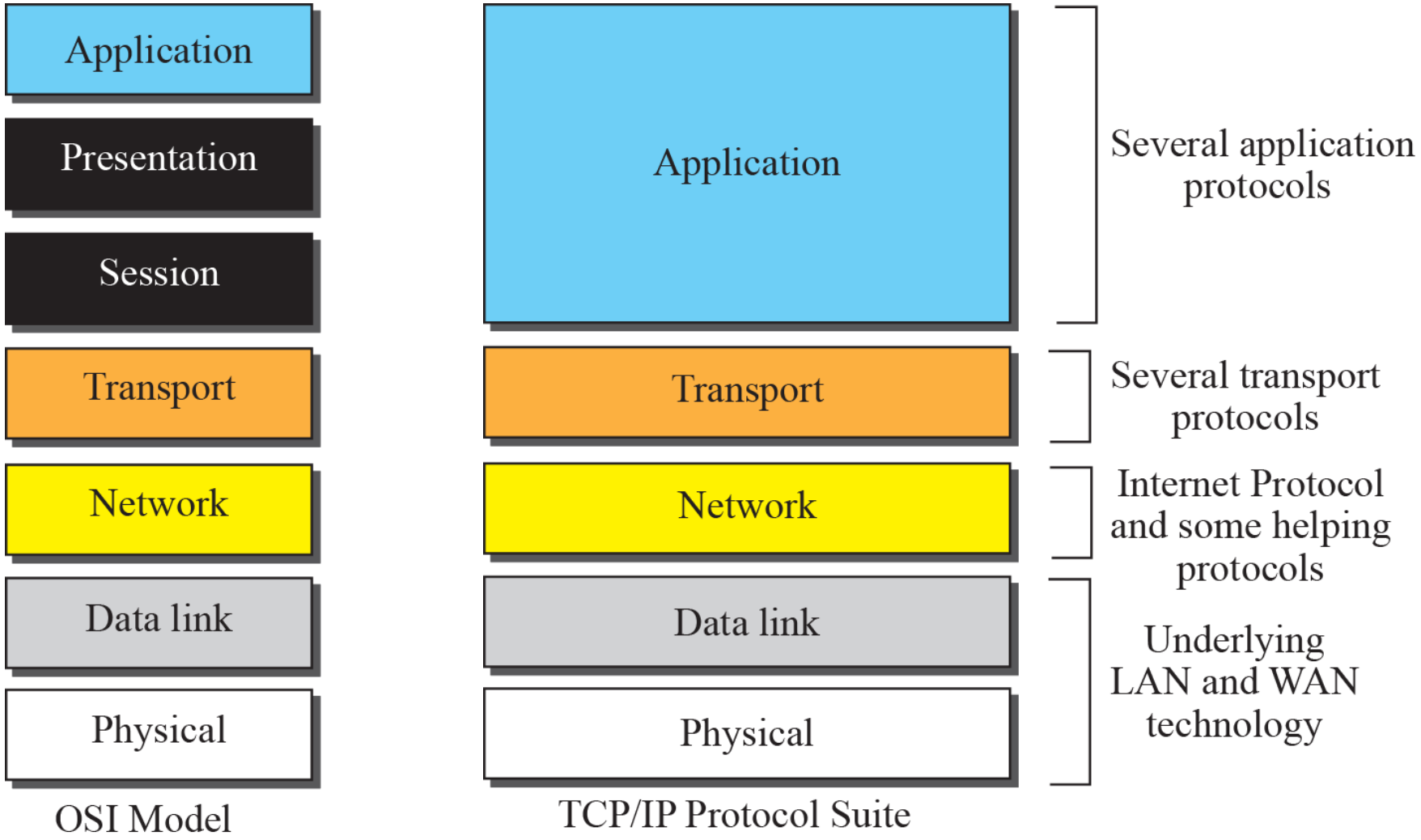
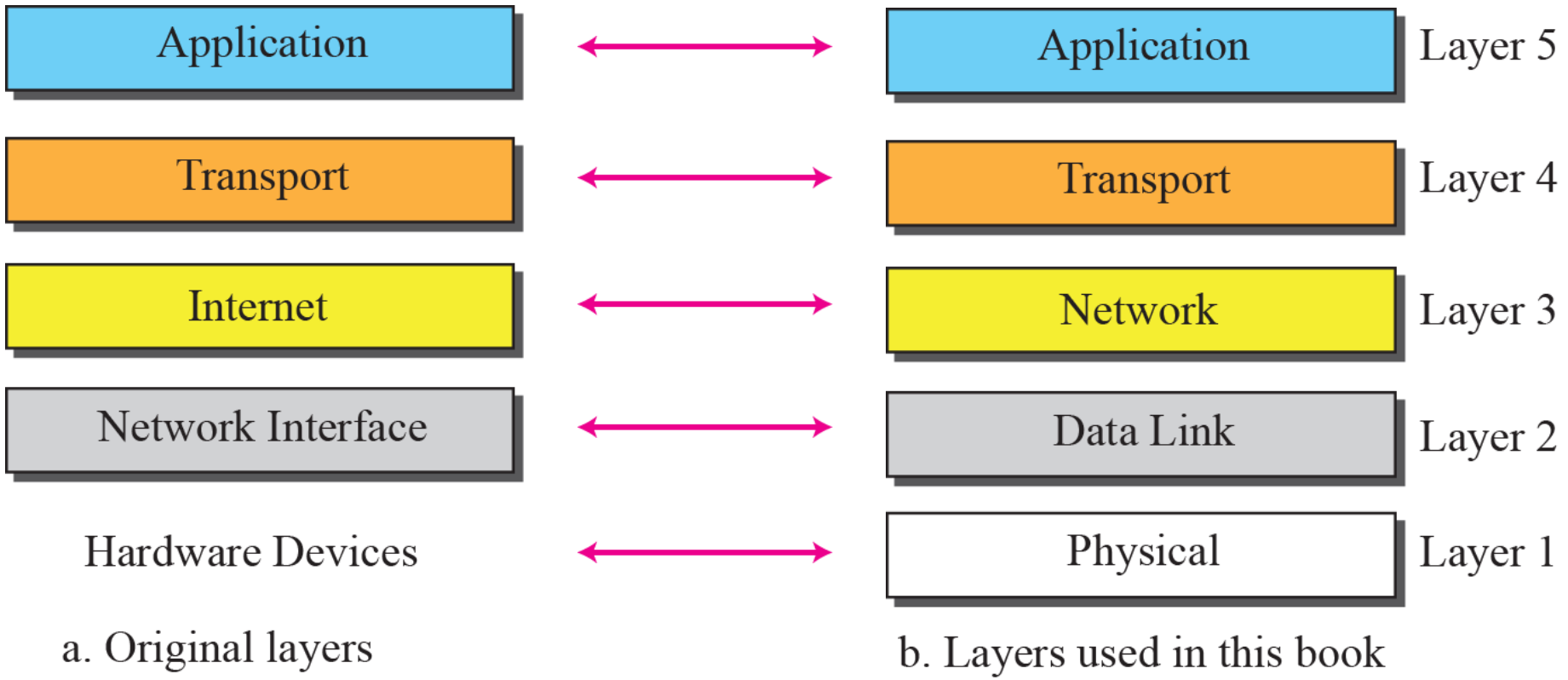
# TCP/IP PROTOCOL SUITE

*The layers in the TCP/IP protocol suite do not exactly match those in the OSI model. The original TCP/IP protocol suite was defined as having four layers: host-to-network, internet, transport, and application. However, when TCP/IP is compared to OSI, we can say that the TCP/IP protocol suite is made of five layers: physical, data link, network, transport, and application.*

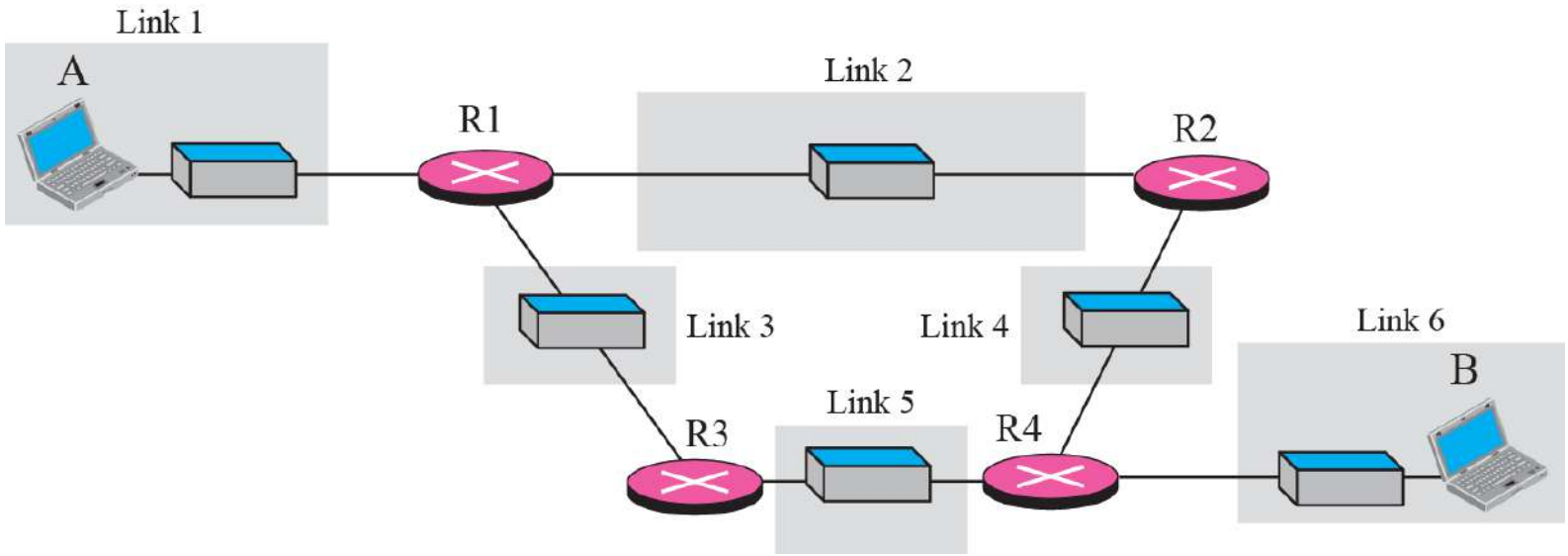
# *TCP/IP and OSI model*



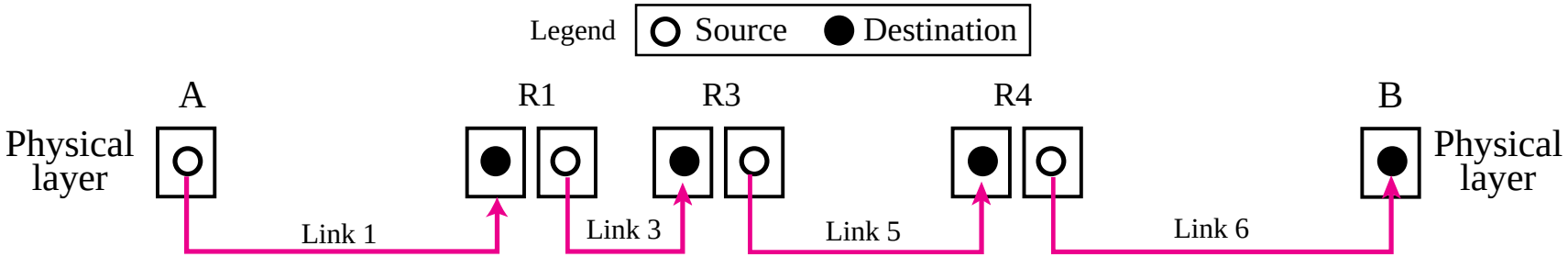
# *Layers in the TCP/IP Protocol Suite*

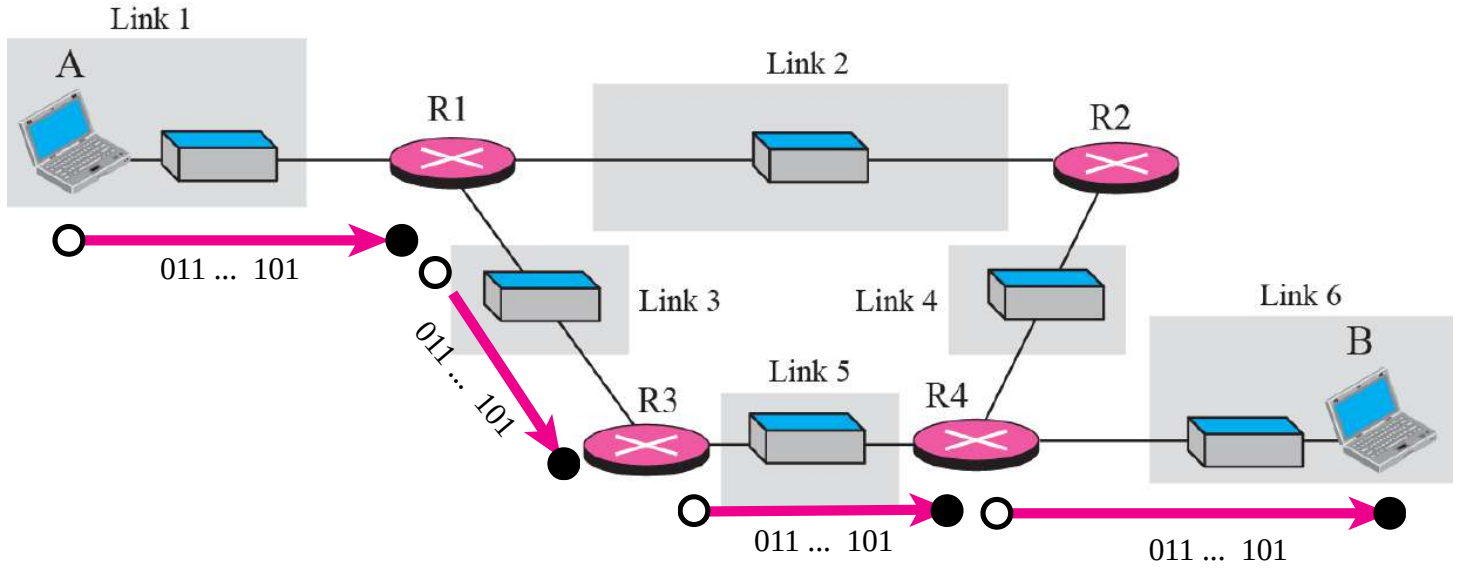


# *A private internet*

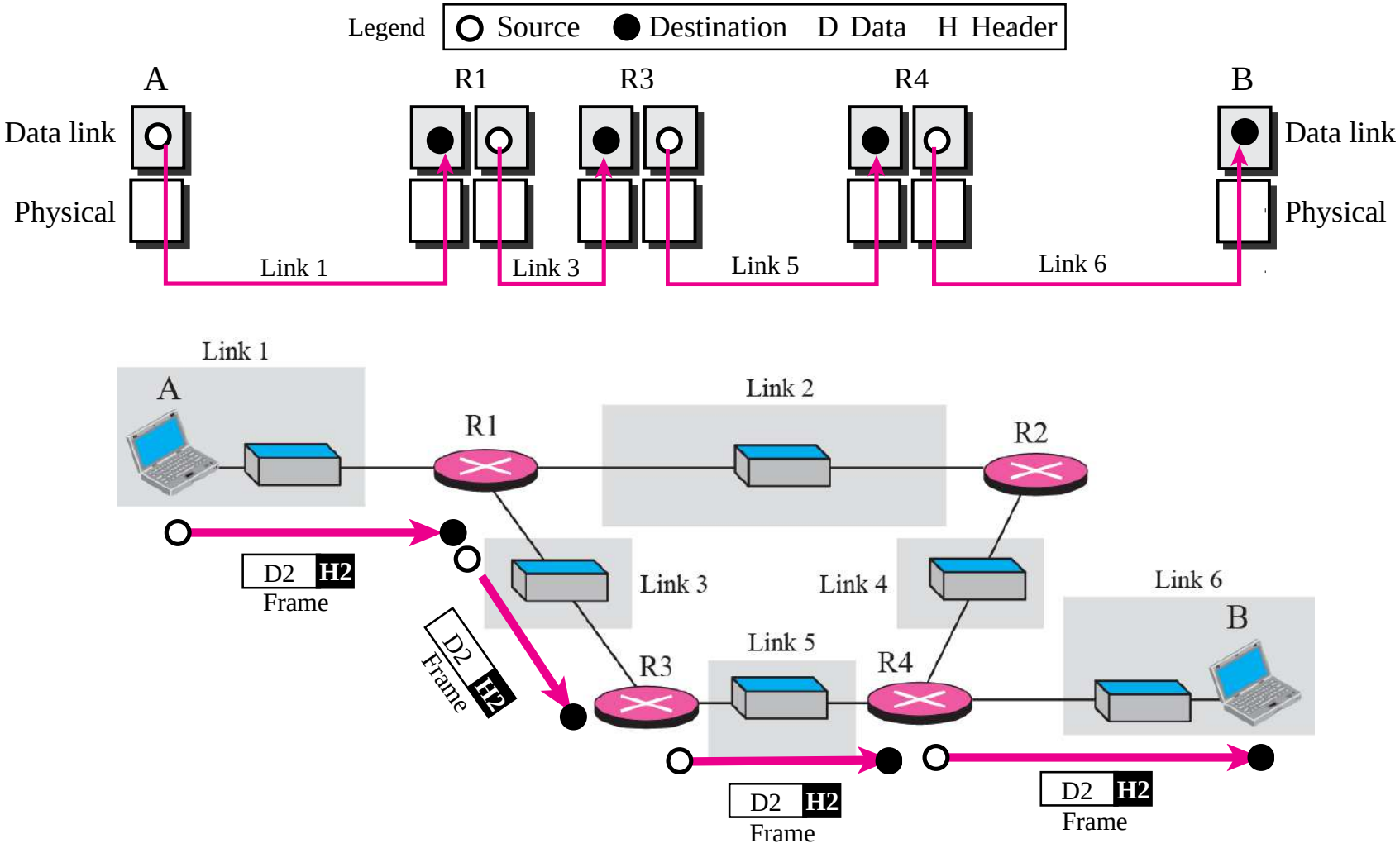


# *Communication at the physical layer*

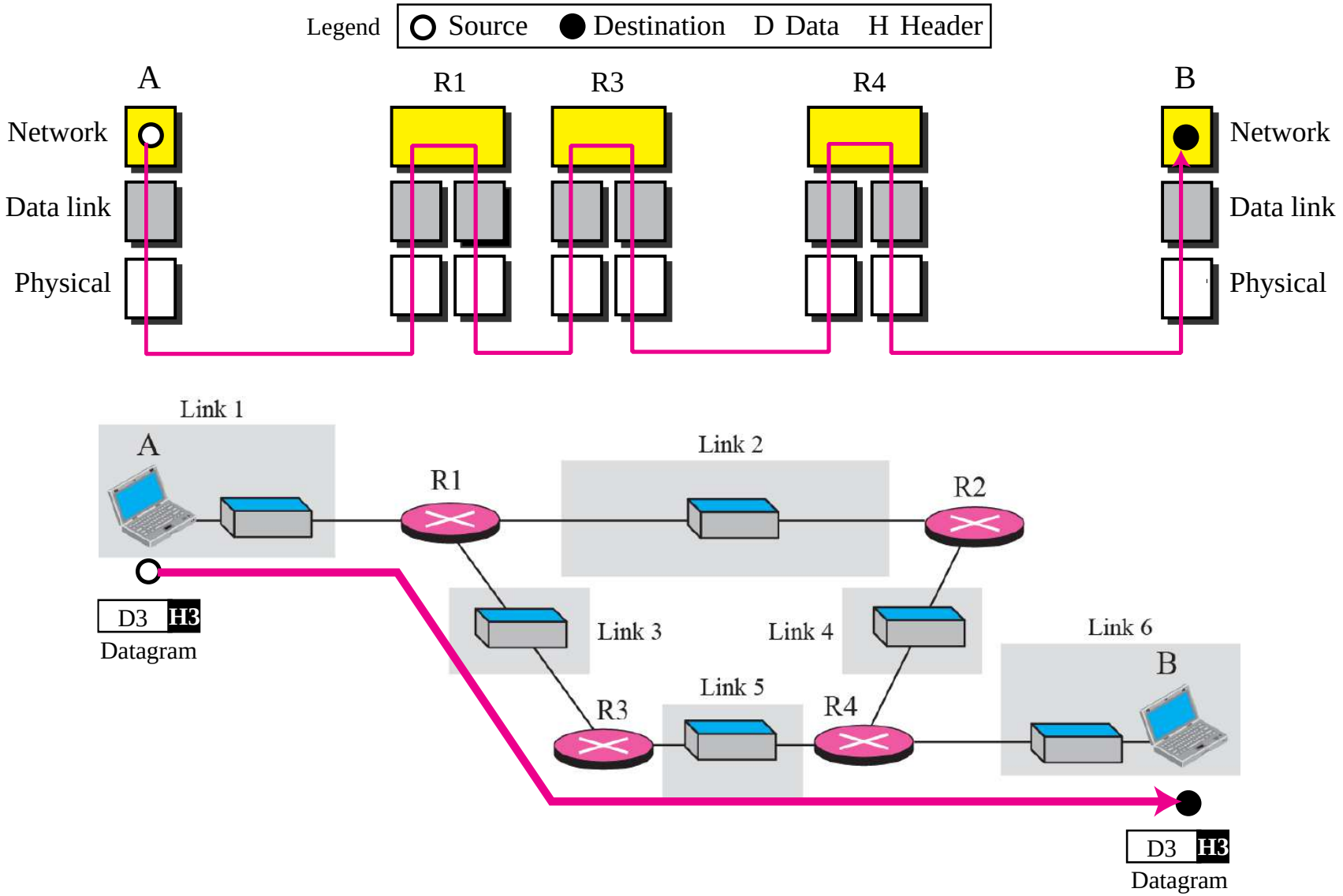


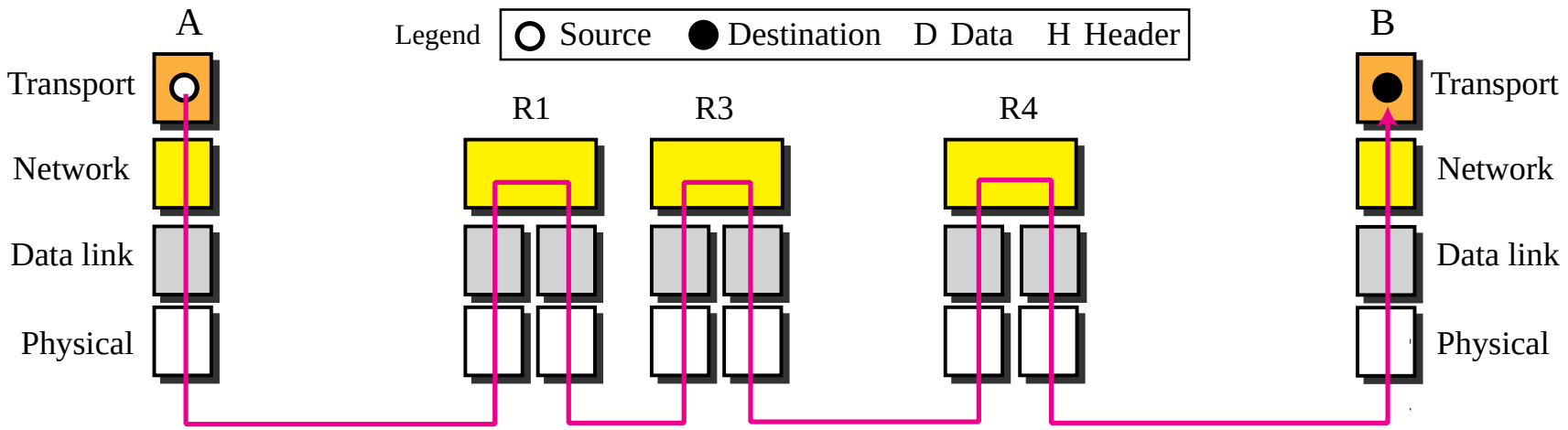
# *Communication at the data link layer*

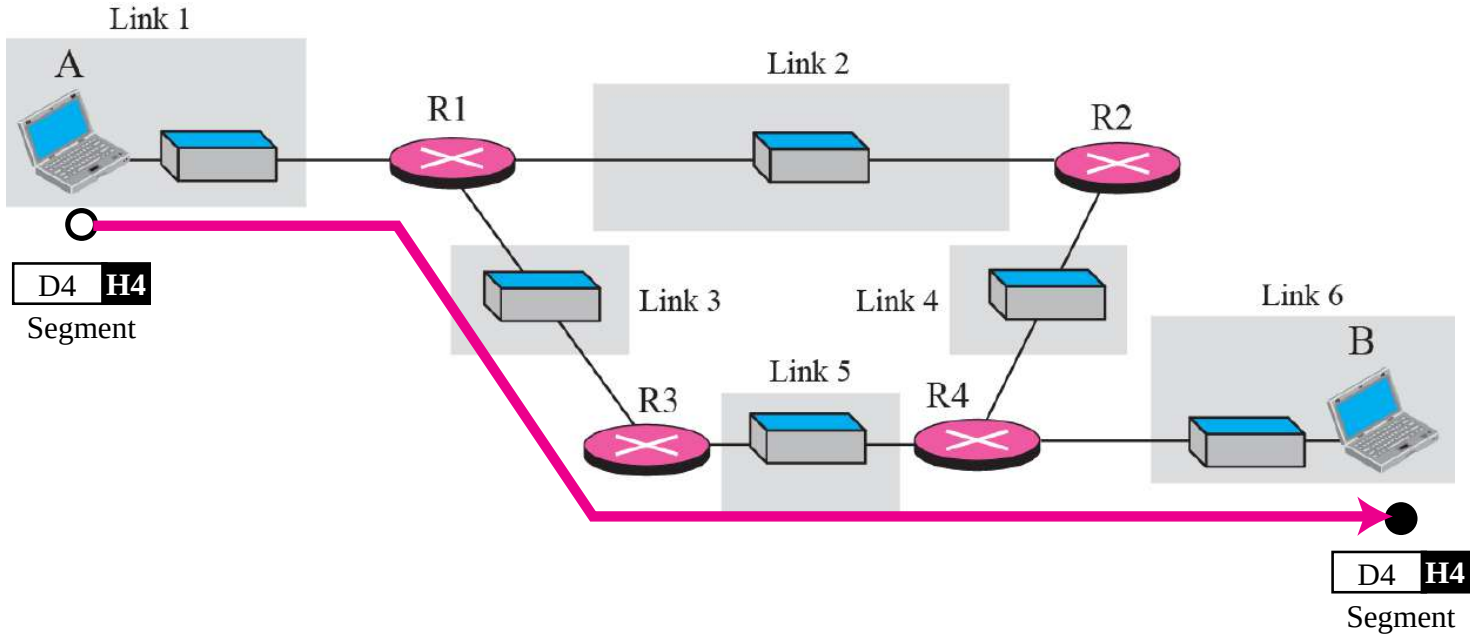


# *Communication at the network layer*

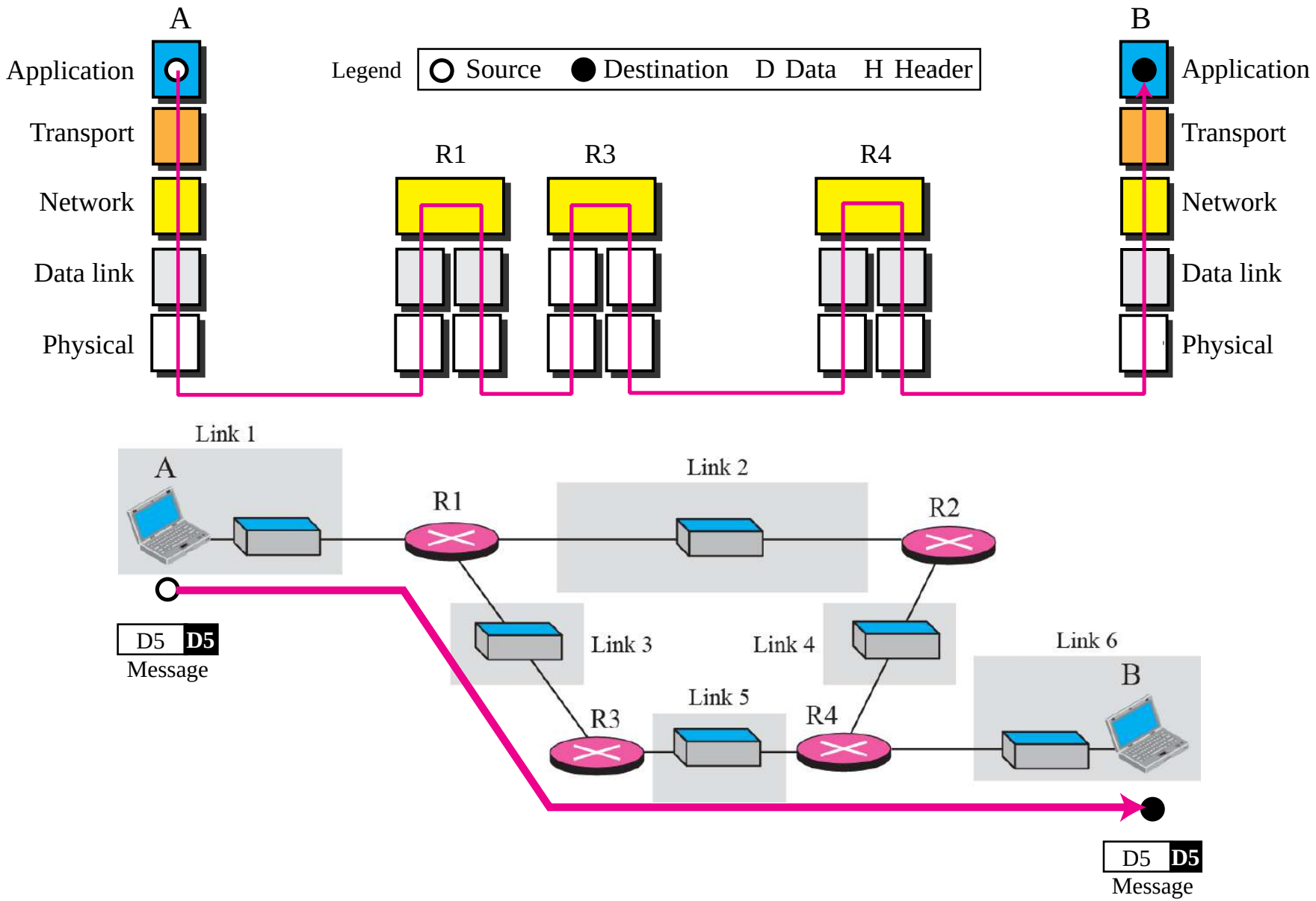


# *Communication at transport layer*

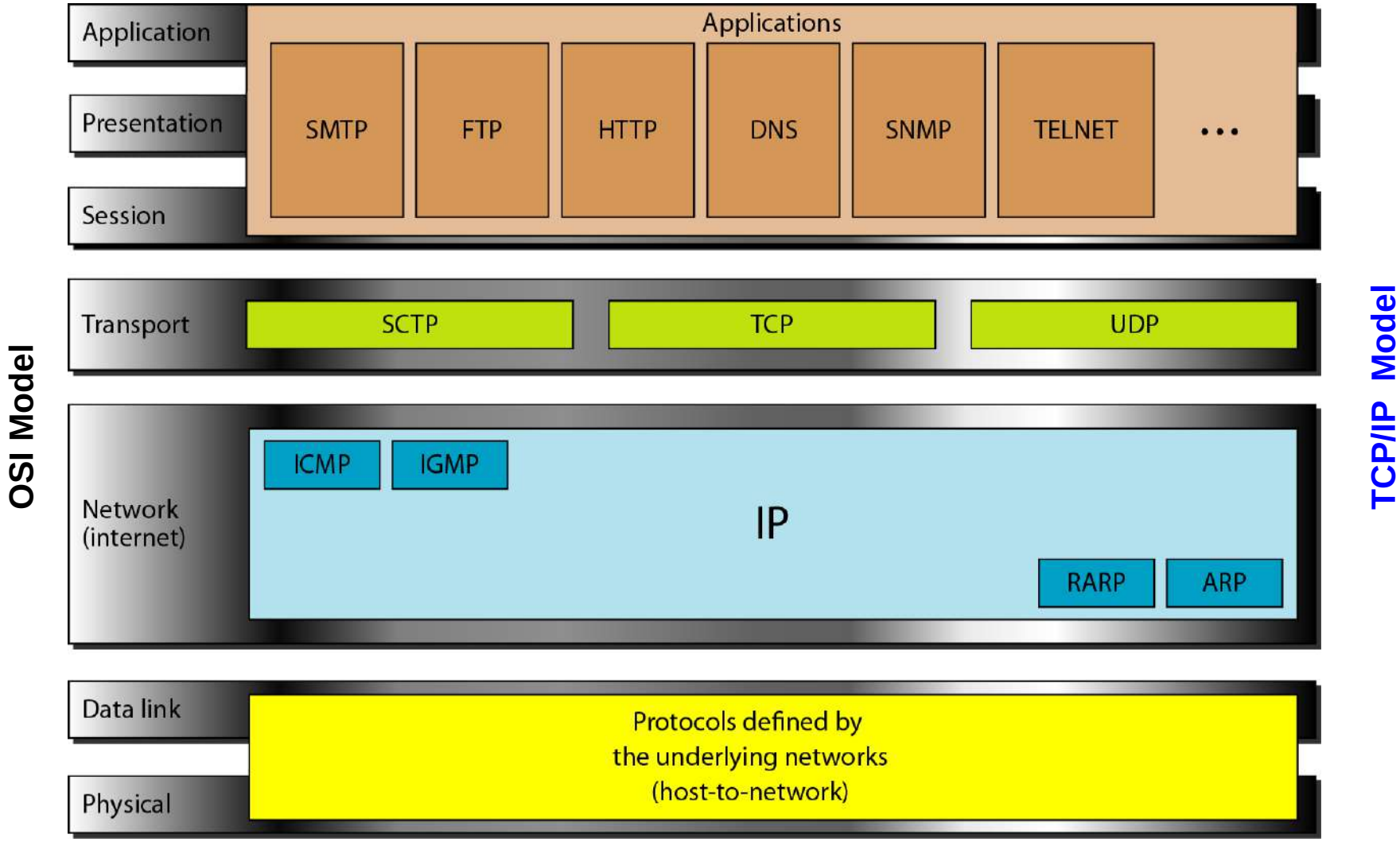


# *Communication at application layer*



# TCP/IP and OSI model



# Internet Layer

TCP/IP  support the Internet Protocol IP ( unreliable).
IP is a host-to-host protocol.
*Supporting protocols:*

- Address Resolution Protocol (ARP)
- Reverse Address Resolution Protocol (RARP)
- Internet Control Massage Protocol (ICMP)
- Internet Group Massage Protocol (IGMP)

# Transport Layer

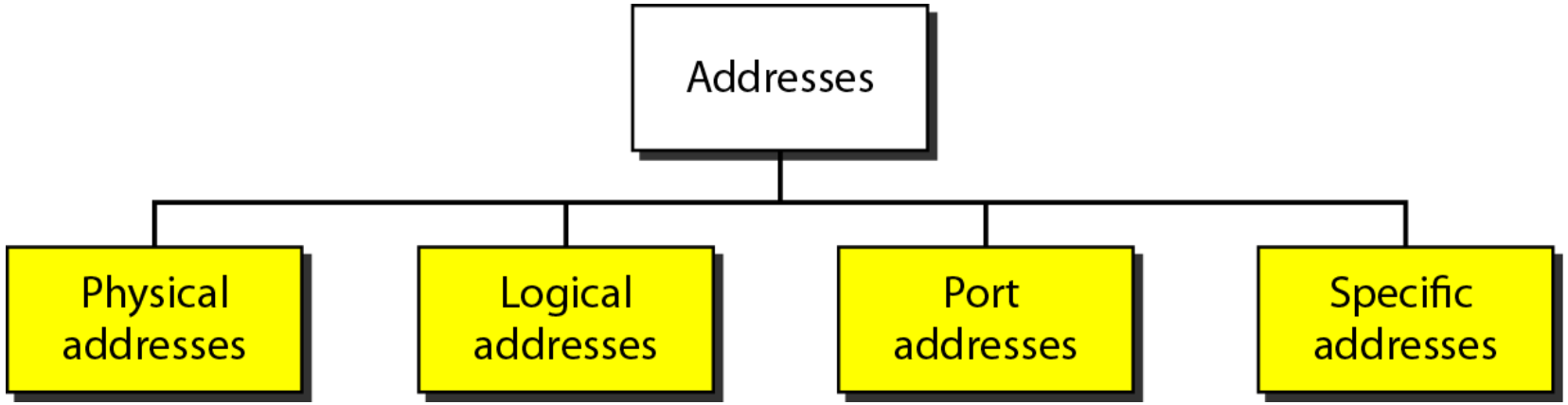
Process-to-process protocol.

- User Datagram Protocol (UDP)
- Transmission Control Protocol (TCP)
- Stream Control Transmission Protocol (SCTP)

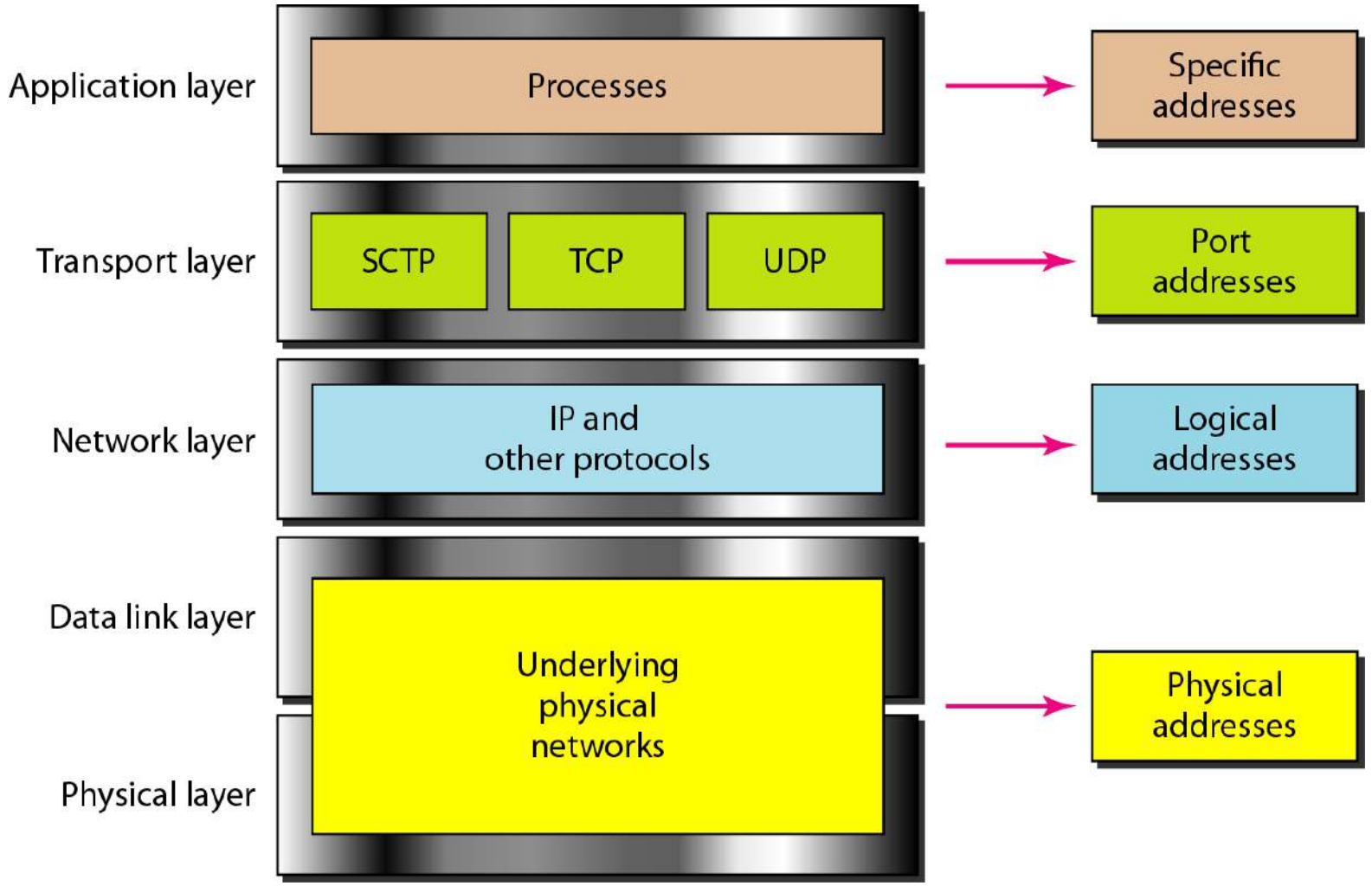
## 1-6 ADDRESSING

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

## *Addresses in TCP/IP*



## *Relationship of layers and addresses in TCP/IP*



# *Physical Address*

Physical addresses are imprinted on the NIC. Most local-area networks (Ethernet) use a 48-bit (6-byte) physical address written as 12 hexadecimal digits; every byte (2 hexadecimal digits) is separated by a colon.

**Example:**

**07:01:02:01:2C:4B**

**A 6-byte (12 hexadecimal digits) physical address.**

# *Physical Address*

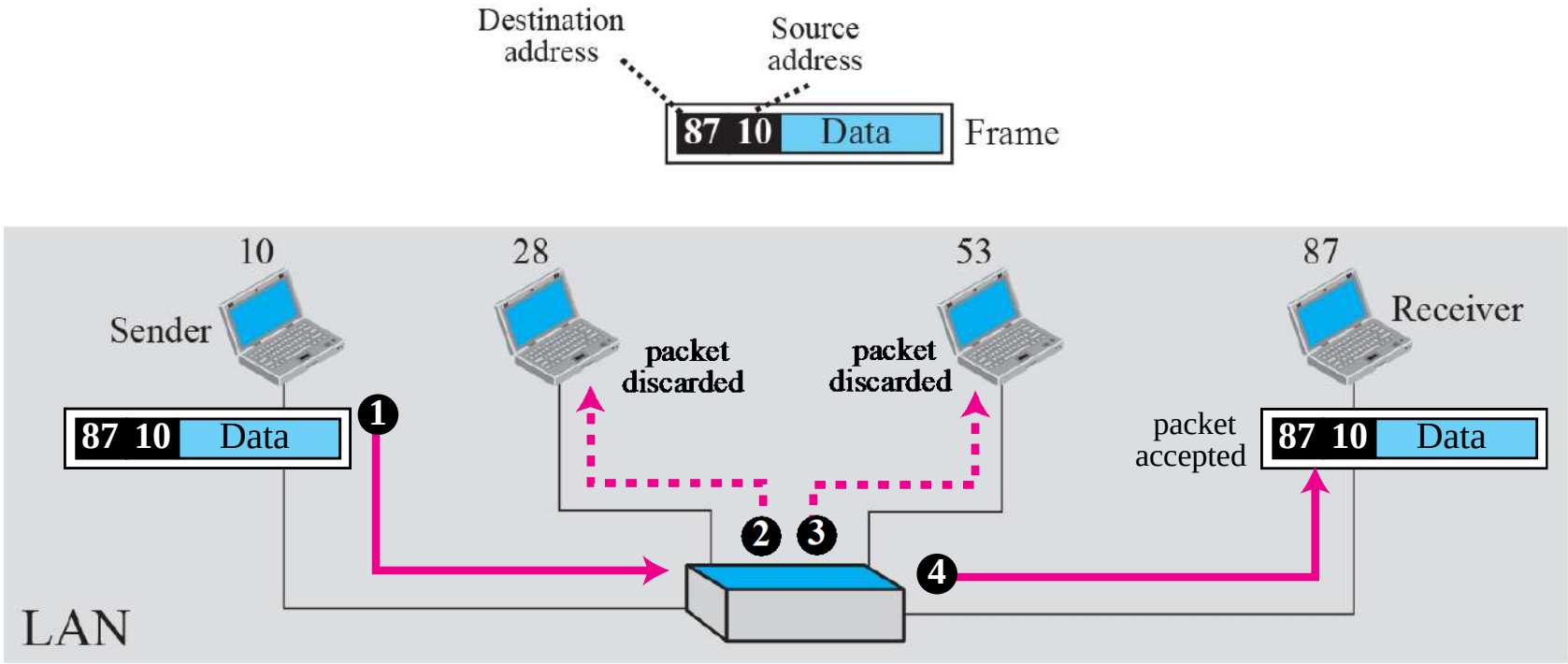
- known also as the MAC address
- Is the address of a node as defined by its LAN or WAN
- It is included in the frame used by data link layer

**The physical addresses in the datagram may change from hop to hop.**

Example 2.3

**In Figure 2.16 a node with physical address 10 sends a frame to a node with physical address 87. The two nodes are connected by a link (a LAN). At the data link layer, this frame contains physical (link) addresses in the header. These are the only addresses needed. The rest of the header contains other information needed at this level. As the figure shows, the computer with physical address 10 is the sender, and the computer with physical address 87 is the receiver. The data link layer at the sender receives data from an upper layer. It encapsulates the data in a frame. The frame is propagated through the LAN. Each station with a physical address other than 87 drops the frame because the destination address in the frame does not match its own physical address. The intended destination computer, however, finds a match between the destination address in the frame and its own physical address.**

# *Example 2.3: physical addresses*



# *Logical Address*

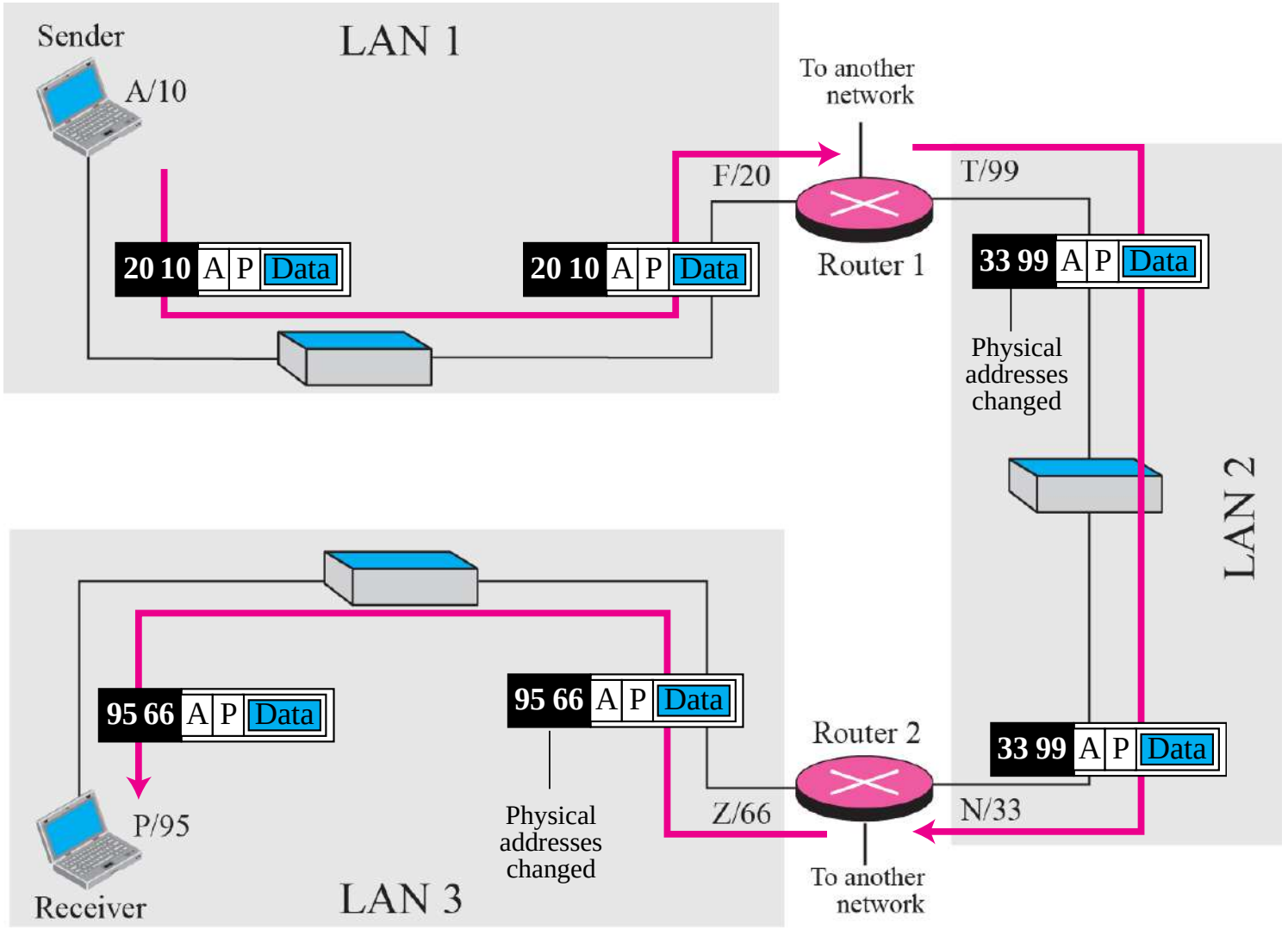
- IP addresses are necessary for universal communications that are independent of physical network.
- No two host address on the internet can have the same IP address
- IP addresses in the Internet are 32-bit address that uniquely define a host.

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

Example 2.5

**Figure 2.17 shows a part of an internet with two routers connecting three LANs. Each device (computer or router) has a pair of addresses (logical and physical) for each connection. In this case, each computer is connected to only one link and therefore has only one pair of addresses. Each router, however, is connected to three networks. So each router has three pairs of addresses, one for each connection. Although it may be obvious that each router must have a separate physical address for each connection, it may not be obvious why it needs a logical address for each connection. We discuss these issues in Chapters 11 and 12 when we discuss routing. The computer with logical address A and physical address 10 needs to send a packet to the computer with logical address P and physical address 95. We use letters to show the logical addresses and numbers for physical addresses, but note that both are actually numbers, as we will see in later chapters.**

# *Example 2.5: logical addresses*



# Port addresses

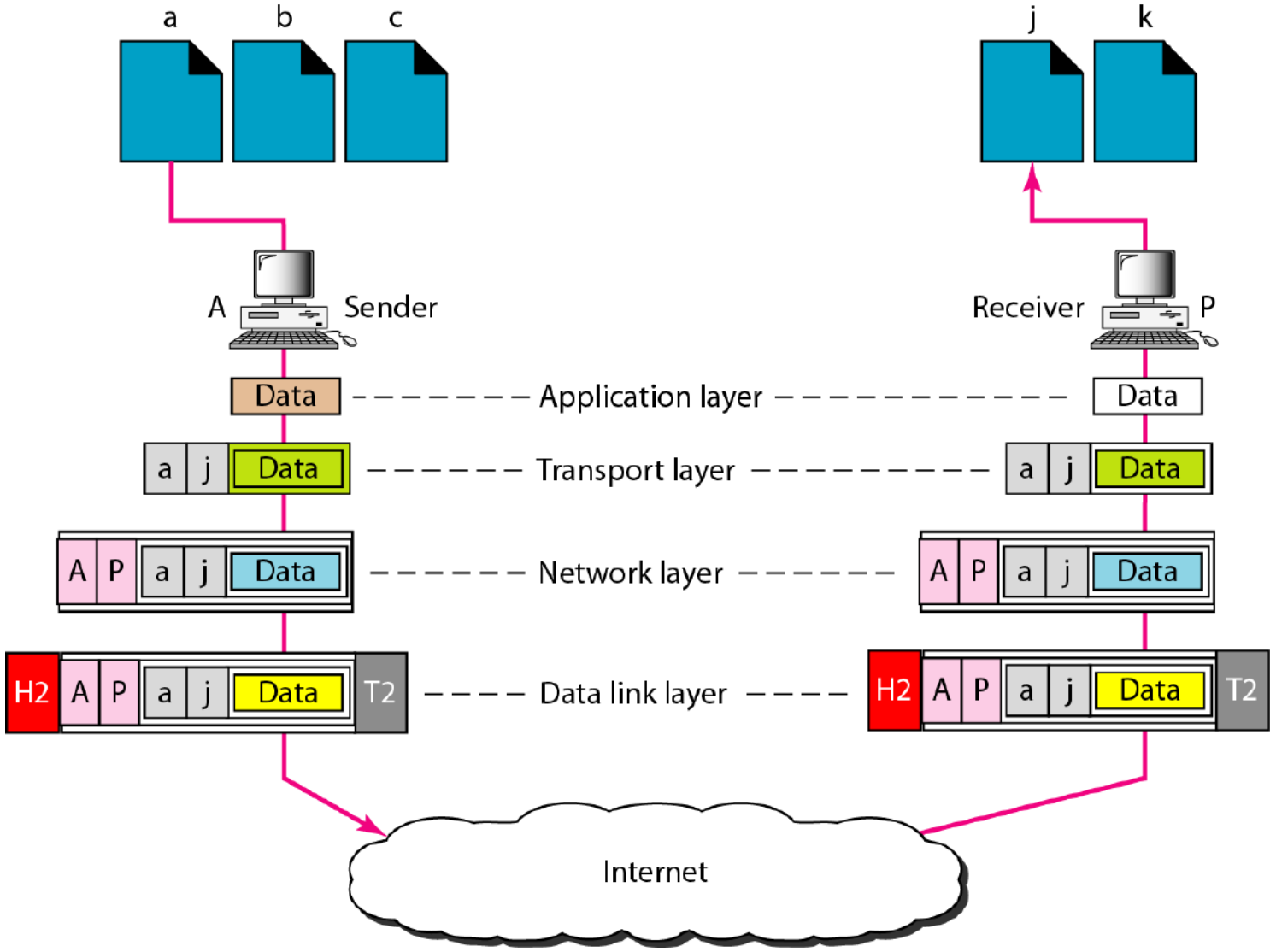
Port address is a 16-bit address represented by one decimal number ranged from (0-65535) to choose a process among multiple processes on the destination host.

- Destination port number is needed for delivery.
- Source port number is needed for receiving a reply as an acknowledgments.

**In TCP/IP , a 16-bit port address represented as one single number. Example: 753**

**The physical addresses change from hop to hop, but the logical and port addresses usually remain the same.**

# Port addresses



# *Specific addresses*

E-mail address (user1@ksu.edu.sa)

Universal Resource Locator (URL) (www.ksu.edu.sa)

The Domain Name System (DNS) translates human-friendly computer hostnames ( URL) into IP addresses. For example, *www.example.com* is translated to *208.77.188.166*

| OSI | TCP/IP |
| --- | --- |
| OSI represents **Open System Interconnection**. | TCP/IP model represents the Transmission Control Protocol / Internet Protocol. |
| OSI is a generic, protocol independent standard. It is acting as an interaction gateway between the network and the final-user. | TCP/IP model depends on standard protocols about which the computer network has created. It is a connection protocol that assigns the network of hosts over the internet. |
| The OSI model was developed first, and then protocols were created to fit the network architecture's needs. | The protocols were created first and then built the TCP/IP model. |
| It provides quality services. | It does not provide quality services. |
| The OSI model represents defines administration, interfaces and conventions. It describes clearly which layer provides services. | It does not mention the services, interfaces, and protocols. |
| The protocols of the OSI model are better unseen and can be returned with another appropriate protocol quickly. | The TCP/IP model protocols are not hidden, and we cannot fit a new protocol stack in it. |
| It is difficult as distinguished to TCP/IP. | It is simpler than OSI. |
| It provides both connection and connectionless oriented transmission in the network layer; however, only connection-oriented transmission in the transport layer. | It provides connectionless transmission in the network layer and supports connecting and connectionless-oriented transmission in the transport layer. |
| It uses a vertical approach. | It uses a horizontal approach. |
| The smallest size of the OSI header is 5 bytes. | The smallest size of the TCP/IP header is 20 bytes. |
| Protocols are unknown in the OSI model and are returned while the technology modifies. | In TCP/IP, returning protocol is not difficult. |