SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT301- COMMUNICATION NETWORKS

III YEAR/V SEMESTER

UNIT 1 – INTRODUCTION TO NETWORKS AND LAYERED ARCHITECTURE

TOPIC– TCP/IP MODEL

TCP/IP PROTOCOL SUITE

The TCP/IP protocol suite was developed prior to the OSI model. Therefore, the layers in the TCP/IP protocol suite do not match exactly with those in the OSI model.

The original TCP/IP protocol suite was defined as four software layers built upon the hardware. Today, however, TCP/IP is thought of as a five-layer model with the layers named similarly to the ones in the OSI model

TCP/IP PROTOCOL SUITE

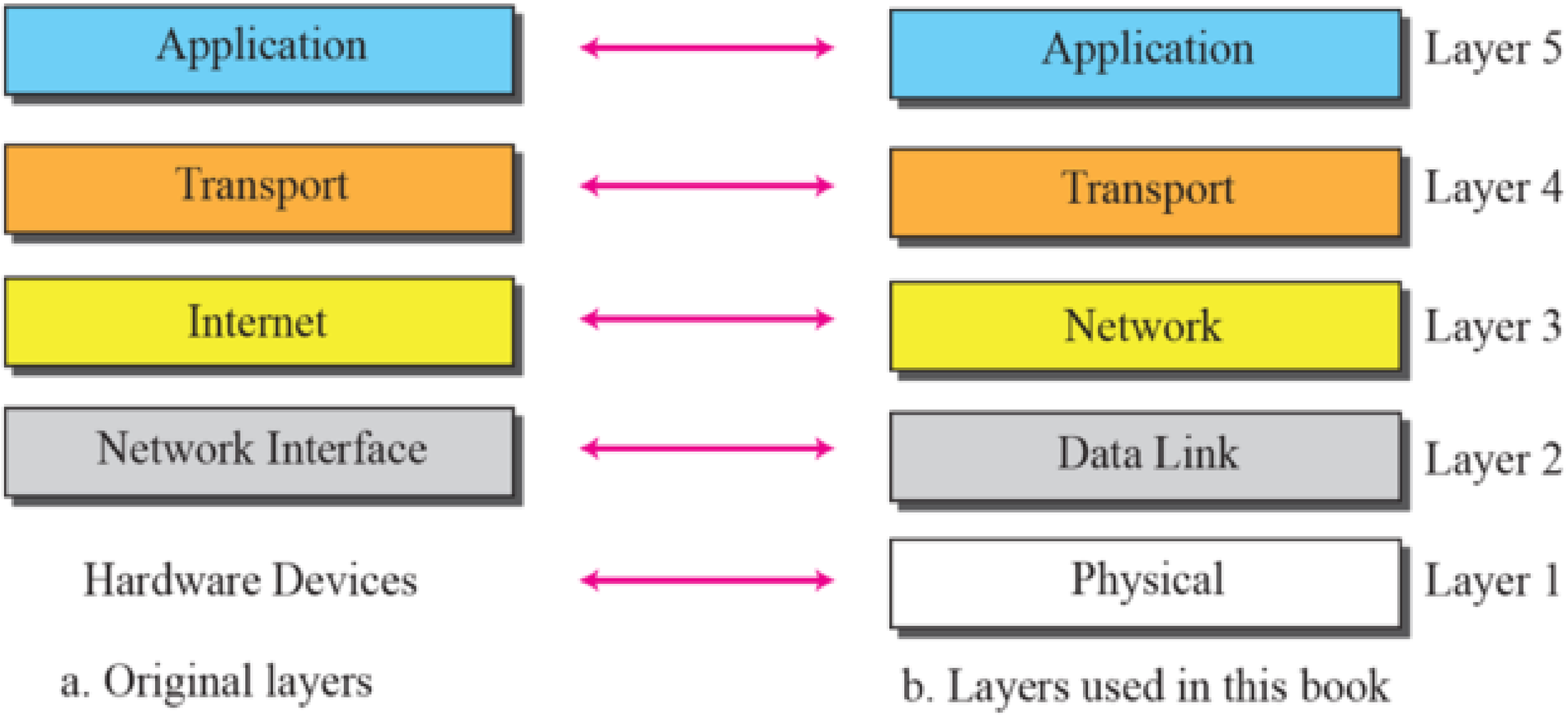
The major design goals of this model were,

- 1. To connect multiple networks together so that they appear as a single network.
- 2. To survive after partial subnet hardware failures.
- 3. To provide a flexible architecture.

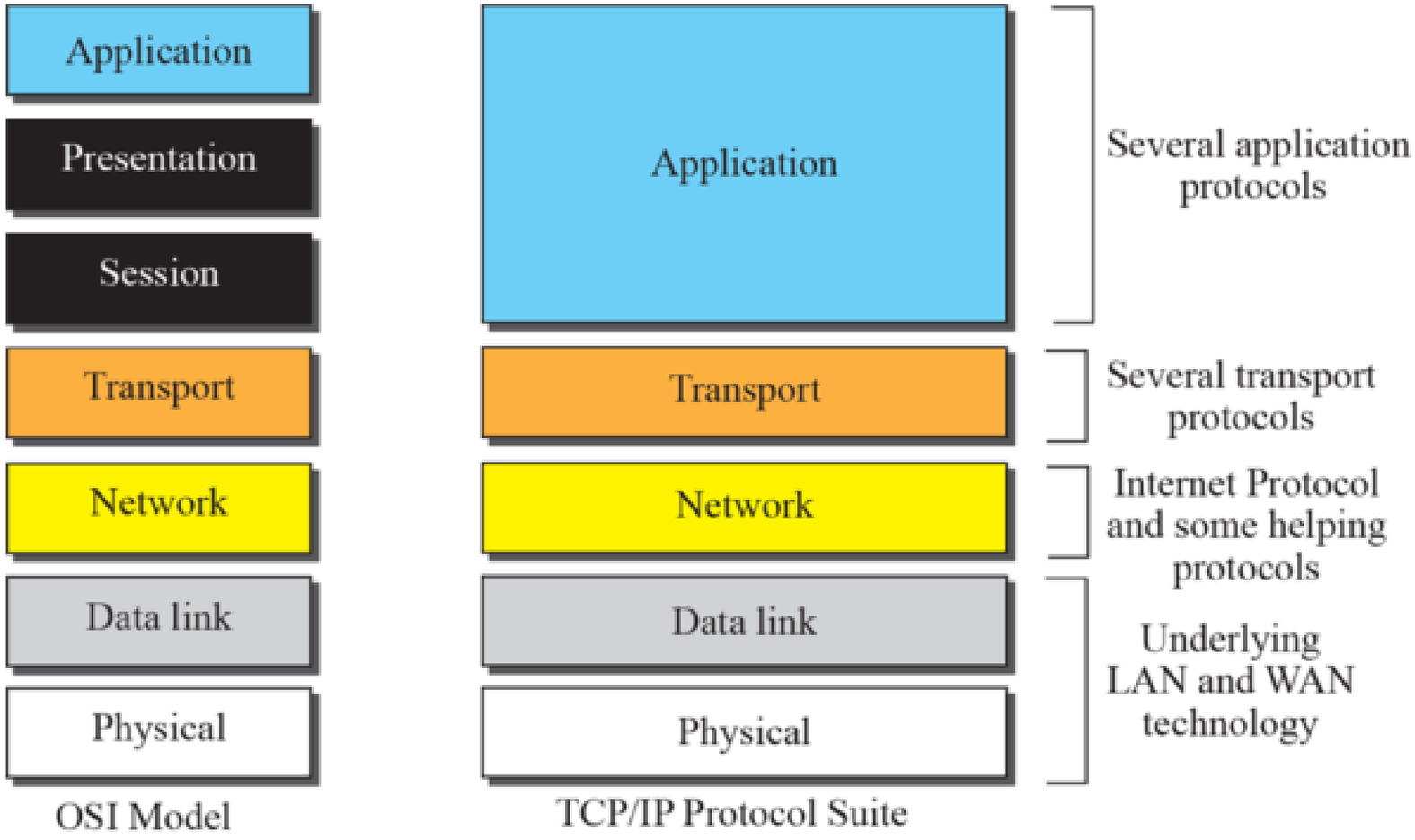
Unlike OSI reference model, TCP/IP reference model has only 4 layers:

- 1. Host-to-Network Layer
- 2. Internet Layer
- 3. Transport Layer
- 4. Application Layer

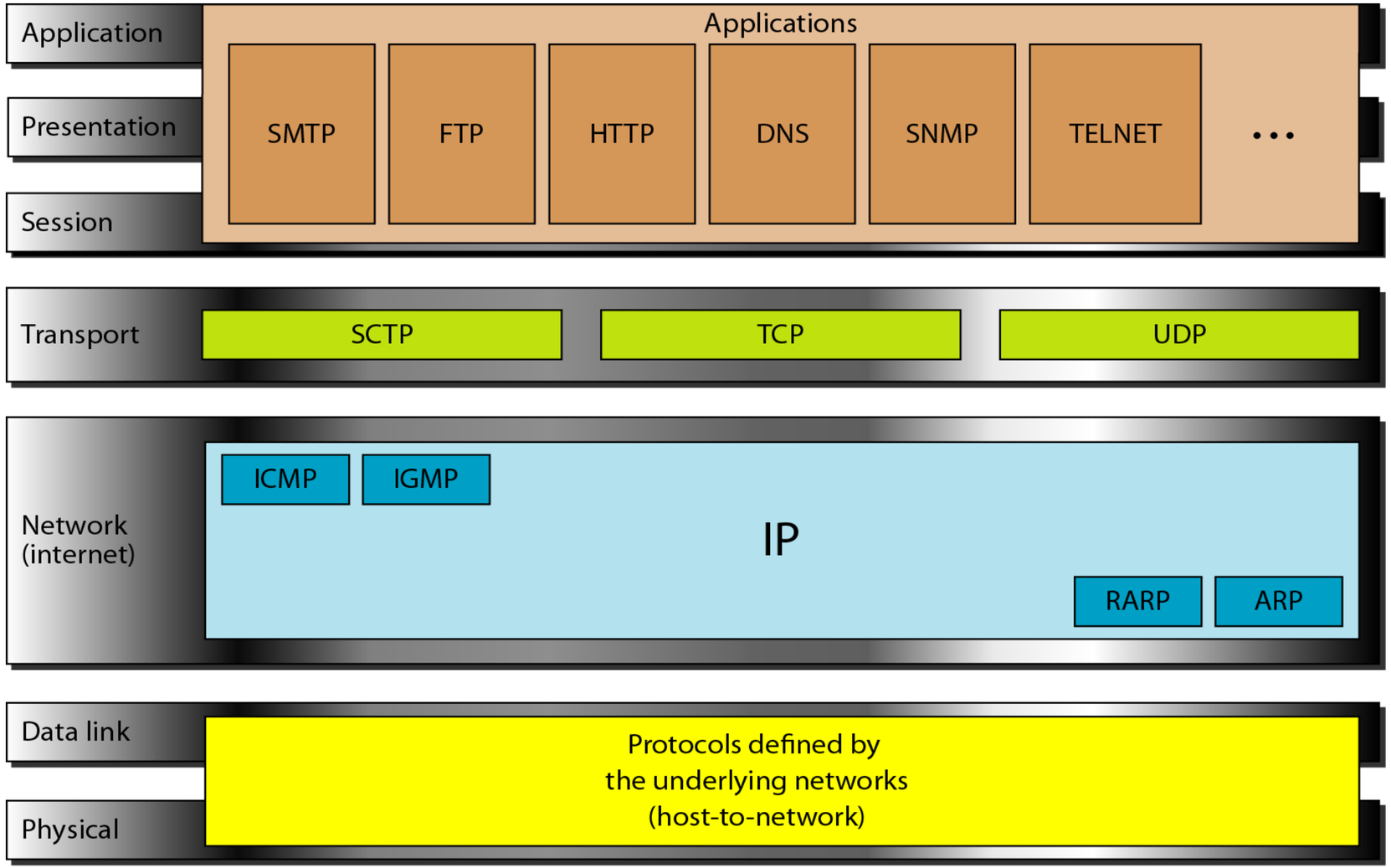
LAYERS IN THE TCP/IP PROTOCOL SUITE



TCP/IP and OSI MODEL



TCP/IP and OSI MODEL



Host-to-Network Layer:

- TCP/IP does not define any specific protocol.
- It supports all the standard and proprietary protocols.
- A network in a TCP/IP internetwork can be a local-area network or a wide-area network

Network Layer:

- TCP/IP supports the Internetworking Protocol
- IP, in turn, uses four supporting protocols: ARP, RARP, ICMP, and IGMP
- It is an unreliable and connectionless protocol-a best-effort delivery service.
- **best effort** means that IP provides no error checking or tracking. IP assumes the unreliability of the underlying layers and does its best to get a transmission through to its destination, but with no guarantees.
- IP transports data in packets called **datagrams**

Address Resolution Protocol

- Associate a logical address with a physical address.
- On a typical physical network, such as a LAN, each device on a link is identified by a physical or station address, usually imprinted on the network interface card (NIC)
- ARP is used to find the physical address of the node when its Internet address is known.

Reverse Address Resolution Protocol

- allows a host to discover its Internet address when it knows only its physical address
- It is used when a computer is connected to a network for the first time

Internet Control Message Protocol

- It is a mechanism used by hosts and gateways to send notification of datagram problems back to the sender.
- ICMP sends query and error reporting messages.

Internet Group Message Protocol

- Facilitate the simultaneous transmission of a message to a group of recipients.

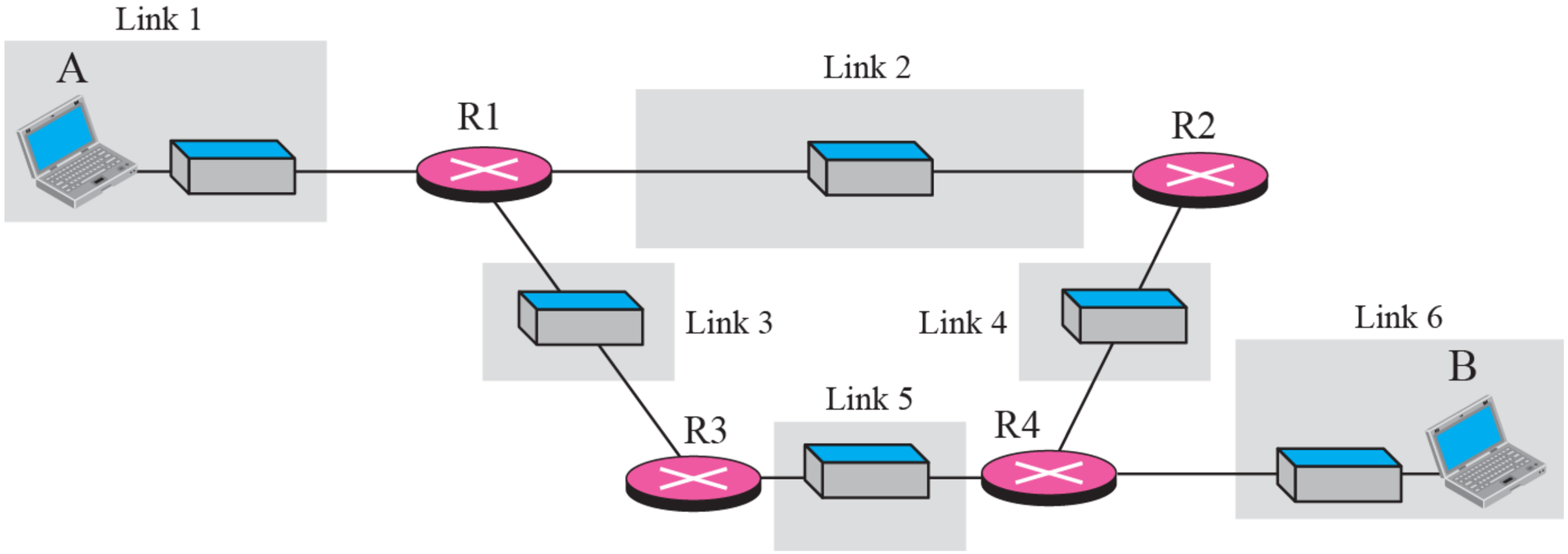
Transport Layer

- UDP and TCP are transport level protocols responsible for delivery of a message from a process (running program) to another process
- ***User Datagram Protocol*** - It is a process-to-process protocol that adds only port addresses, checksum error control, and length information to the data from the upper layer
- ***Transmission Control Protocol*** - TCP is a reliable stream transport protocol, connection-oriented
- TCP divides a stream of data into smaller units called *segments.*

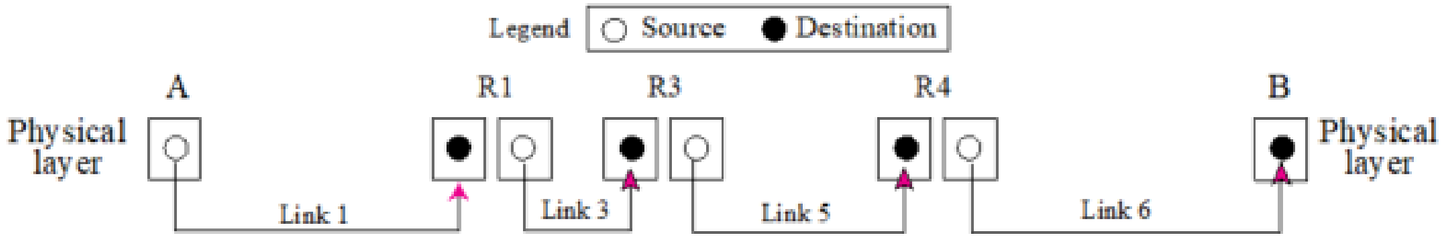
Stream Control Transmission Protocol

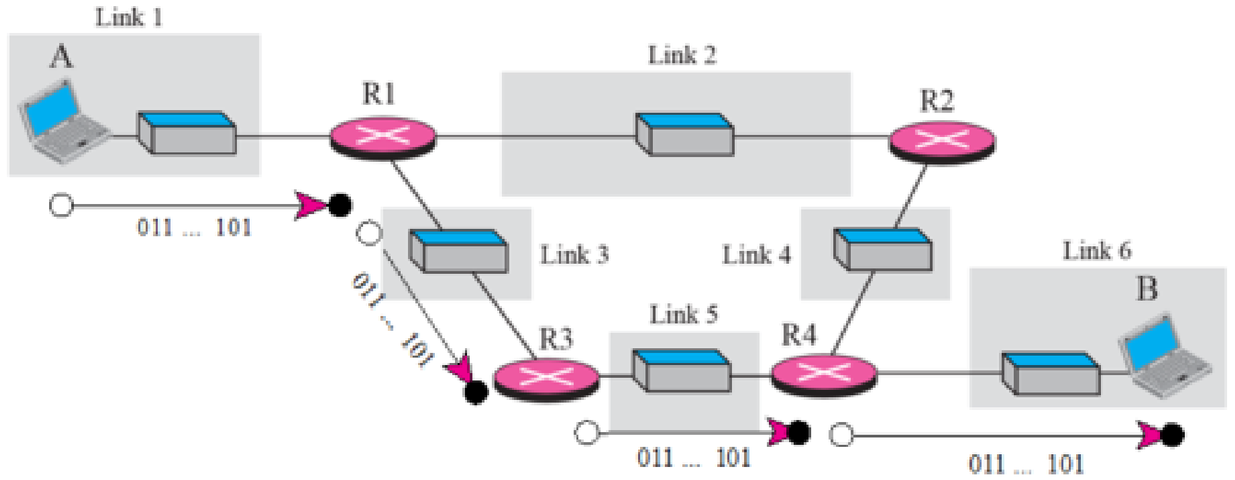
- provides support for newer applications such as voice over the Internet.

A PRIVATE INTERNET



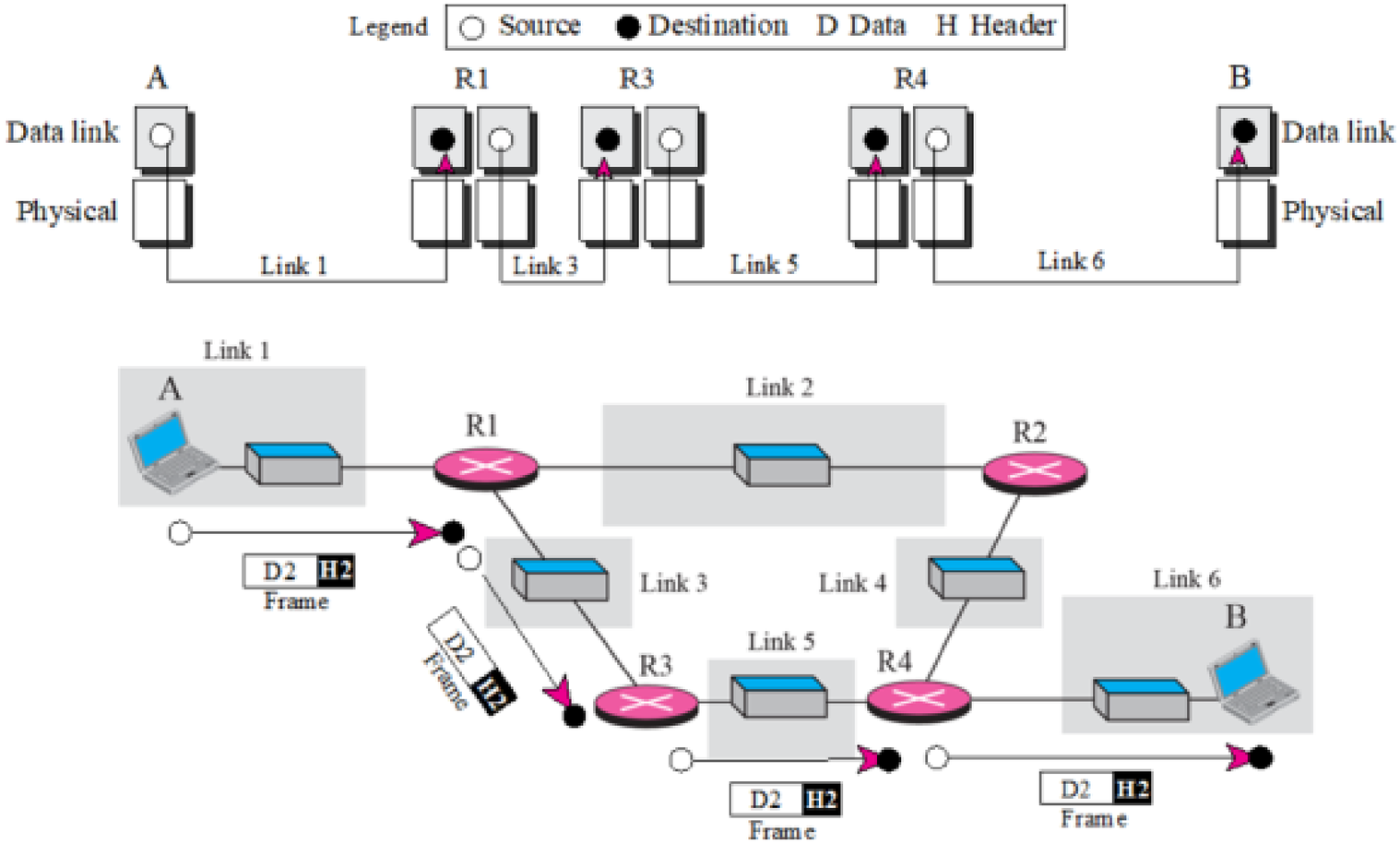
COMMUNICATION AT THE PHYSICAL LAYER





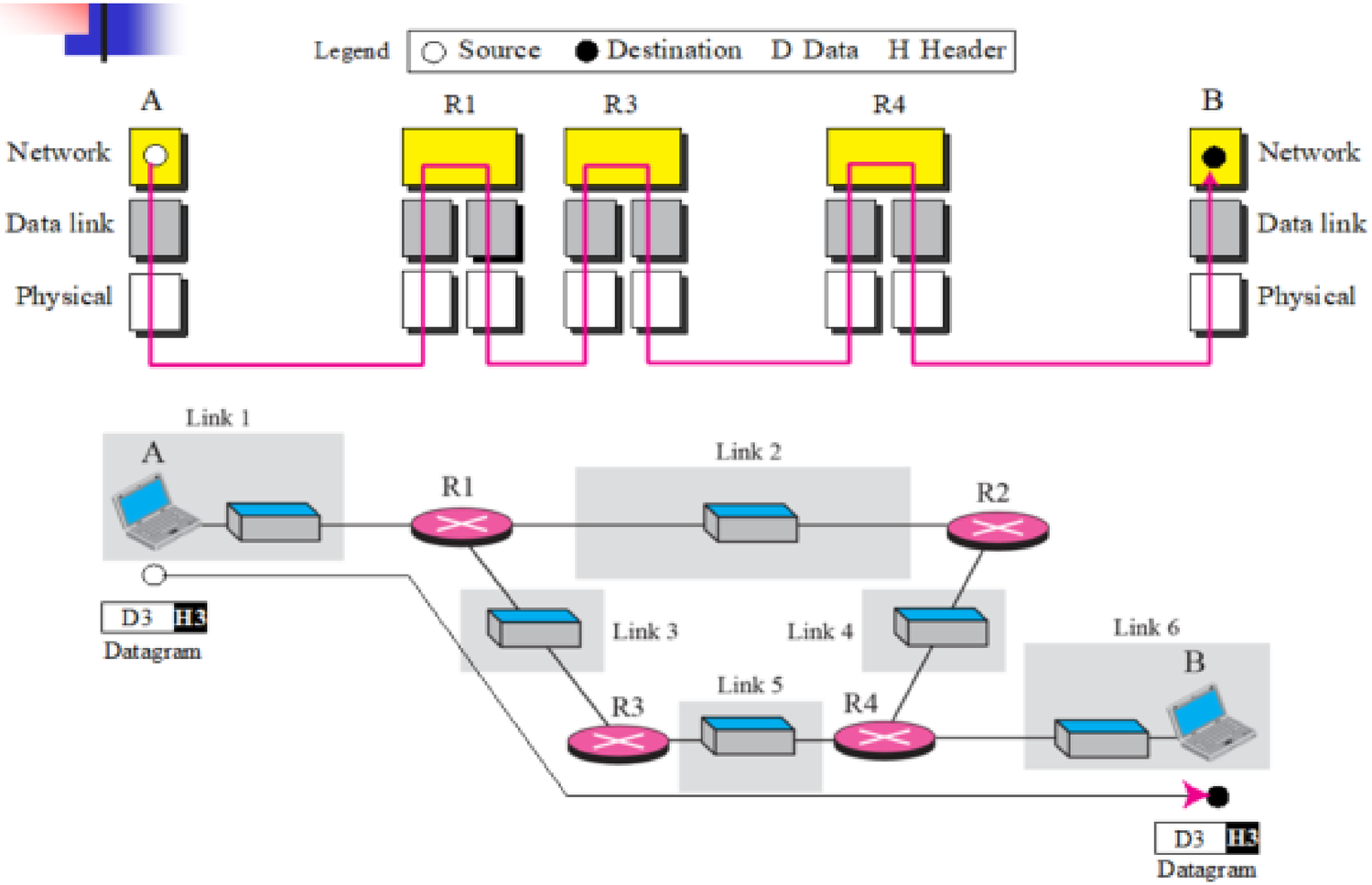
The unit of communication at the physical layer is a bit.

COMMUNICATION AT THE DATA LINK LAYER



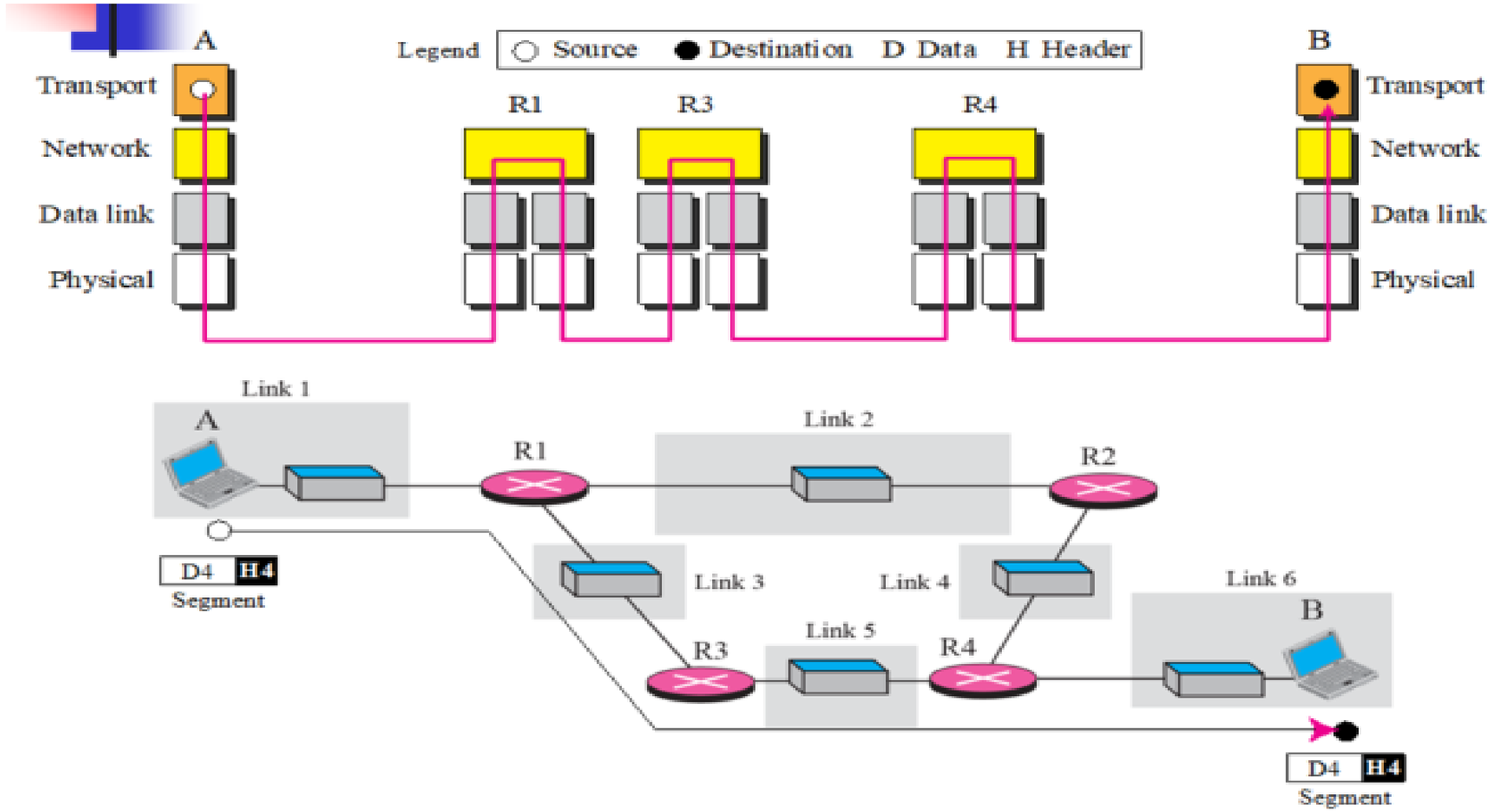
The unit of communication at the data link layer is a frame.

COMMUNICATION AT THE NETWORK LAYER



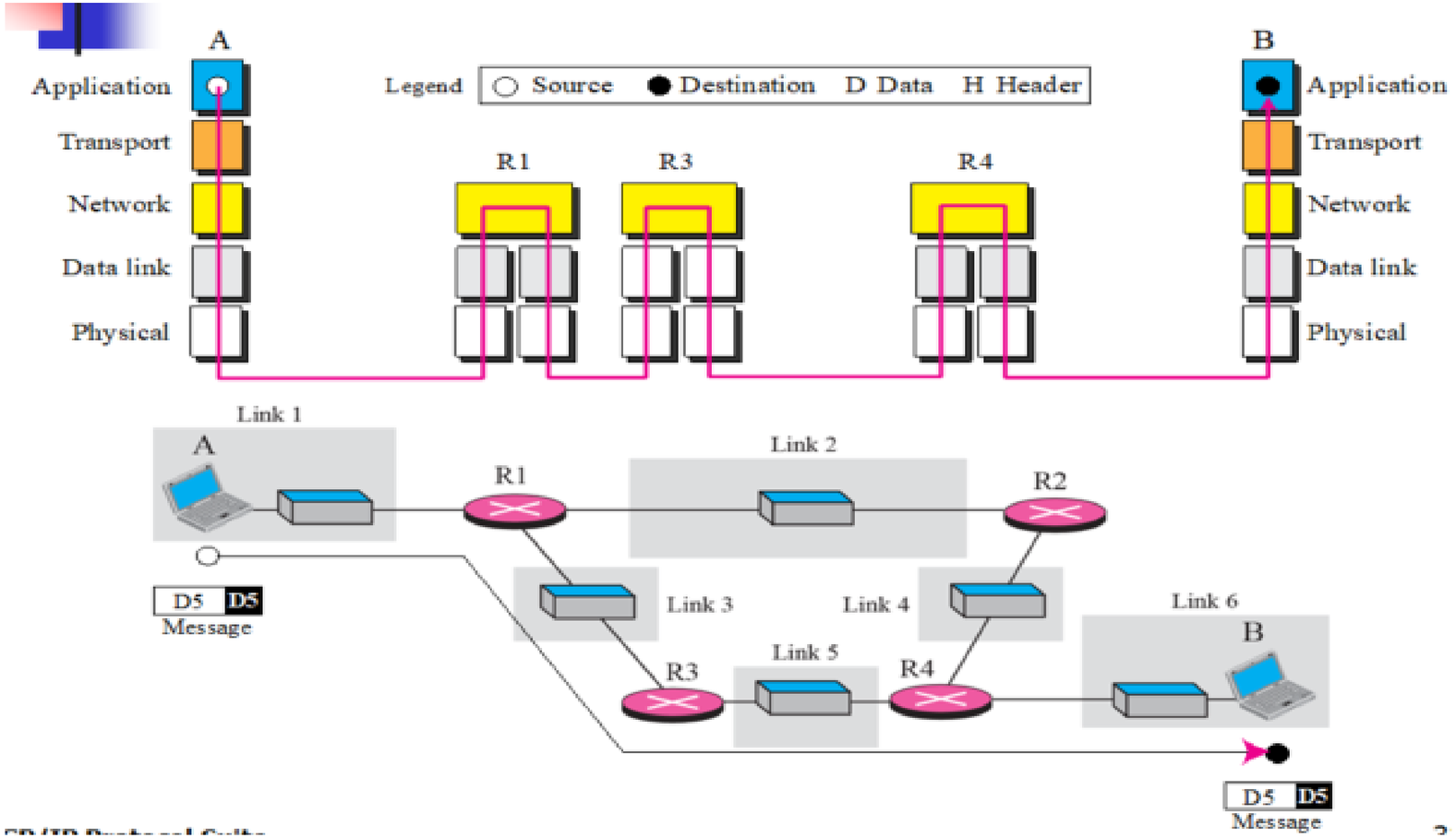
The unit of communication at the network layer is a datagram.

COMMUNICATION AT TRANSPORT LAYER



The unit of communication at the transport layer is a segment, user datagram, or a packet, depending on the specific protocol used in this layer.

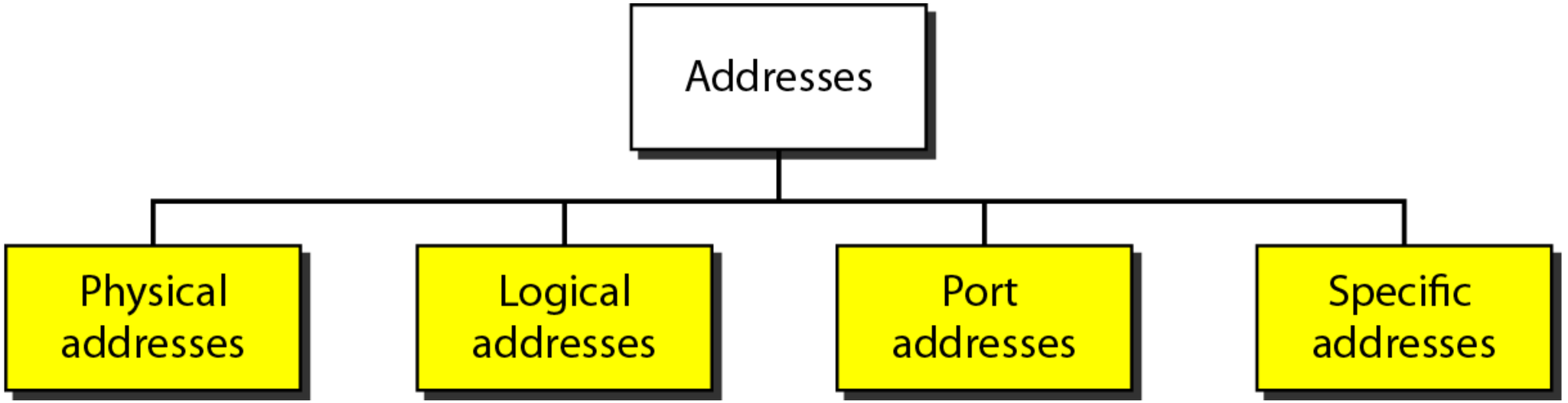
COMMUNICATION AT APPLICATION LAYER



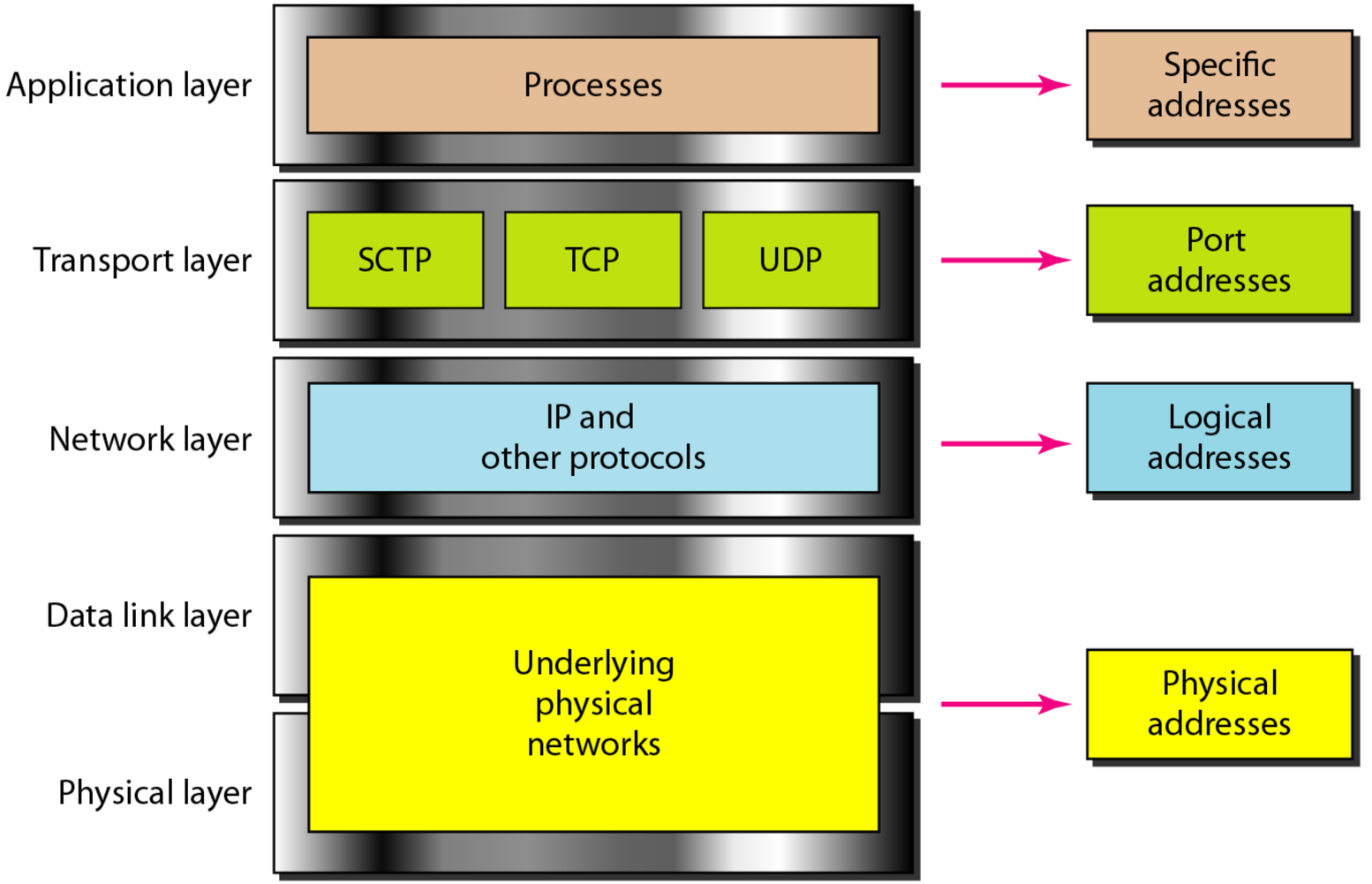
The unit of communication at the application layer is a message.

ADDRESSING

Four levels of addresses are used in an internet employing the TCP/IP protocols: physical address, logical address, port address, and application-specific address. Each address is related to a one layer in the TCP/IP architecture



RELATIONSHIP OF LAYERS AND ADDRESSES IN TCP/IP



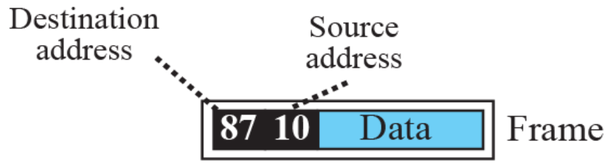
PHYSICAL ADDRESSES

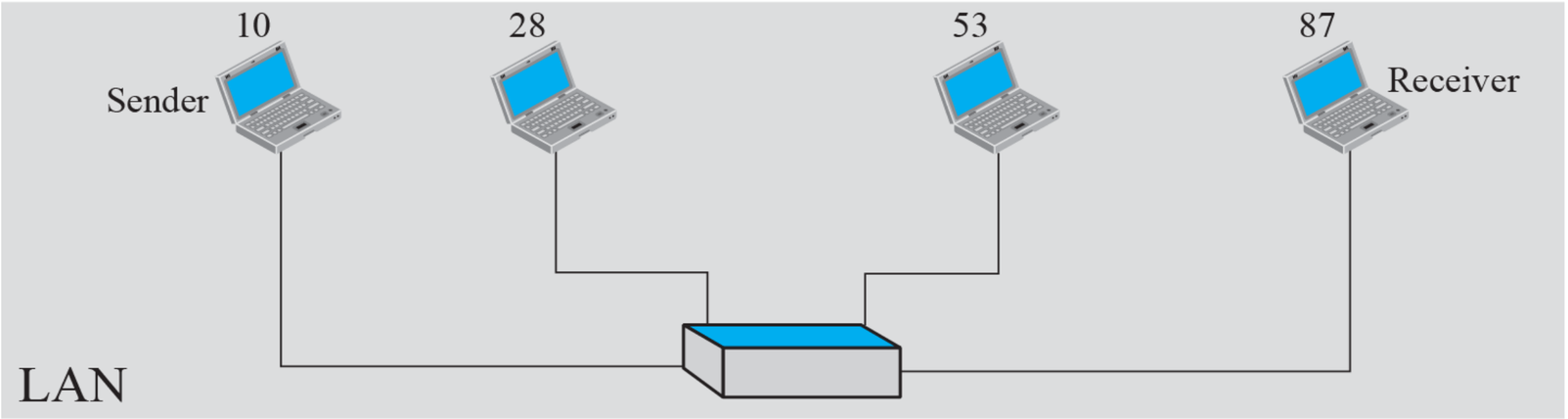
A node with physical address 10 sends a frame to a node with physical address 87. The two nodes are connected by a link (a LAN).

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.

PHYSICAL ADDRESSES





most local area networks use a 48-bit (6-byte) physical address written as 12 hexadecimal digits; every byte (2 hexadecimal digits) is separated by a colon, as shown below:

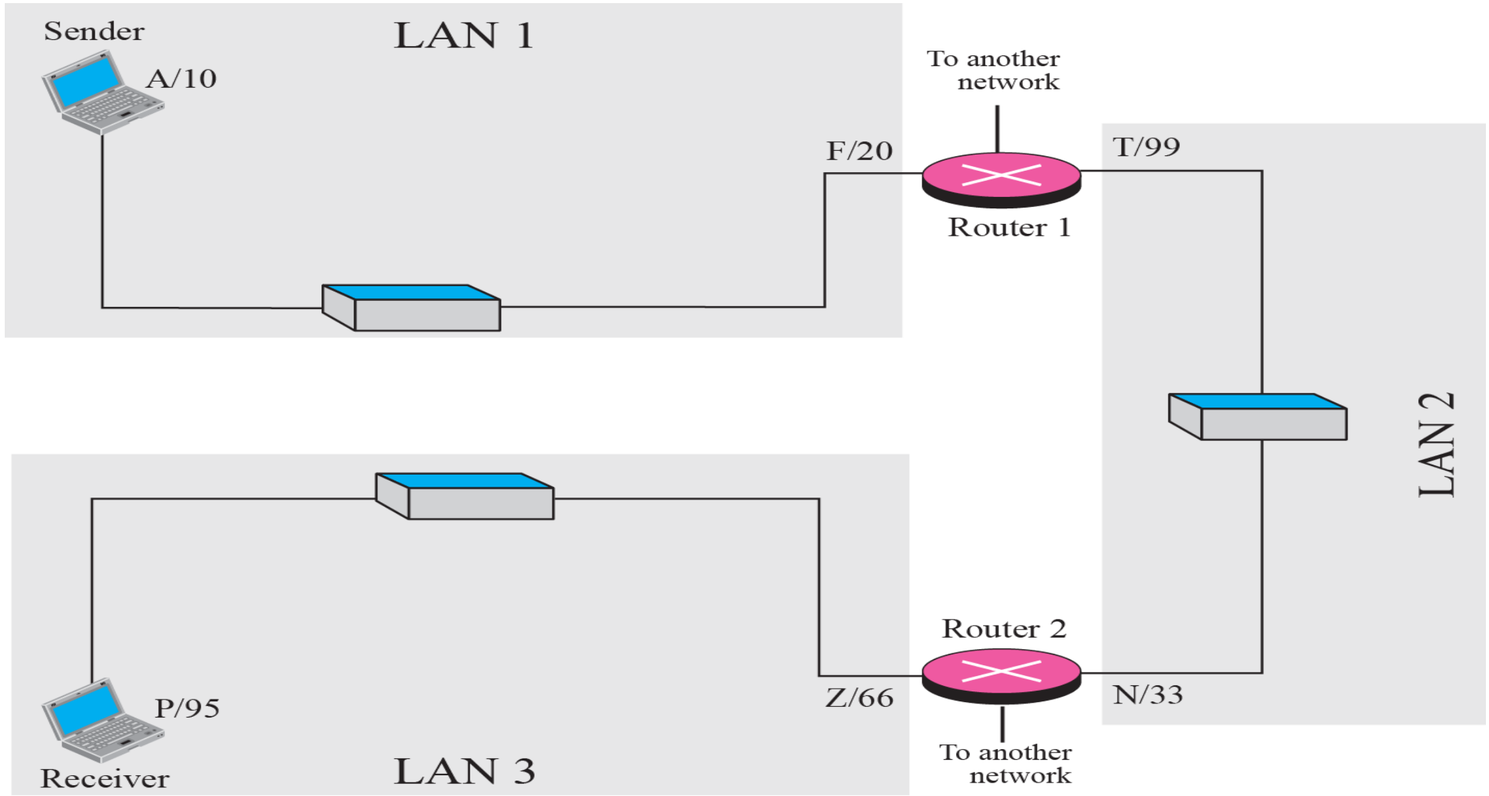
07:01:02:01:2C:4B

A 6-byte (12 hexadecimal digits) physical address

LOGICAL ADDRESSES

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.

LOGICAL ADDRESSES

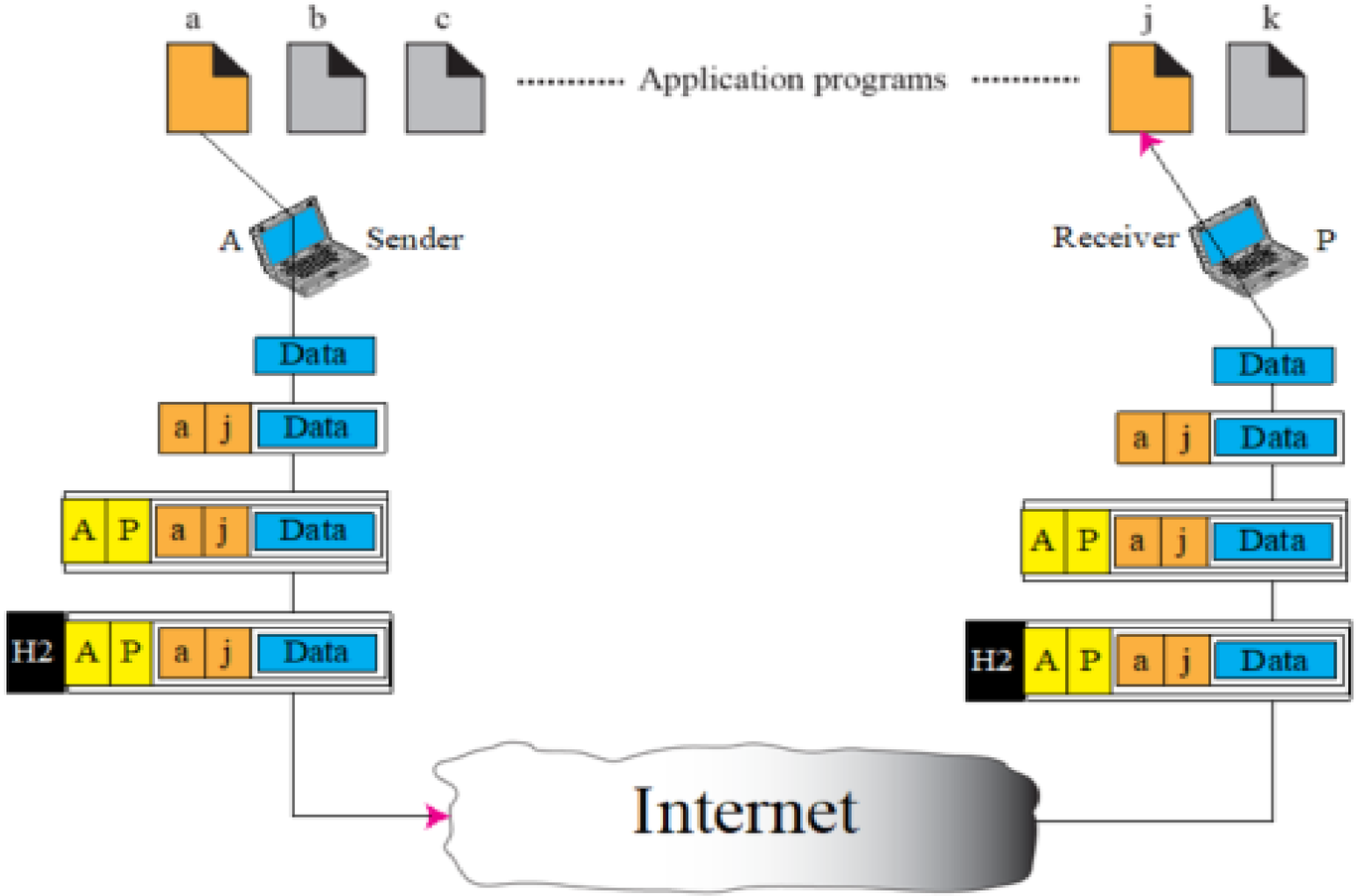


The physical addresses will change from hop to hop, but the logical addresses remain the same.

PORT NUMBERS

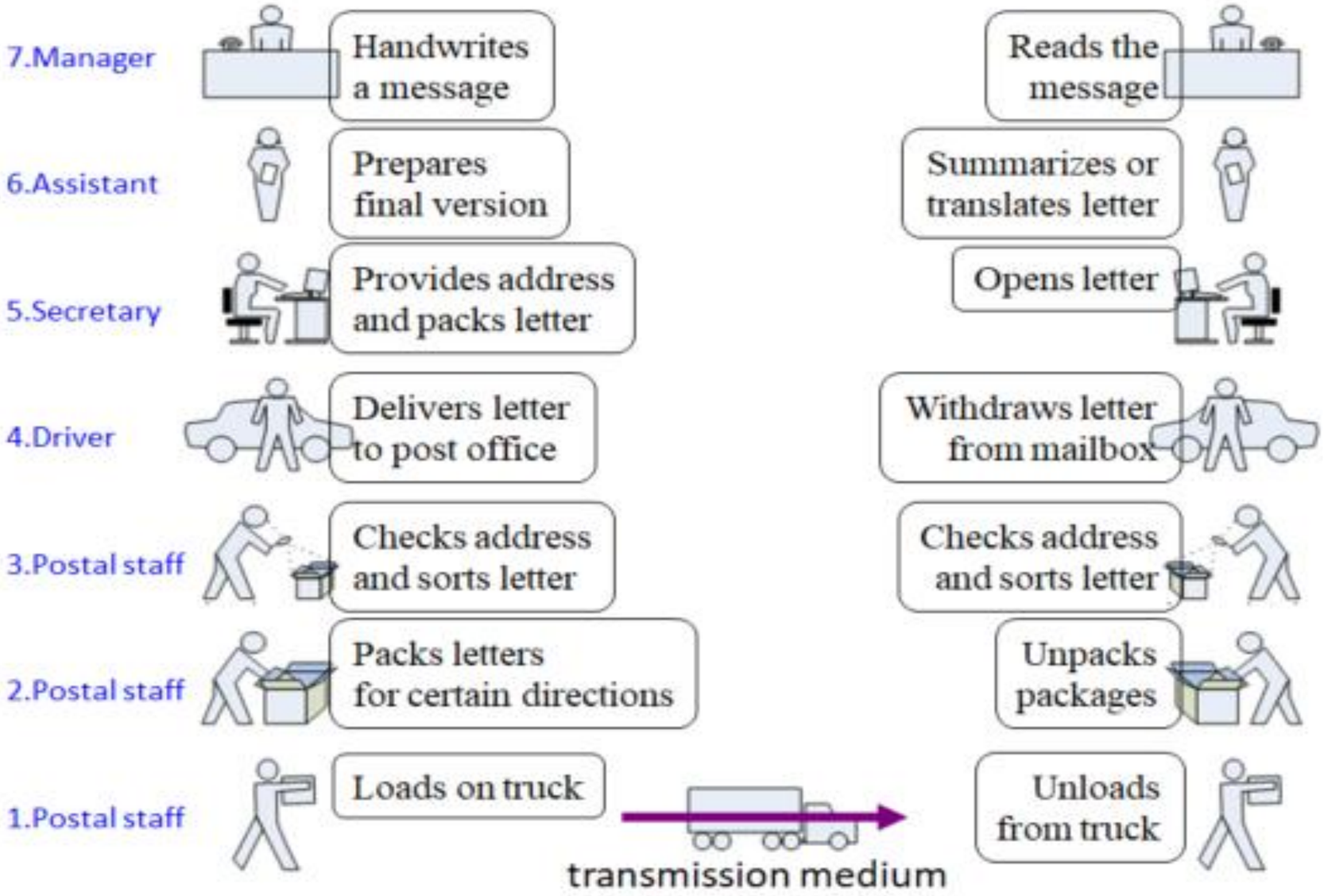
Two computers communicating via the Internet. The sending computer is running three processes at this time with port addresses a, b, and c. The receiving computer is running two processes at this time with port addresses j and k. Process a in the sending computer needs to communicate with process j in the receiving computer. Note that although both computers are using the same application, FTP, for example, the port addresses are different because one is a client program and the other is a server program,

PORT NUMBERS



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

OSI Layers in Real World



THANK YOU