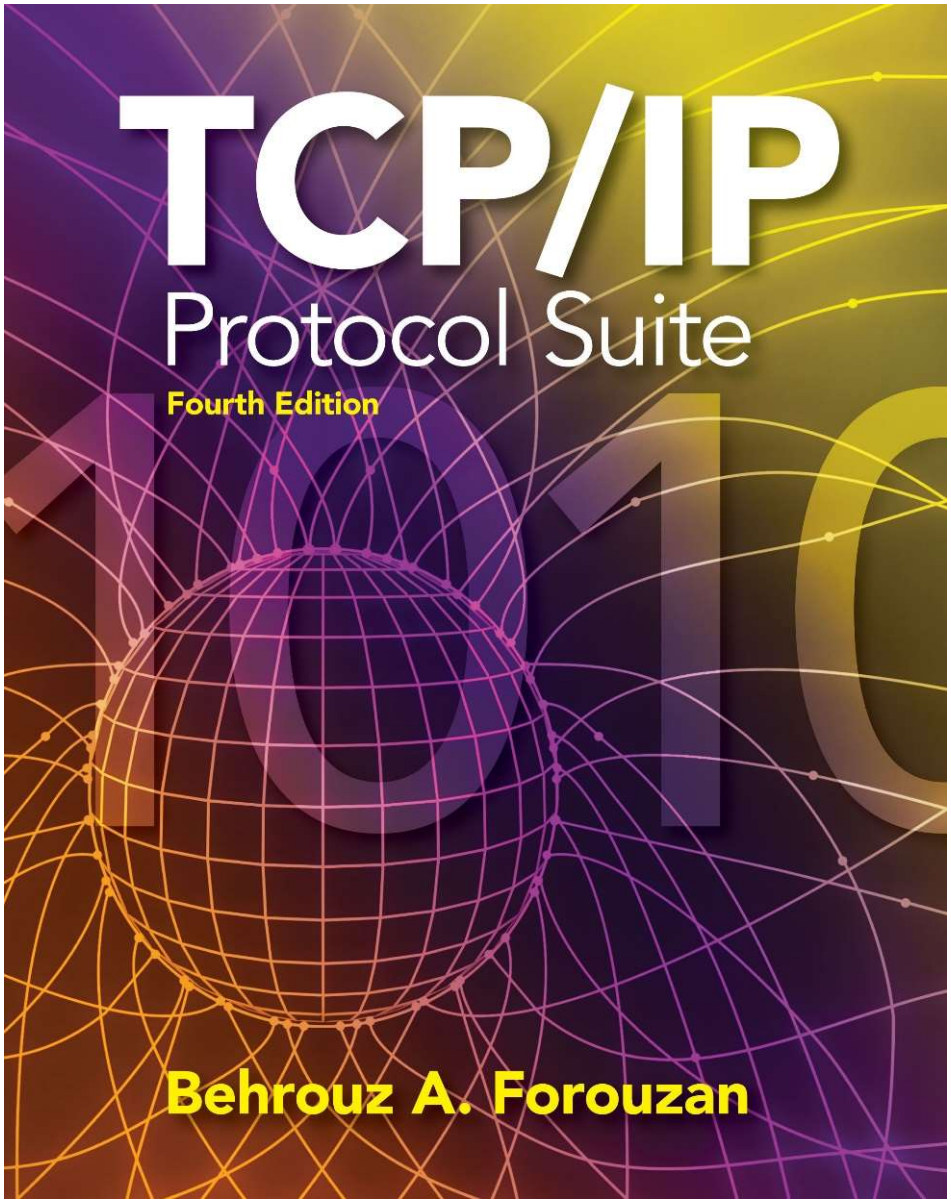
Chapter 8

Address Resolution Protocol (ARP)



OBJECTIVES:

- To make a distinction between logical address (IP address) and physical address (MAC address).
- To describe how the mapping of a logical address to a physical address can be static or dynamic.
- To show how the address resolution protocol (ARP) is used to dynamically map a logical address to a physical address.
- To show that the proxy ARP can be used to create a subnetting effect.
- To discuss ATMARP, which maps the IP addresses when the underlying network is an ATM WAN.
- To show that an ARP software package can be made of five components.
- To show the pseudocode for each module used in the ARP software package.

Chapter Outline

8.1 Address Mapping

8.2 The ARP Protocol

8.3 ATM ARP

8.4 ARP Package

8-1 ADDRESS MAPPING

The delivery of a packet to a host or a router requires two levels of addressing: *logical* and *physical*. We need to be able to map a logical address to its corresponding physical address and vice versa. These can be done using either *static* or *dynamic* mapping.

Topics Discussed in the Section

- ✓ **Static Mapping**
- ✓ **Dynamic Mapping**

8-2 ADDRESS MAPPING

Anytime a host or a router has an IP datagram to send to another host or router, it has the logical (IP) address of the receiver. But the IP datagram must be encapsulated in a frame to be able to pass through the physical network. This means that the sender needs the physical address of the receiver. A mapping corresponds a logical address to a physical address. ARP accepts a logical address from the IP protocol, maps the address to the corresponding physical address and pass it to the data link layer.

Topics Discussed in the Section

- ✓ **Packet Format**
- ✓ **Encapsulation**
- ✓ **Operation**
- ✓ **Proxy ARP**

Figure 8.1 *Position of ARP in TCP/IP protocol suite*

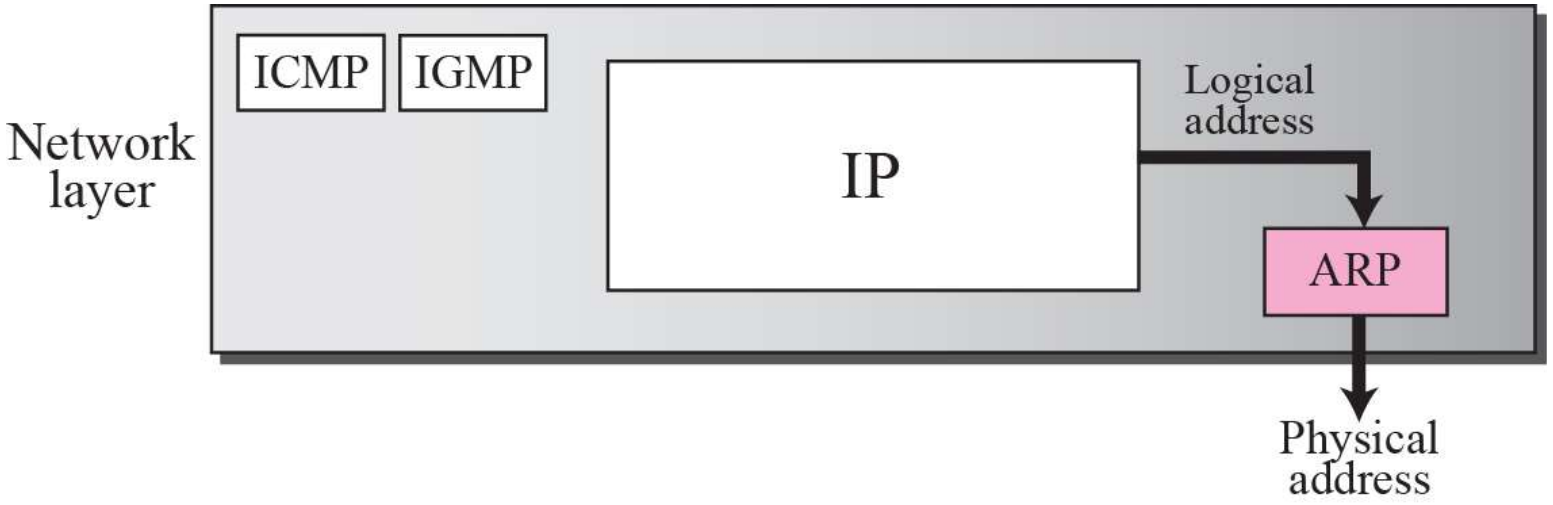
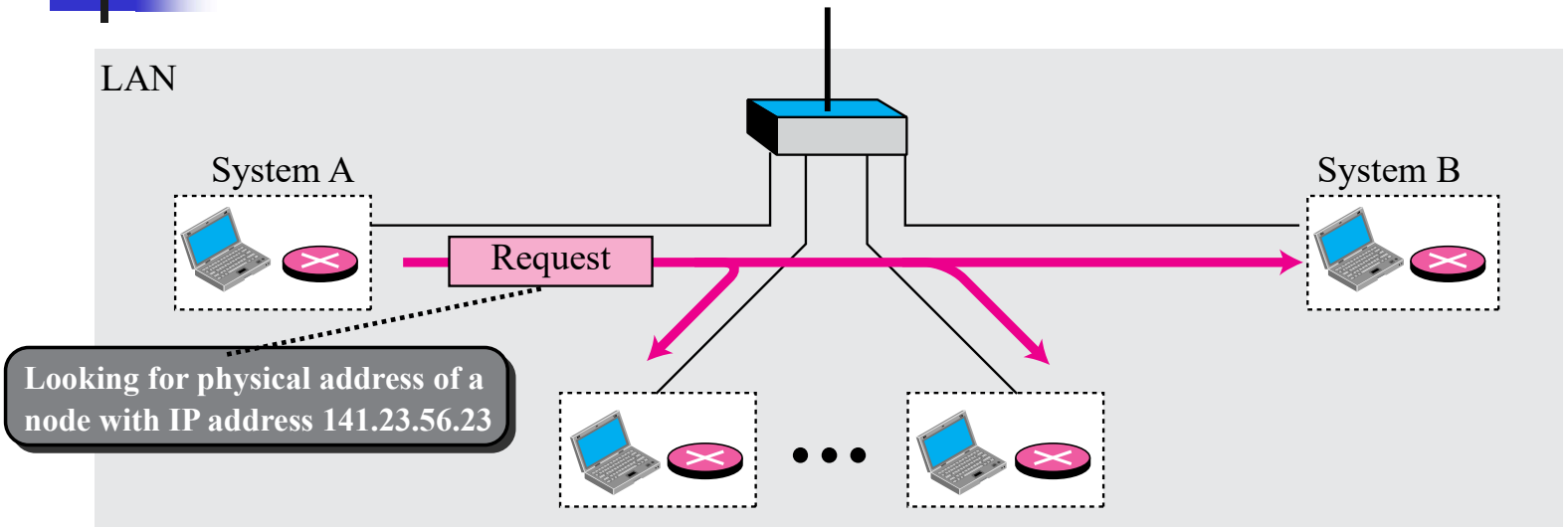
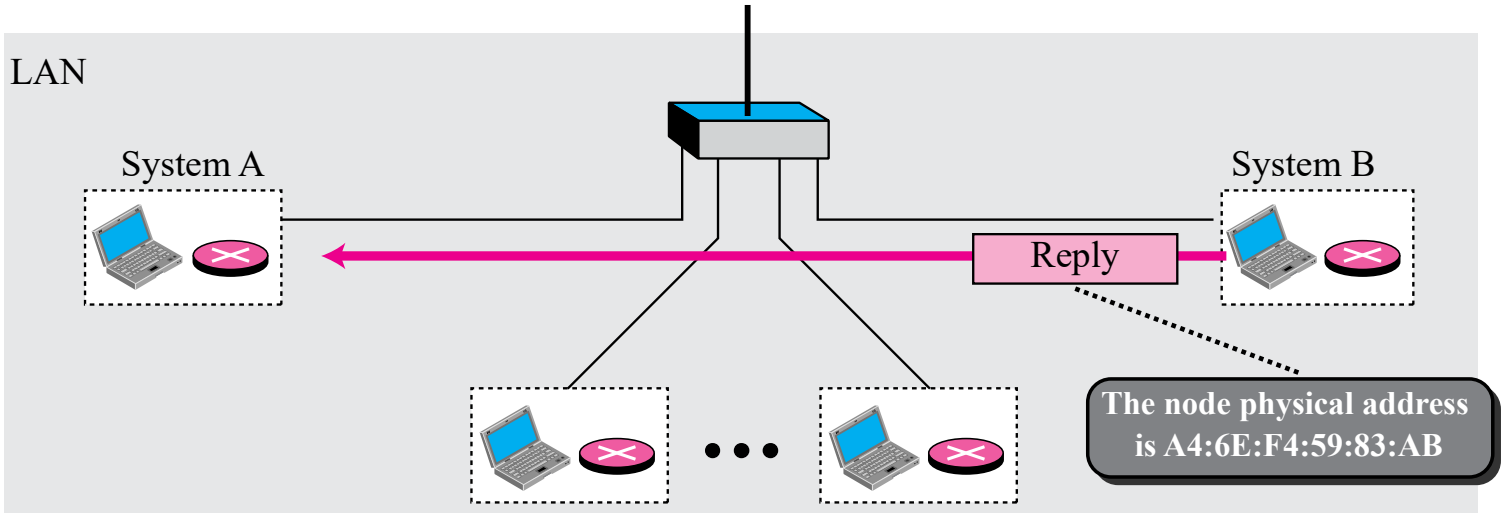


Figure 8.2 *ARP operation*



a. ARP request is **broadcast**



b. ARP reply is unicast

Figure 8.3 *ARP packet*

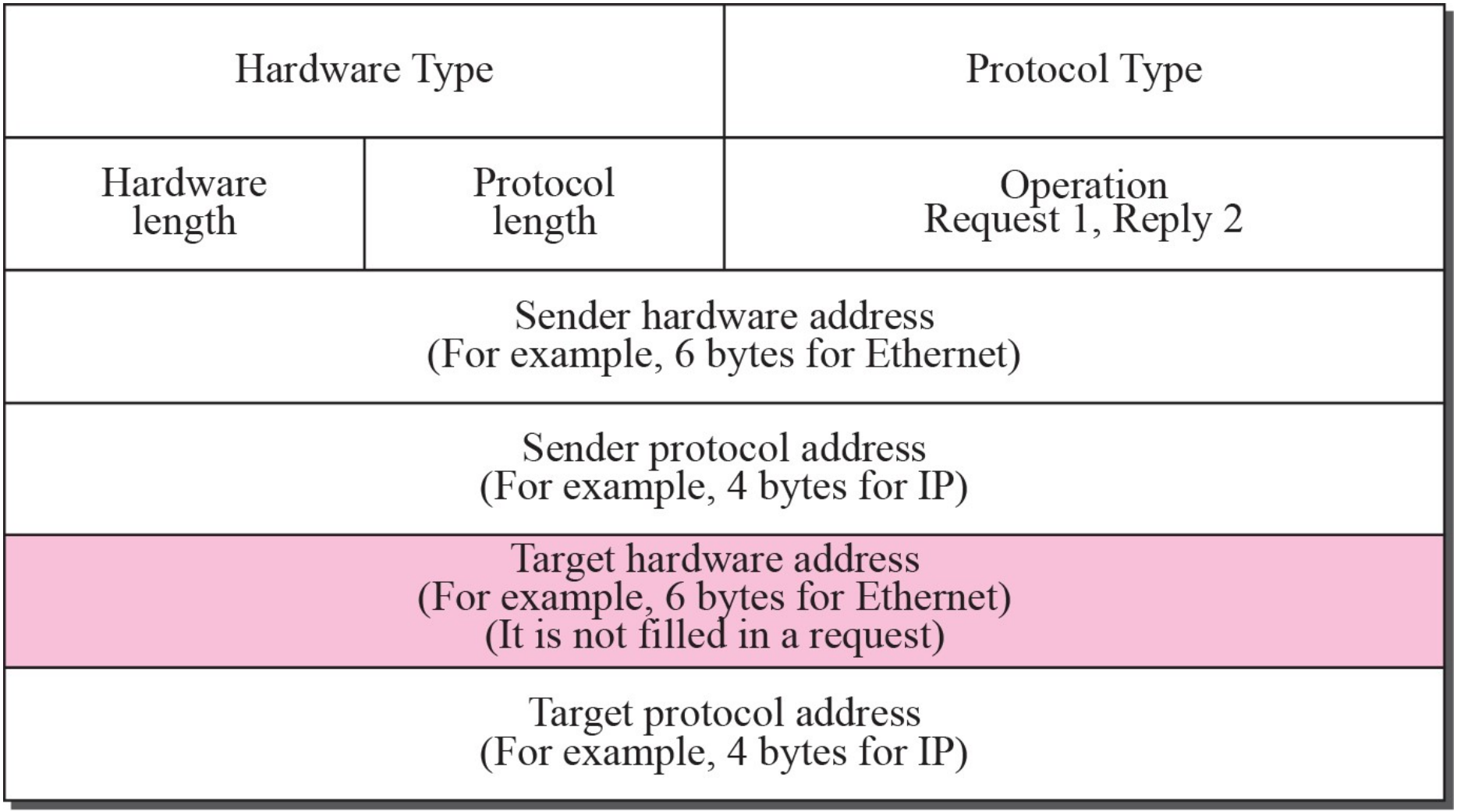
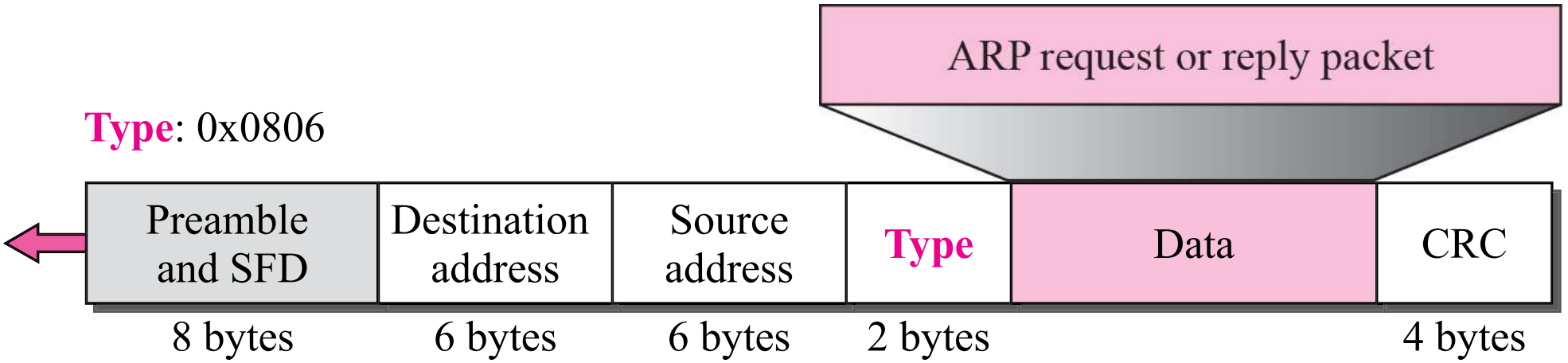
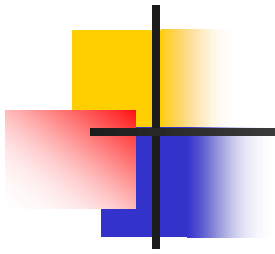


Figure 8.4 *Encapsulation of ARP packet*



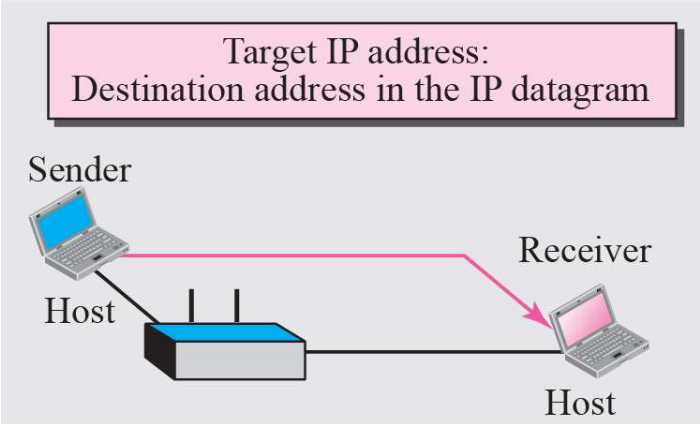


Note

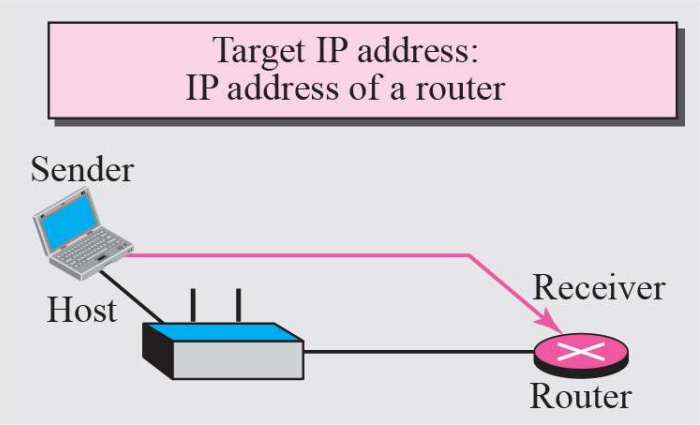
An ARP request is broadcast; an ARP reply is unicast.

Figure 8.5 *Four cases using ARP*

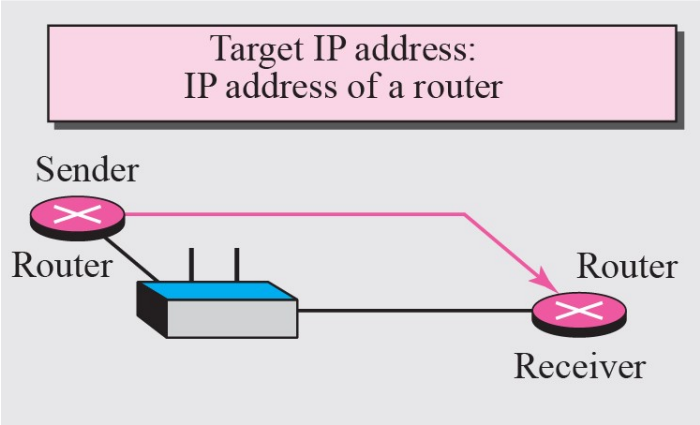
Case 1: A host has a packet to send to a host on the same network.



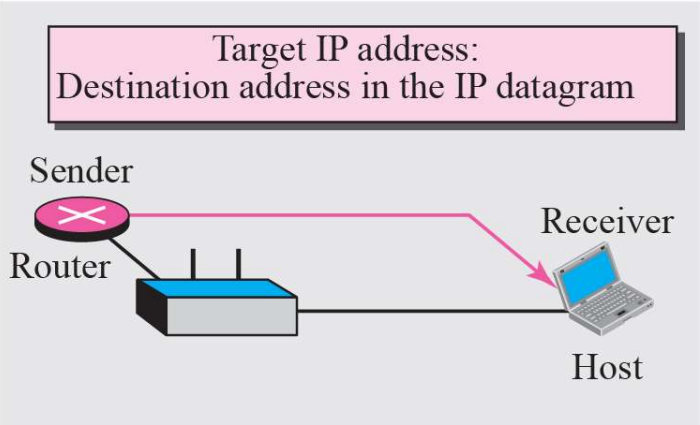
Case 2: A host has a packet to send to a host on another network.



Case 3: A router has a packet to send to a host on another network.



Case 4: A router has a packet to send to a host on the same network.



Example 8.1

A host with IP address 130.23.43.20 and physical address B2:34:55:10:22:10 has a packet to send to another host with IP address 130.23.43.25 and physical address A4:6E:F4:59:83:AB. The two hosts are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames.

Solution

Figure 8.6 shows the ARP request and reply packets. Note that the ARP data field in this case is 28 bytes, and that the individual addresses do not fit in the 4-byte boundary. That is why we do not show the regular 4-byte boundaries for these addresses. Also note that the IP addresses are shown in hexadecimal.

Figure 8.6 *Example 8.1*

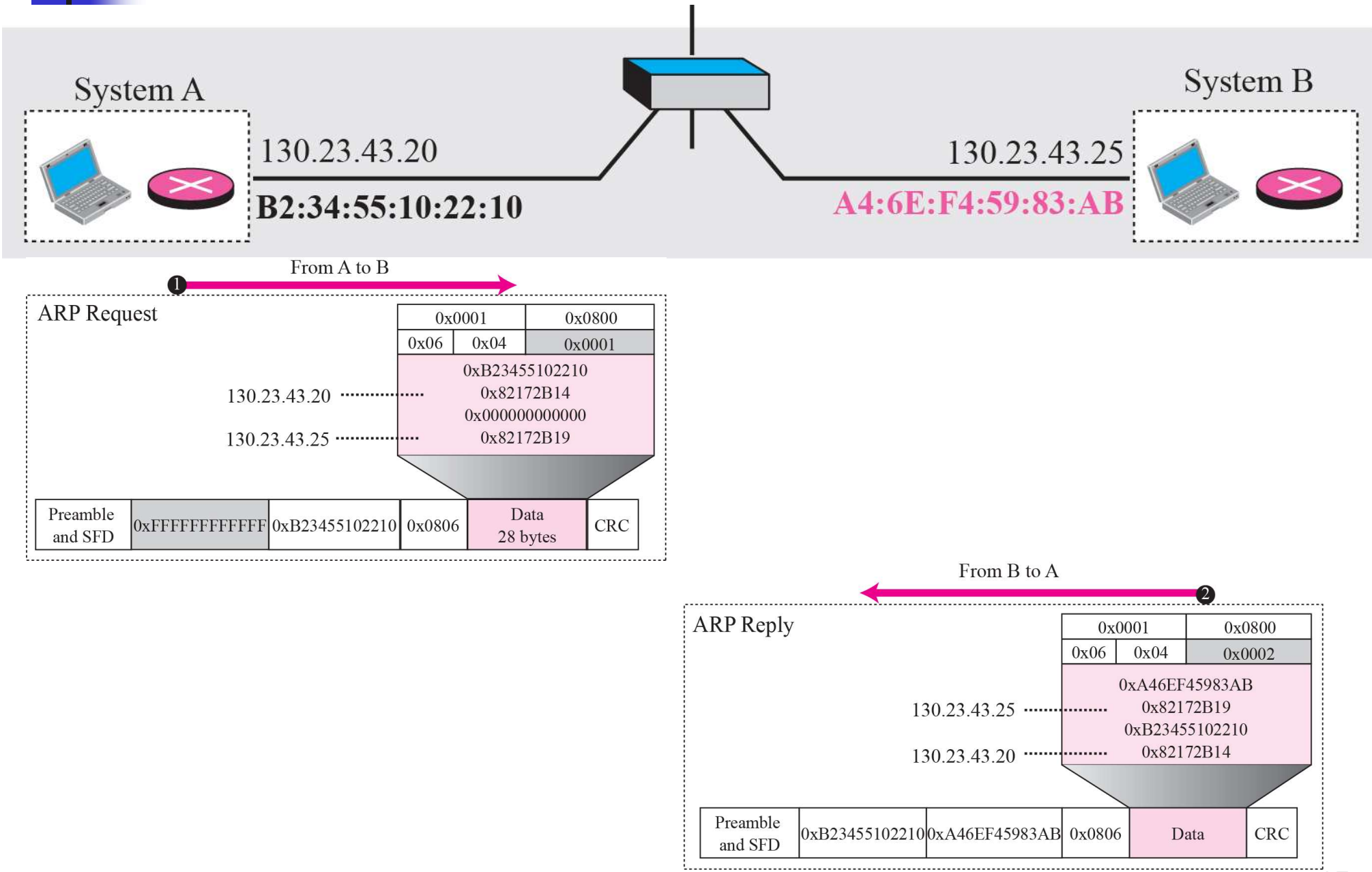


Figure 8.7 *Proxy ARP*