

# Chapter 3

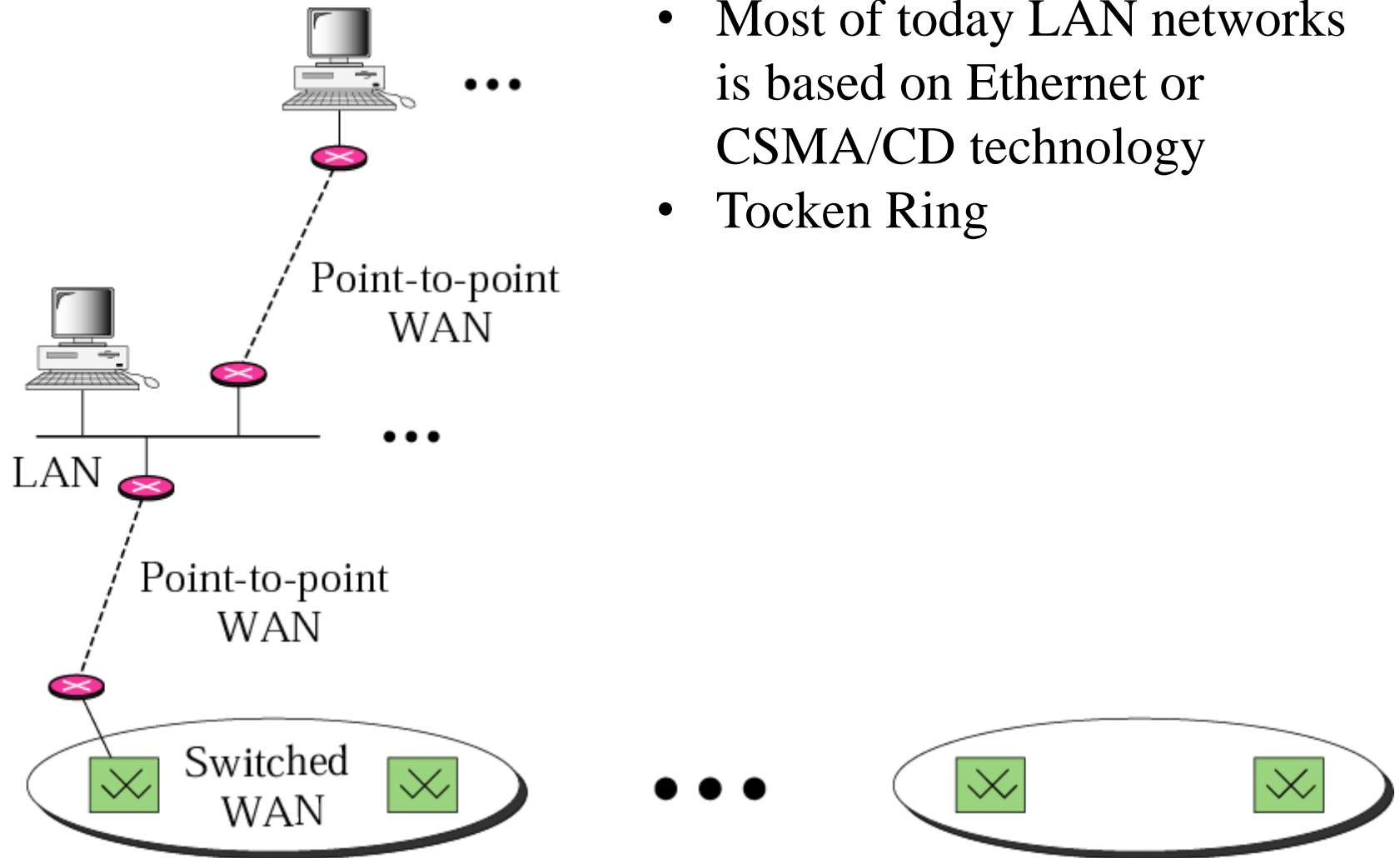
## *Underlying Technologies*

# ***CONTENTS***

- **LANs**
- **CONNECTING DEVICES**
- **WAN**

Figure 3-1

# Internet model

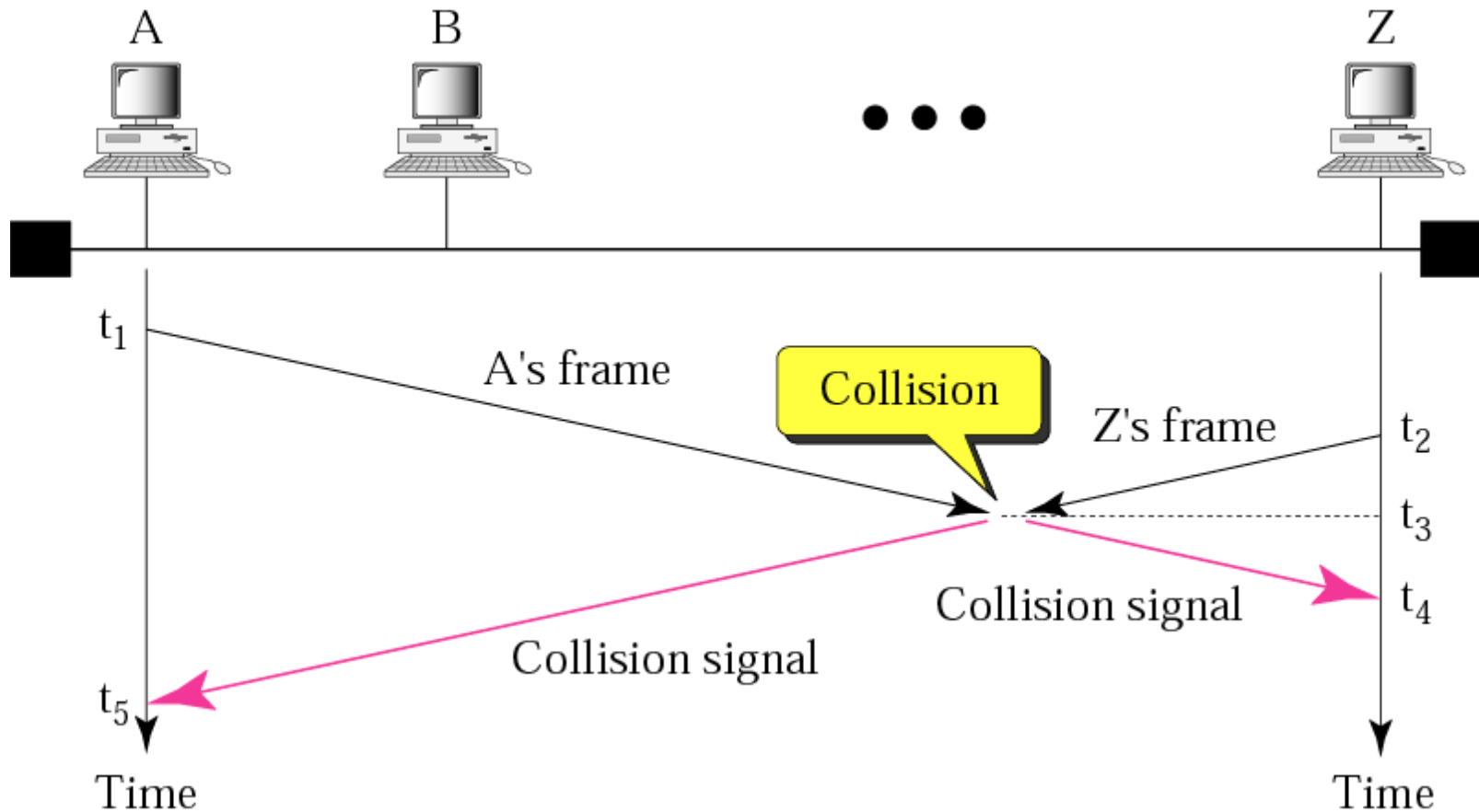


## ***3.1***

# **LOCAL AREA NETWORKS (LANS)**

Figure 3-2

# CSMA/CD



## Note

*Minimum frame length/Transmission rate  
is proportional to  
Collision domain / Propagation speed*

# Remark

- Traditional networks implementing Ethernet technology (based on CSMA/CD)
  - For ex. 10Base2 defined a distance of 200m between two farthest node of the network
- Today's LAN network require a transmission rate of 100 Mbps or 1000 Mbps
- In order to let today's LAN networks to work always with the CSMA/CD mechanism, we should either
  - Reduce the distance
  - Frame length

Figure 3-3

# Ethernet layers

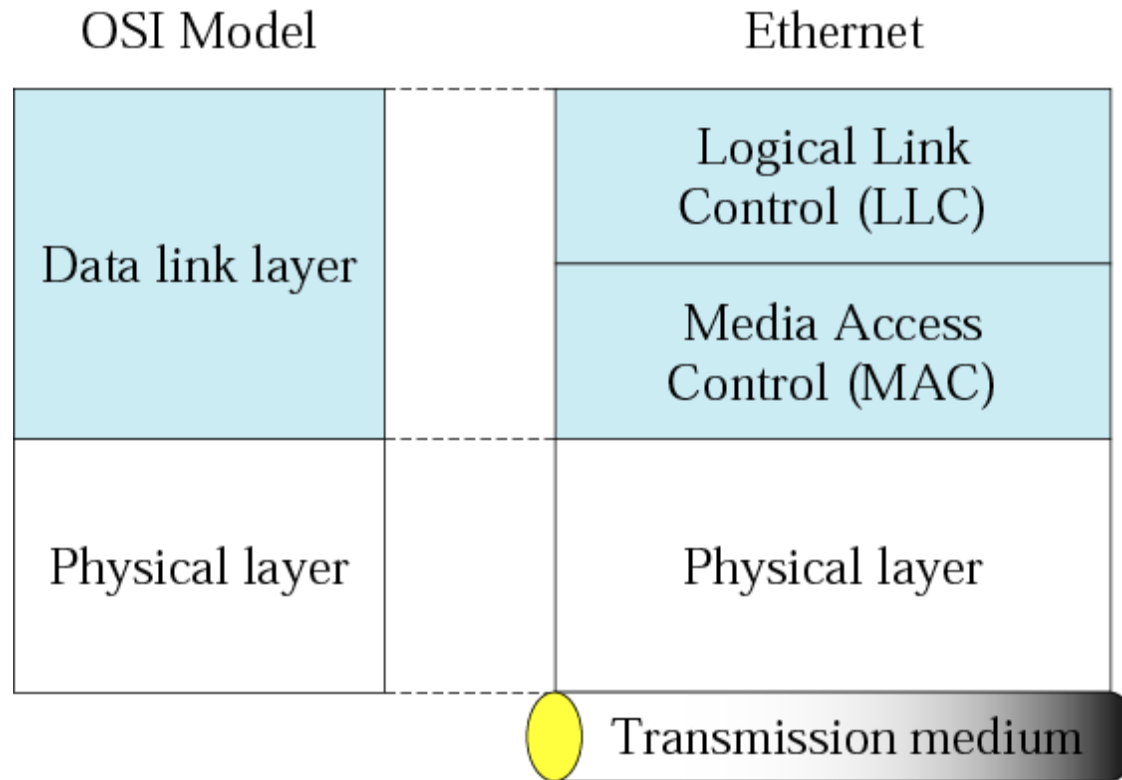
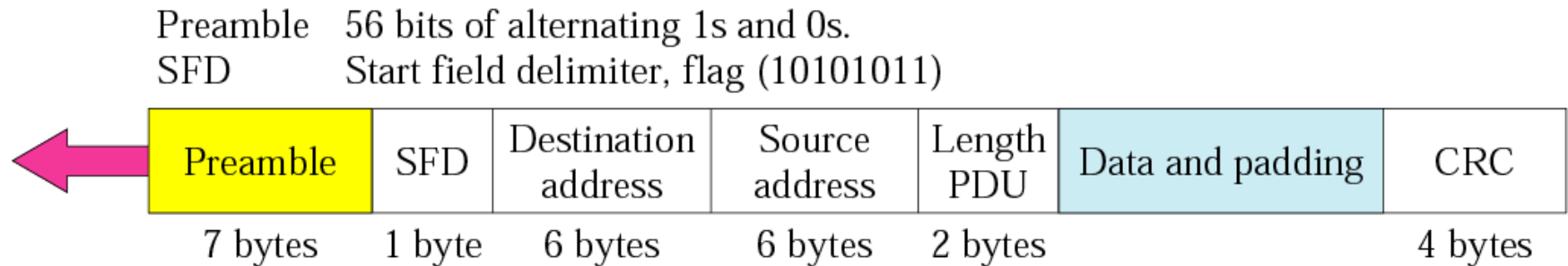




Figure 3-4

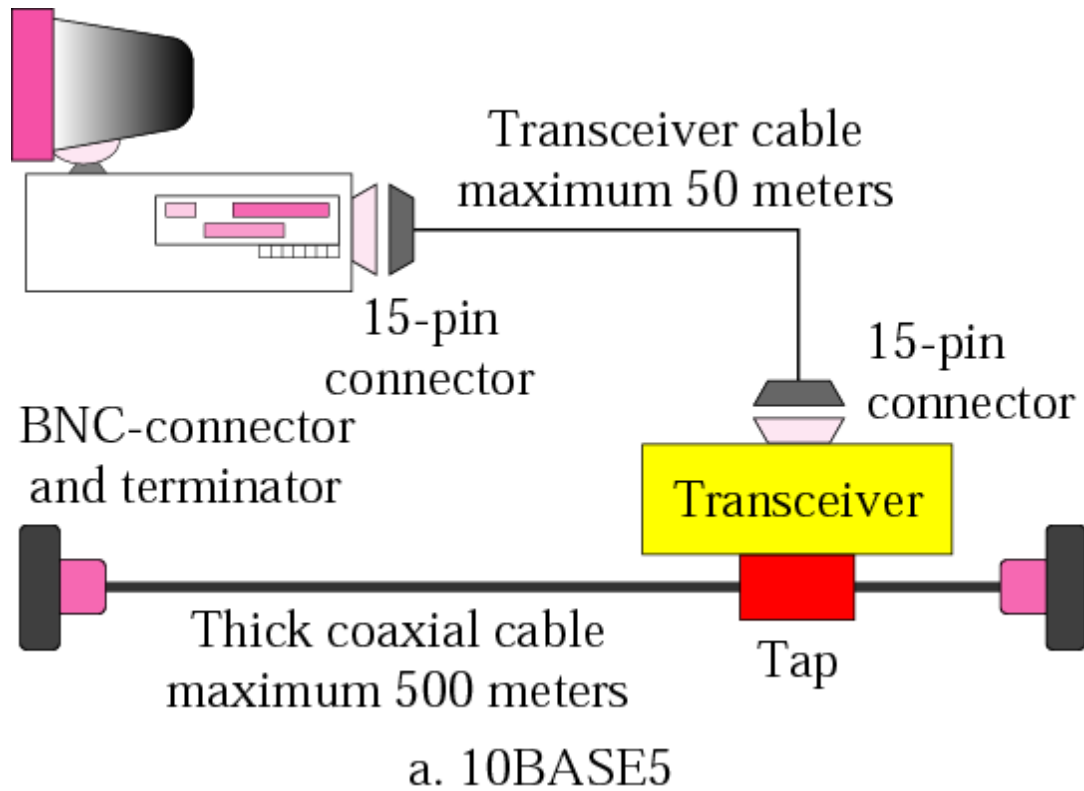
# Ethernet frame



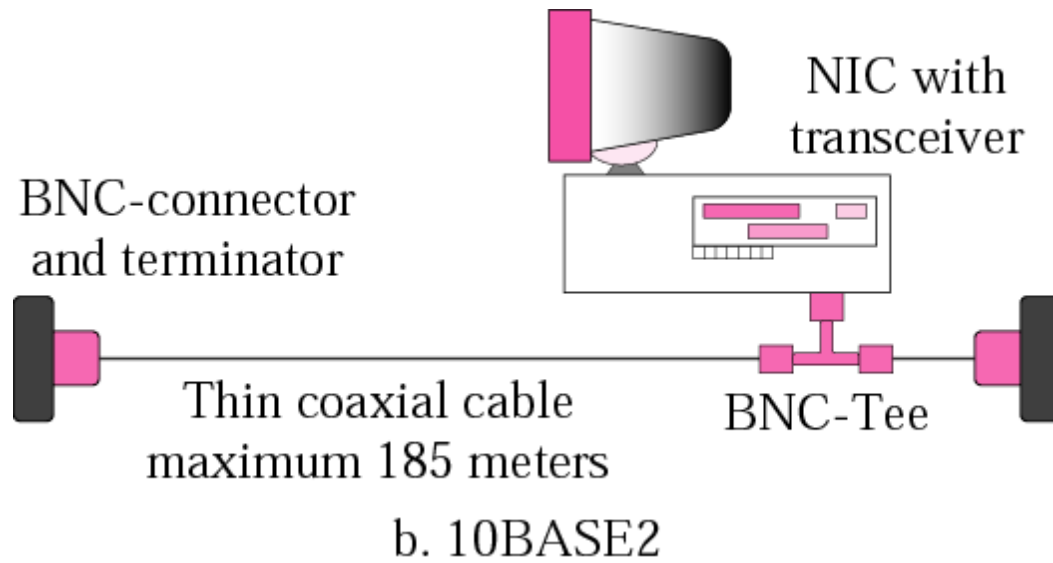
- Ethernet address sent byte by byte, left to right
- For each byte, the less significant bit is sent first
- Unicast (least significant bit of the first byte = 0), multicast (least significant bit = 1) and broadcast addresses (48 1s)
- A source address is always unicast, a destination address can be unicast, broadcast or multicast

Figure 3-5:a

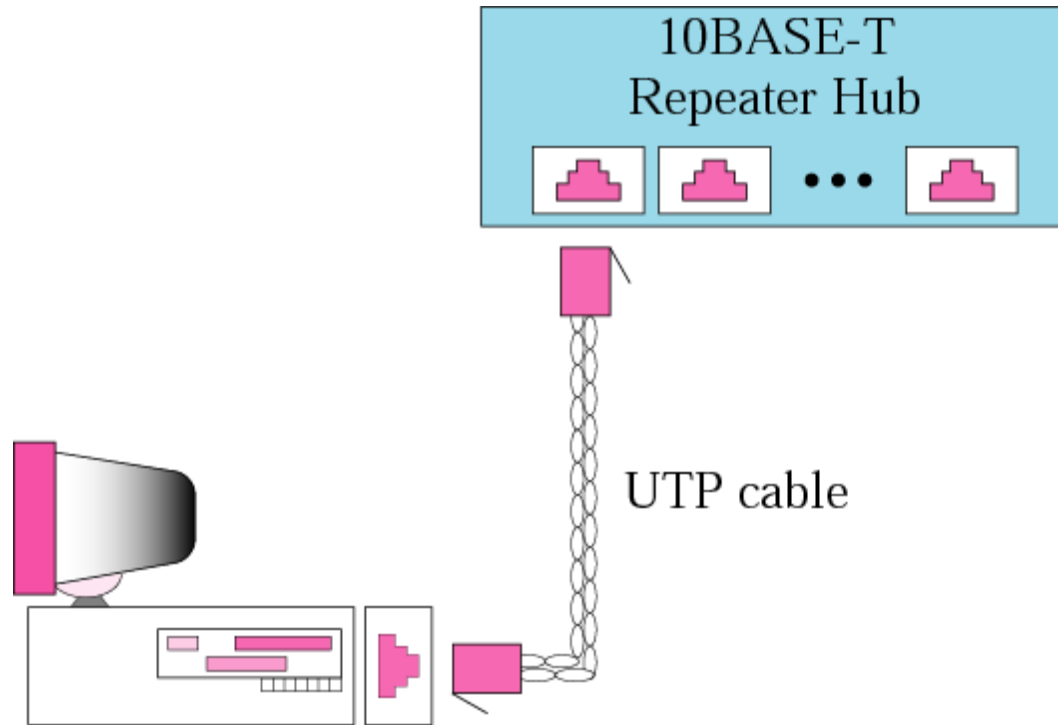
# Ethernet implementation



# Ethernet implementation



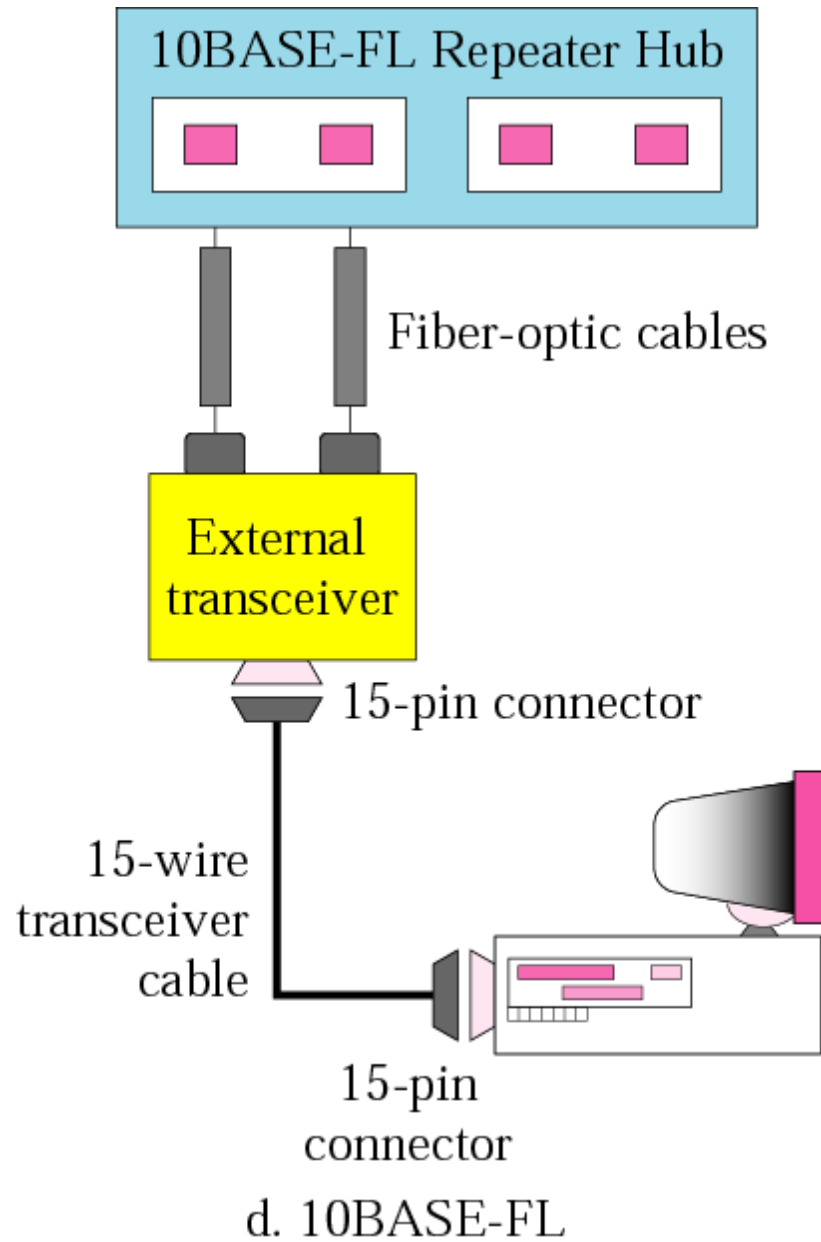
# Ethernet implementation



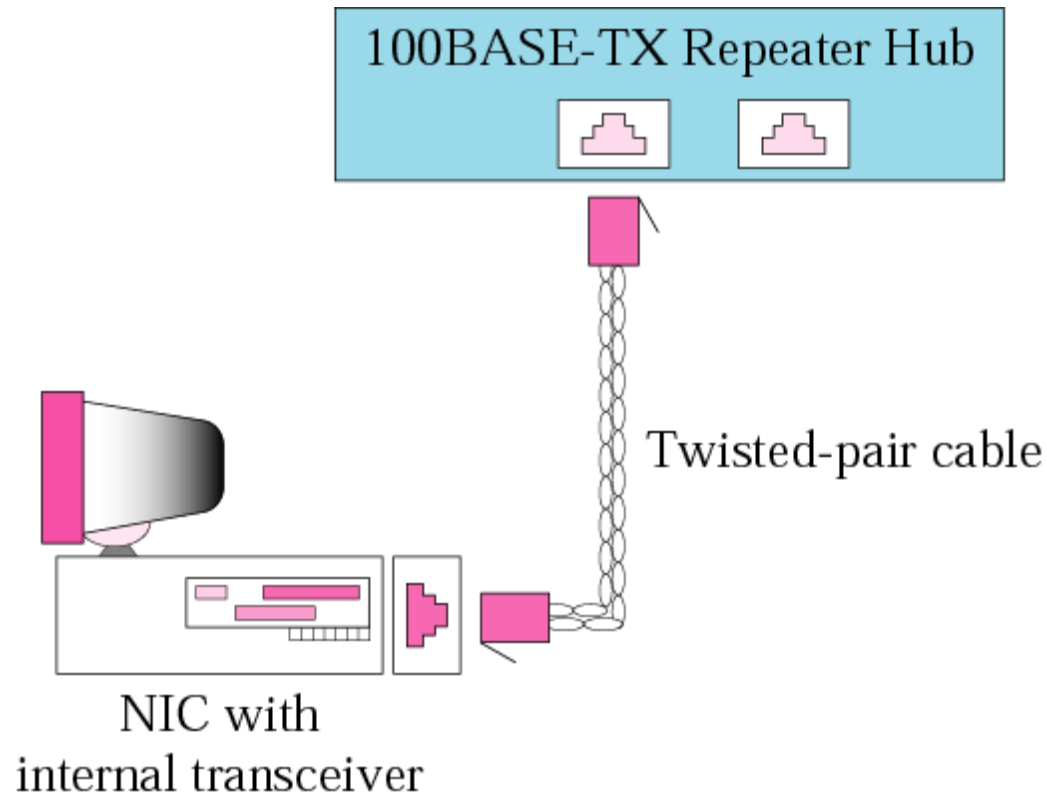
c. 10BASE-T

Figure 3-5:d

# Ethernet implementation

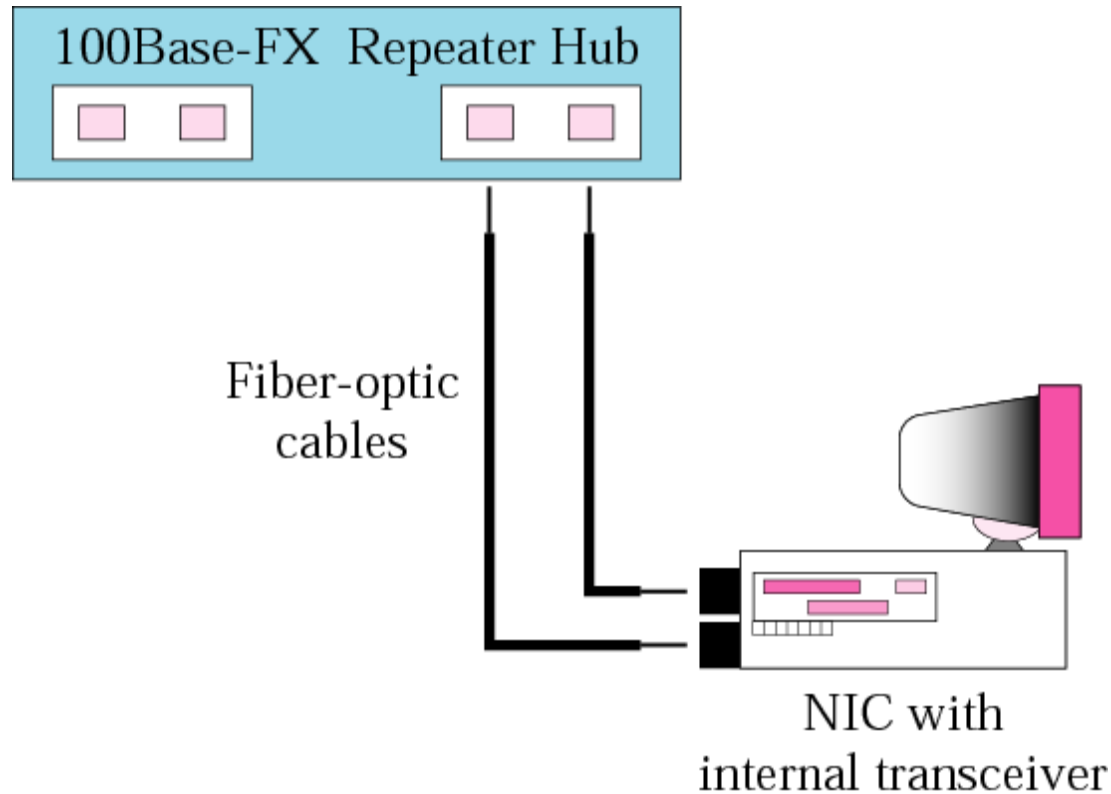


# Fast Ethernet implementation



a. 100BASE-TX

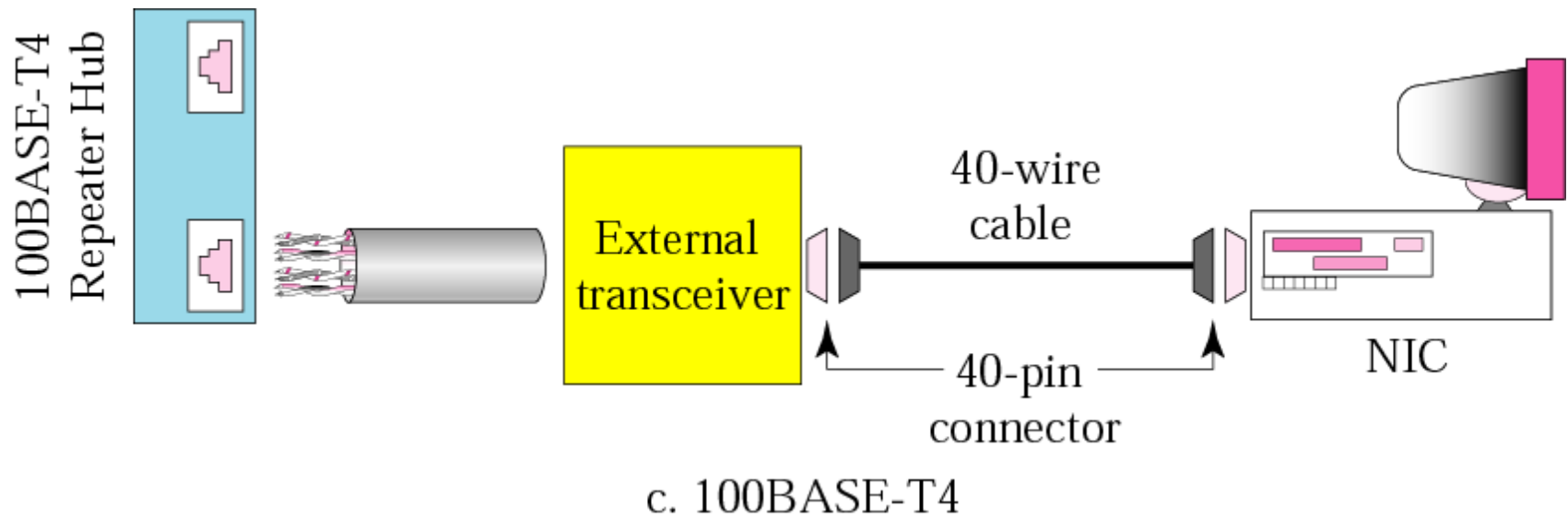
# Fast Ethernet implementation



b. 100BASE-FX

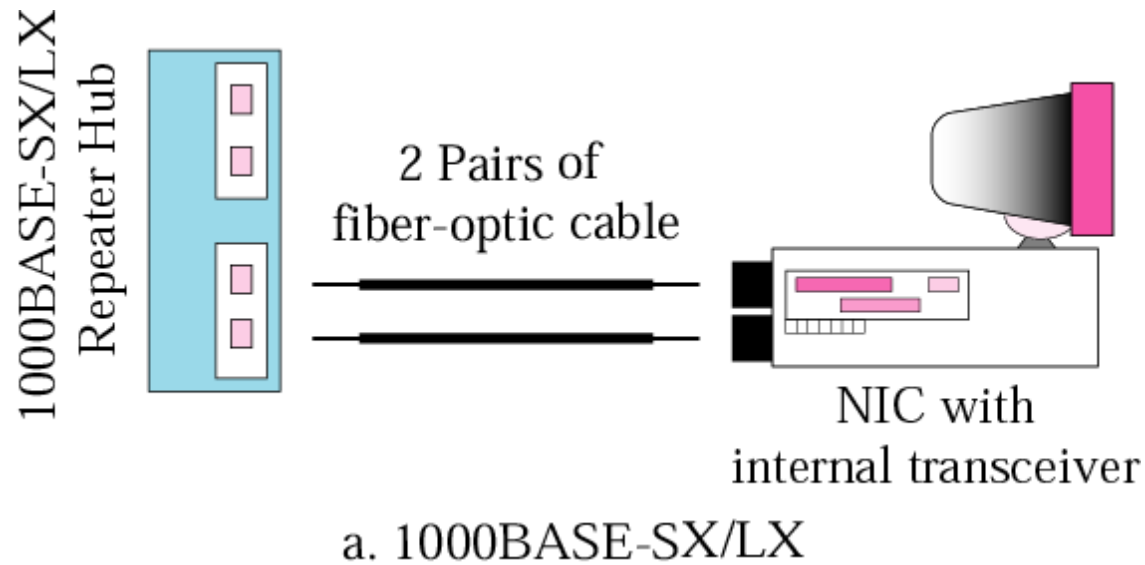
Figure 3-6:c

# Fast Ethernet implementation

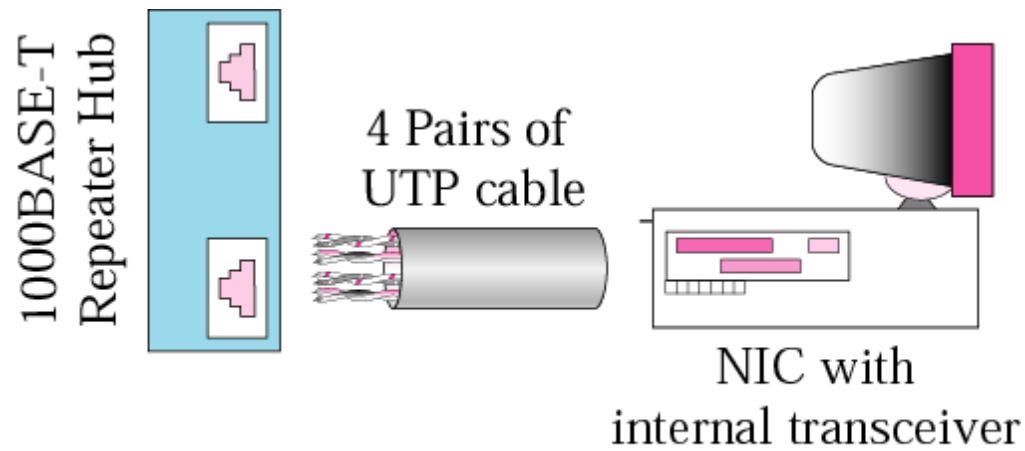




# Gigabit Ethernet implementation

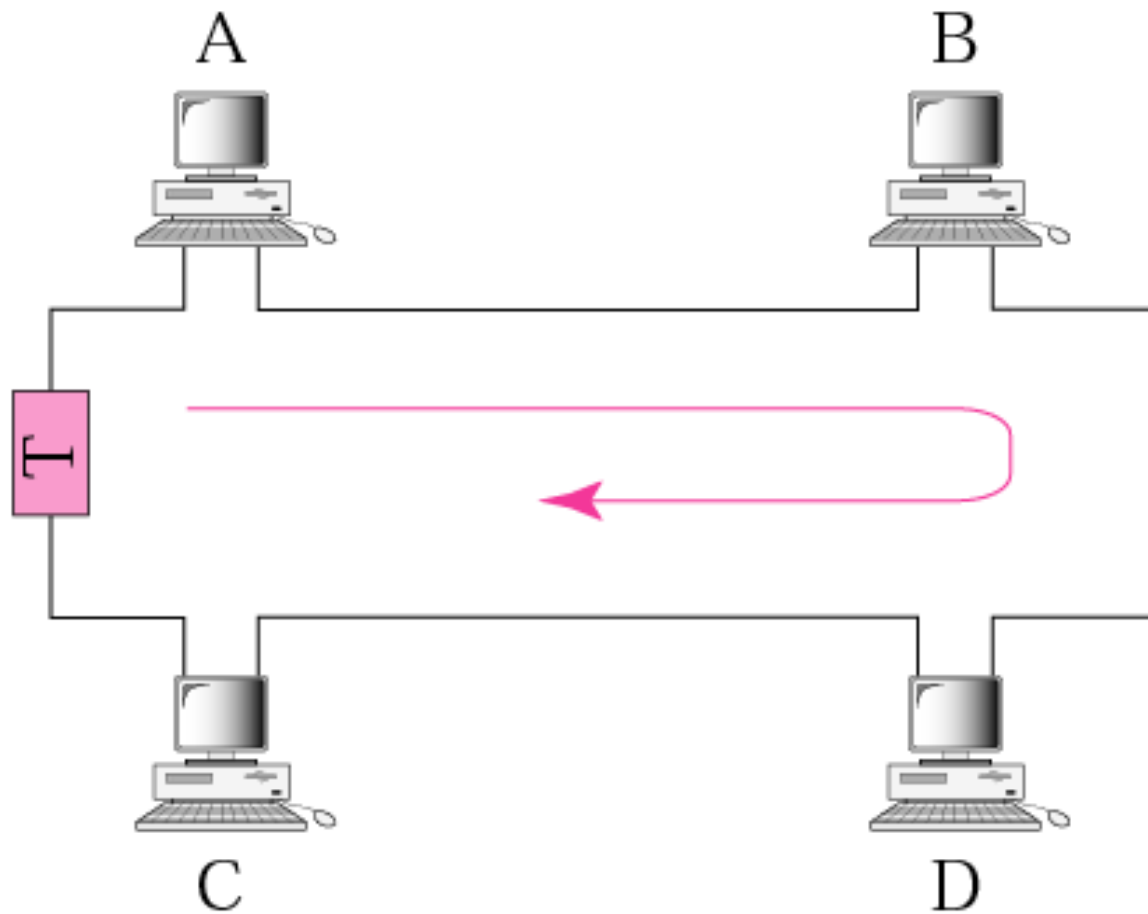


# Gigabit Ethernet implementation



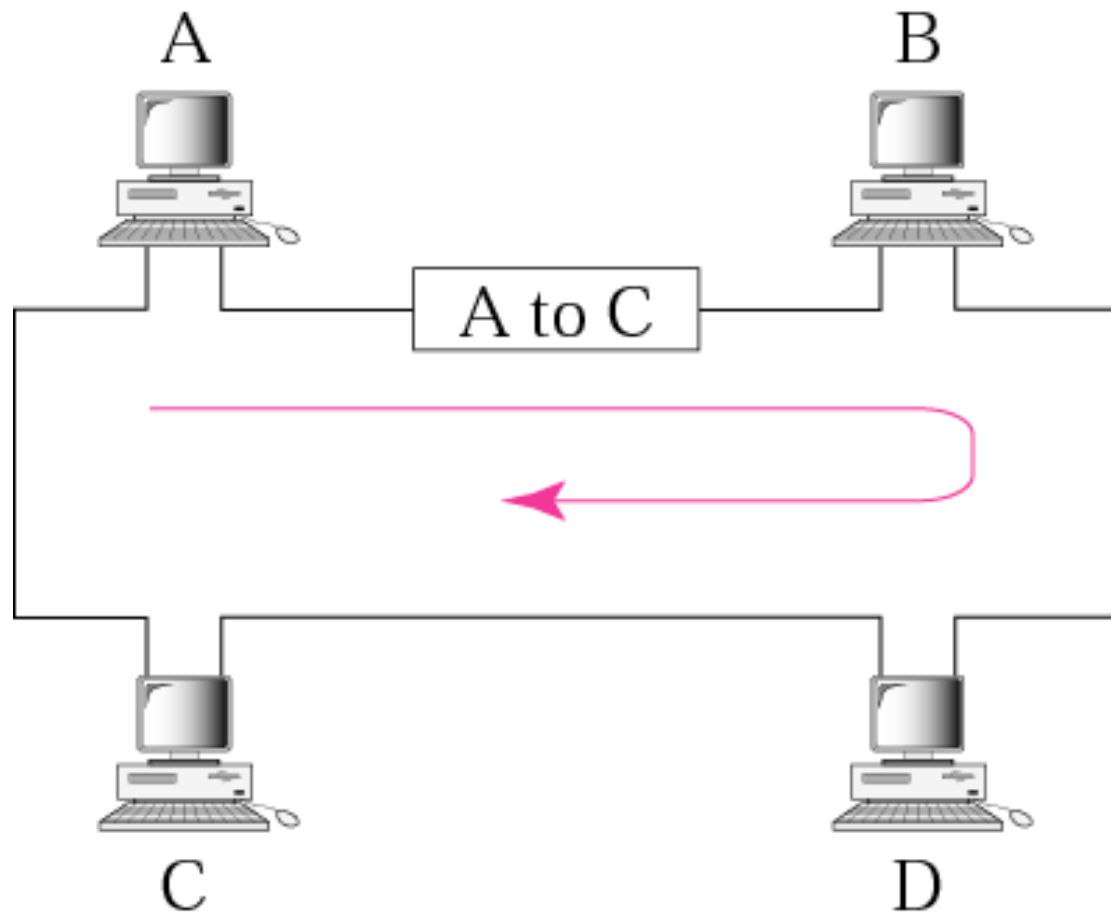
b. 1000BASE-T

# Token passing



a. Station A captures the token

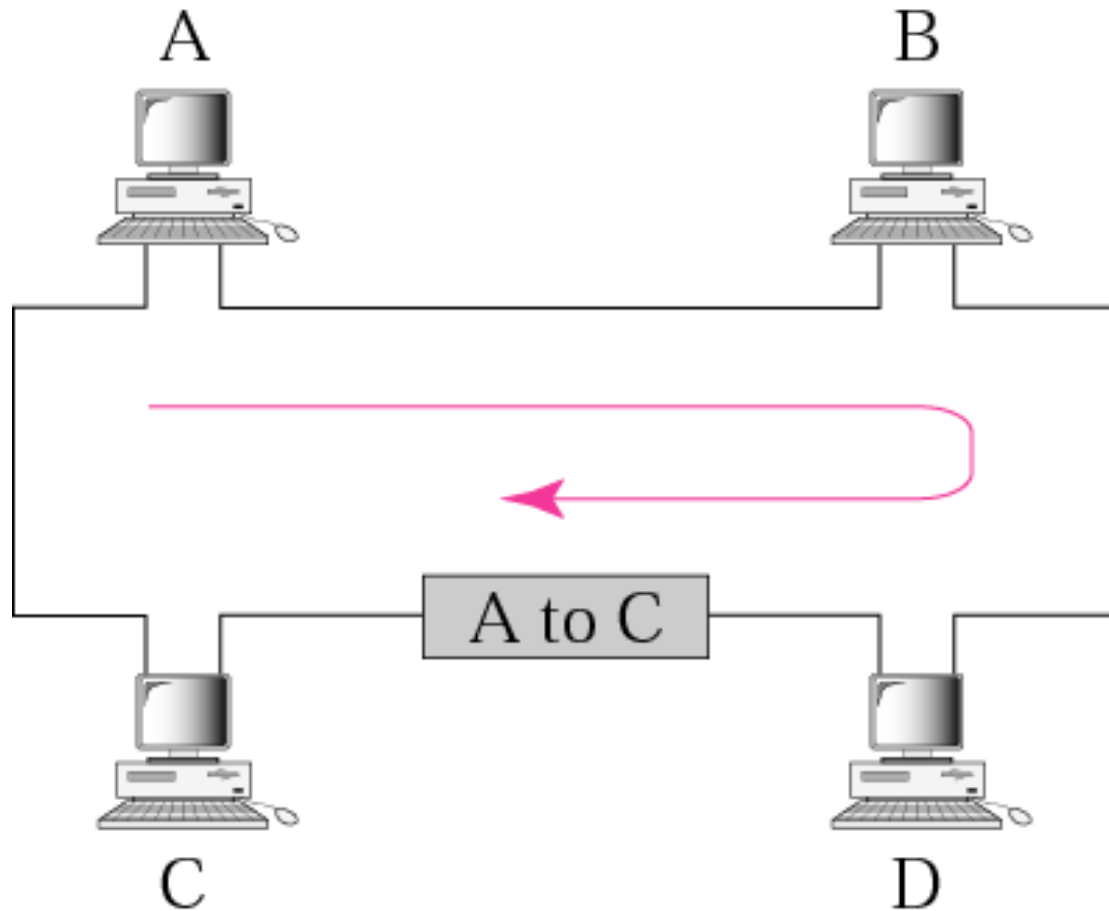
# Token passing



b. Station A sends data to station C

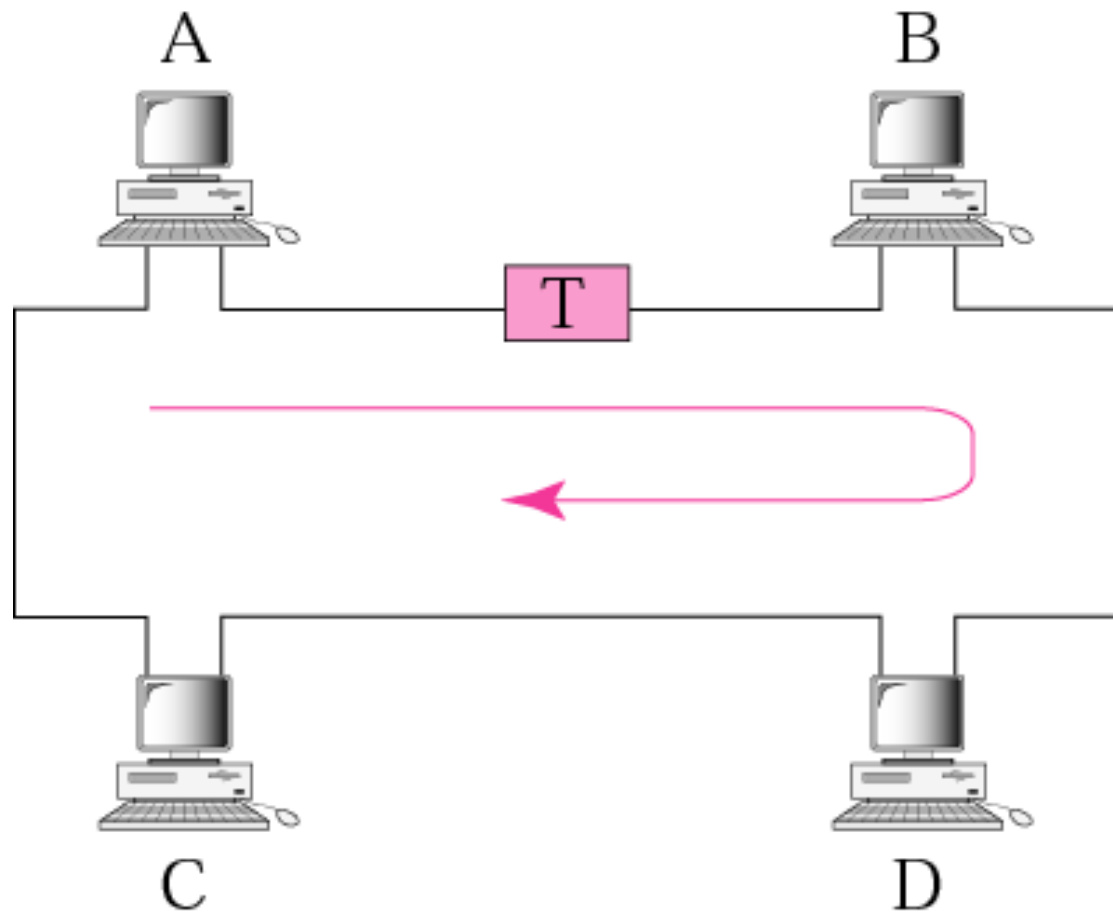
Figure 3-8:c

# Token passing



c. Station C copies data and  
sends frame back to A

# Token passing



d. Station A releases the token

Figure 3-9

# Data frame

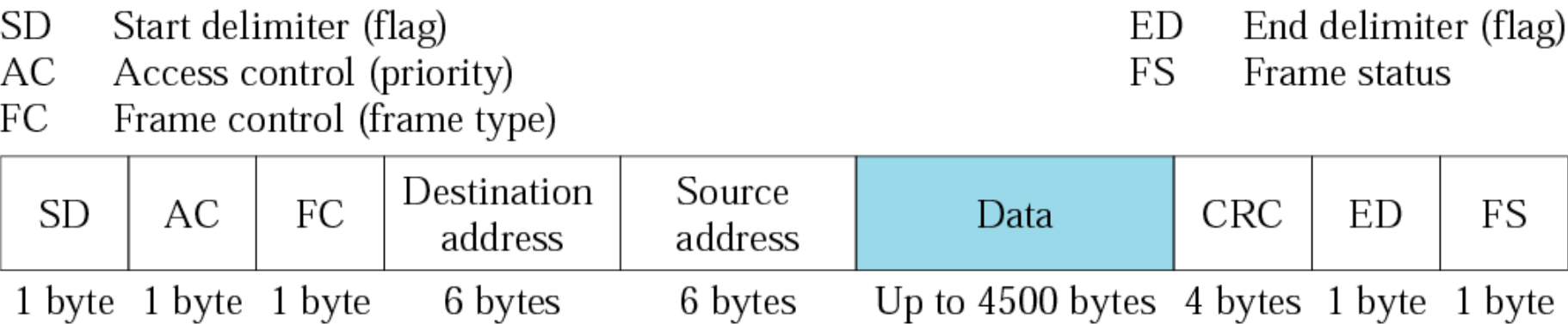
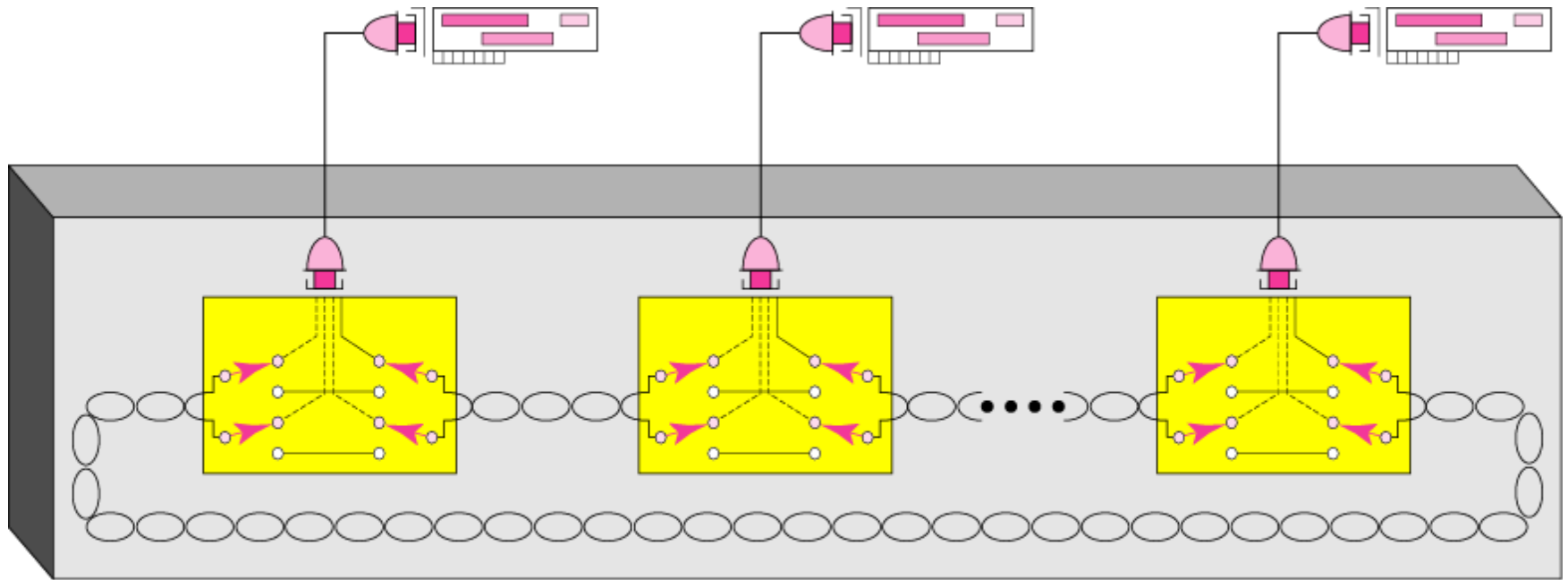


Figure 3-10

# MAU



Multistation access unit  
MAU



**3.4**

# CONNECTING DEVICES

Figure 3-26

# Connecting devices

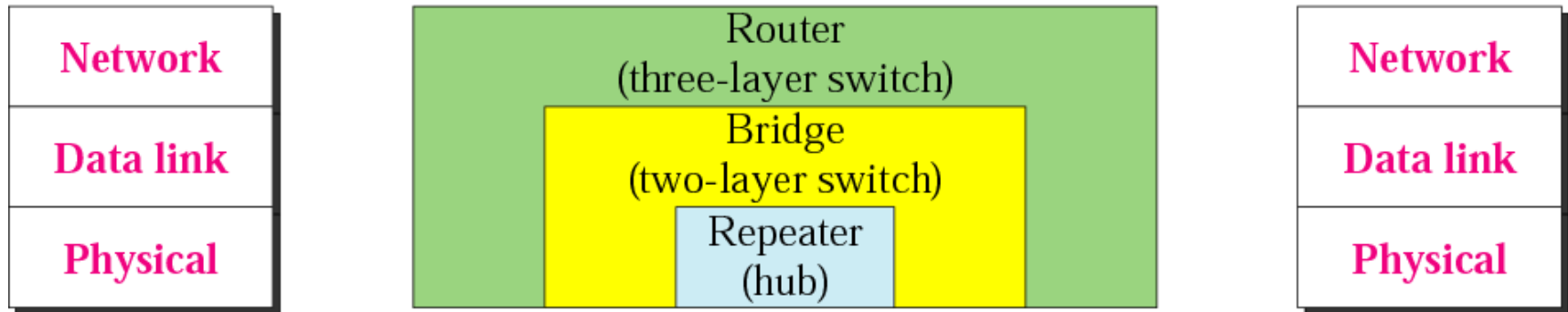
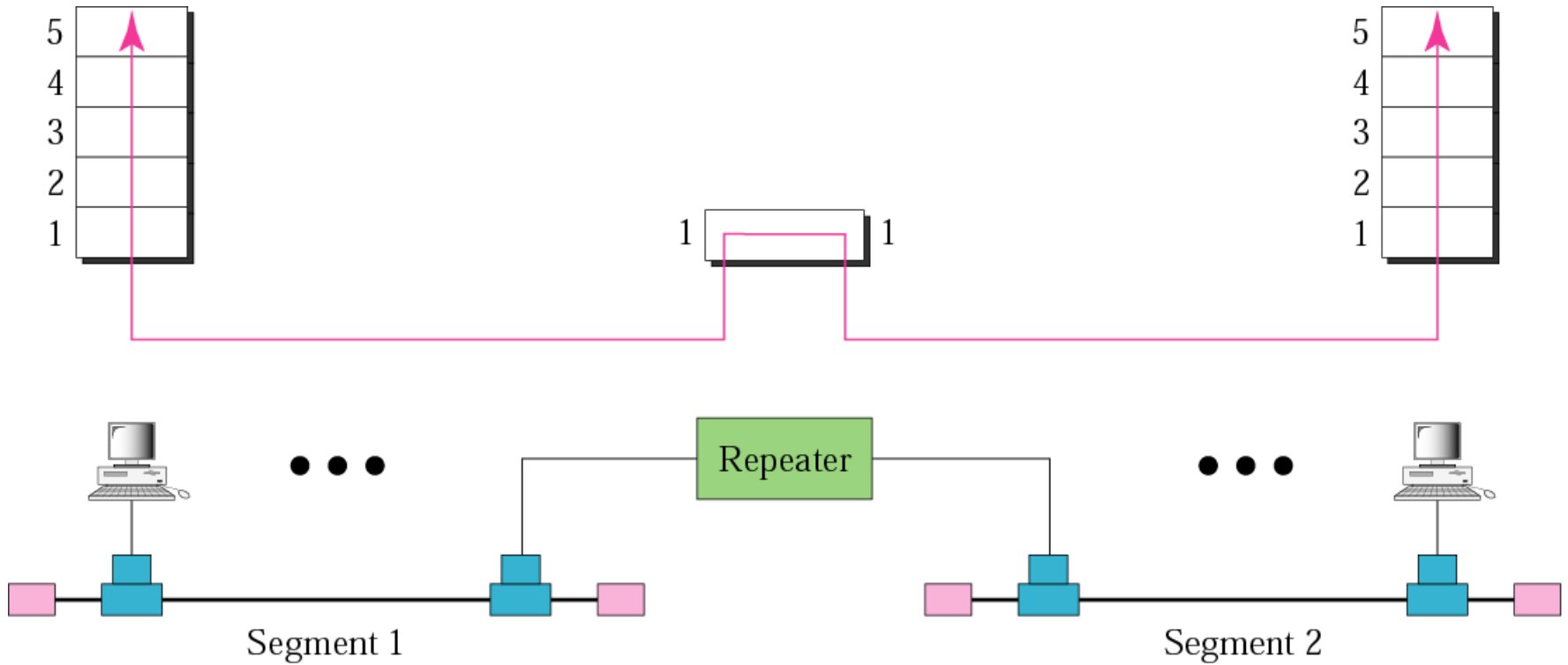


Figure 3-27

# Repeater



## Note

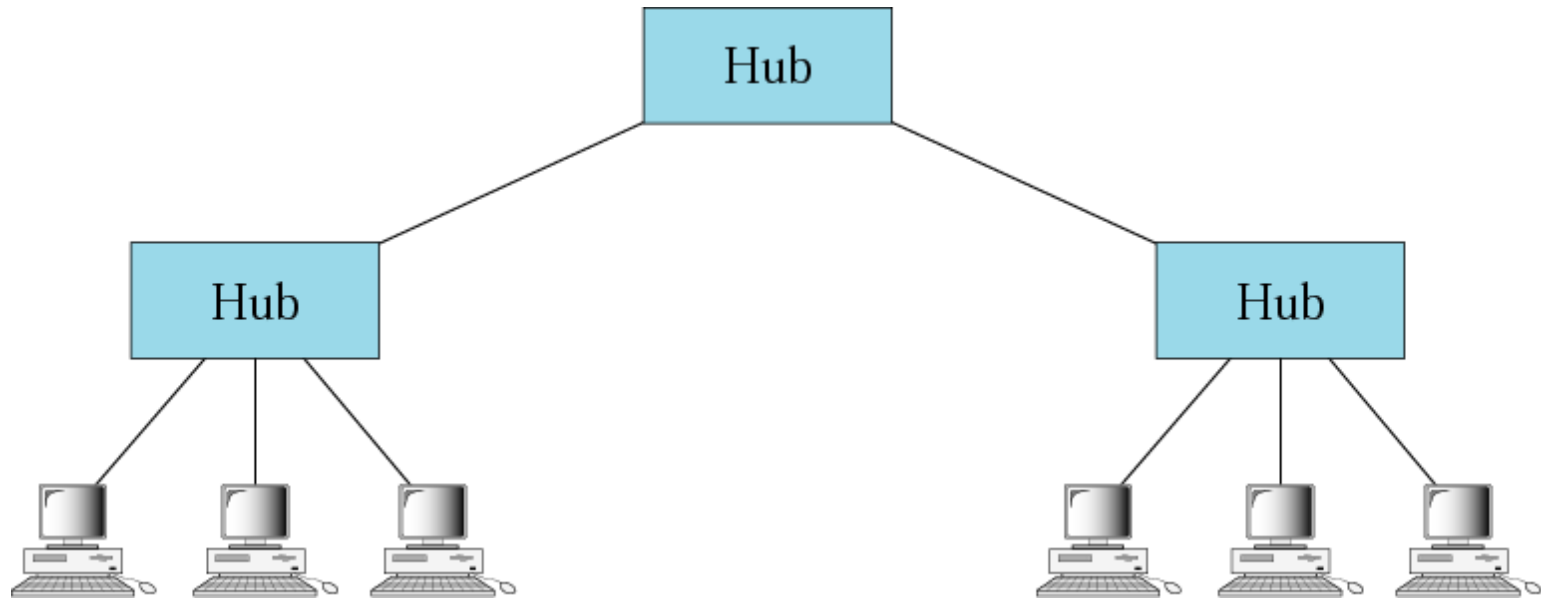
*A repeater connects segments of a LAN together.*

## Note

*A repeater forwards every packet; it has no filtering capability.*

Figure 3-28

# Hubs

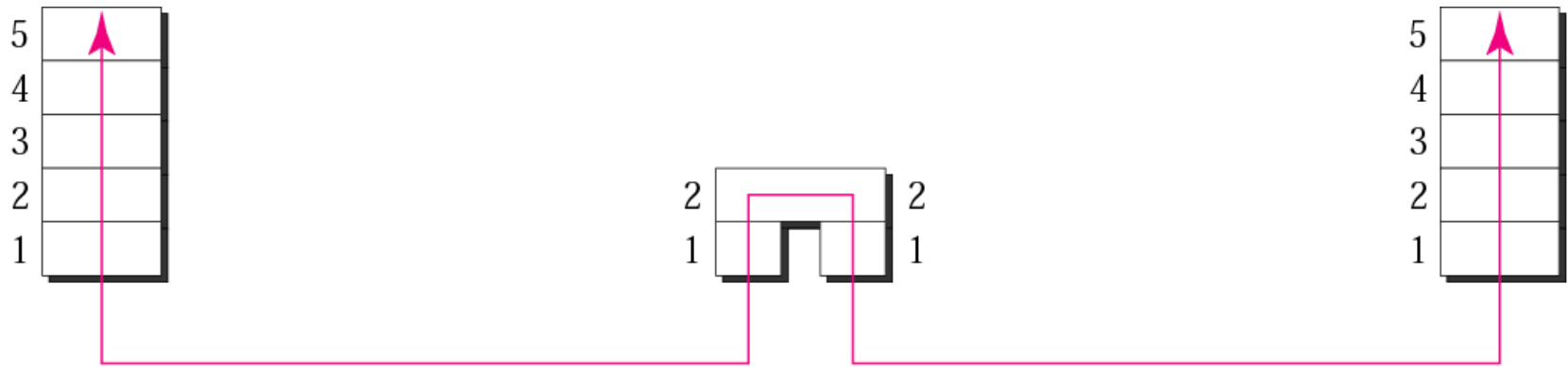


## Note

*A bridge has a table used in filtering decisions.*

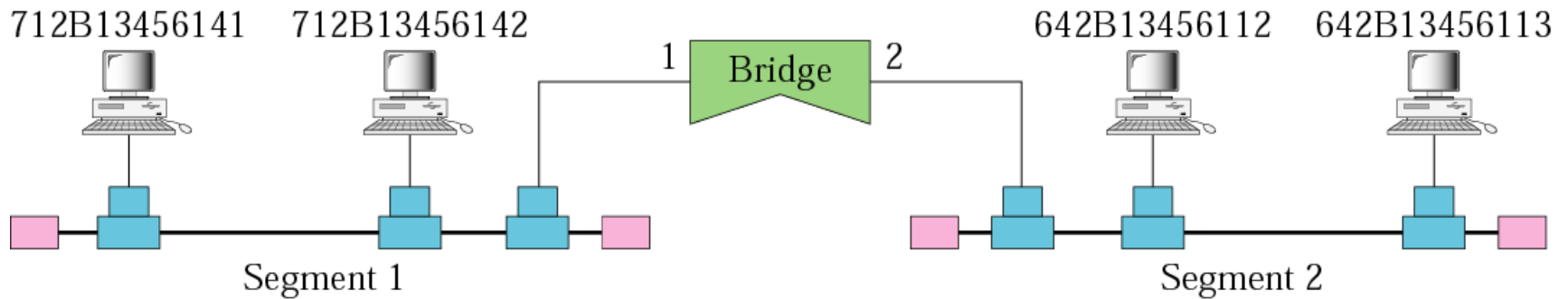
Figure 3-29

# Bridge



| Address      | Interface |
|--------------|-----------|
| 712B13456141 | 1         |
| 712B13456142 | 1         |
| 642B13456112 | 2         |
| 642B13456113 | 2         |

Bridge table





## Note

*A bridge connects segments of a LAN together.*

## Note

*A router is a three-layer (physical, data link, and network) device.*

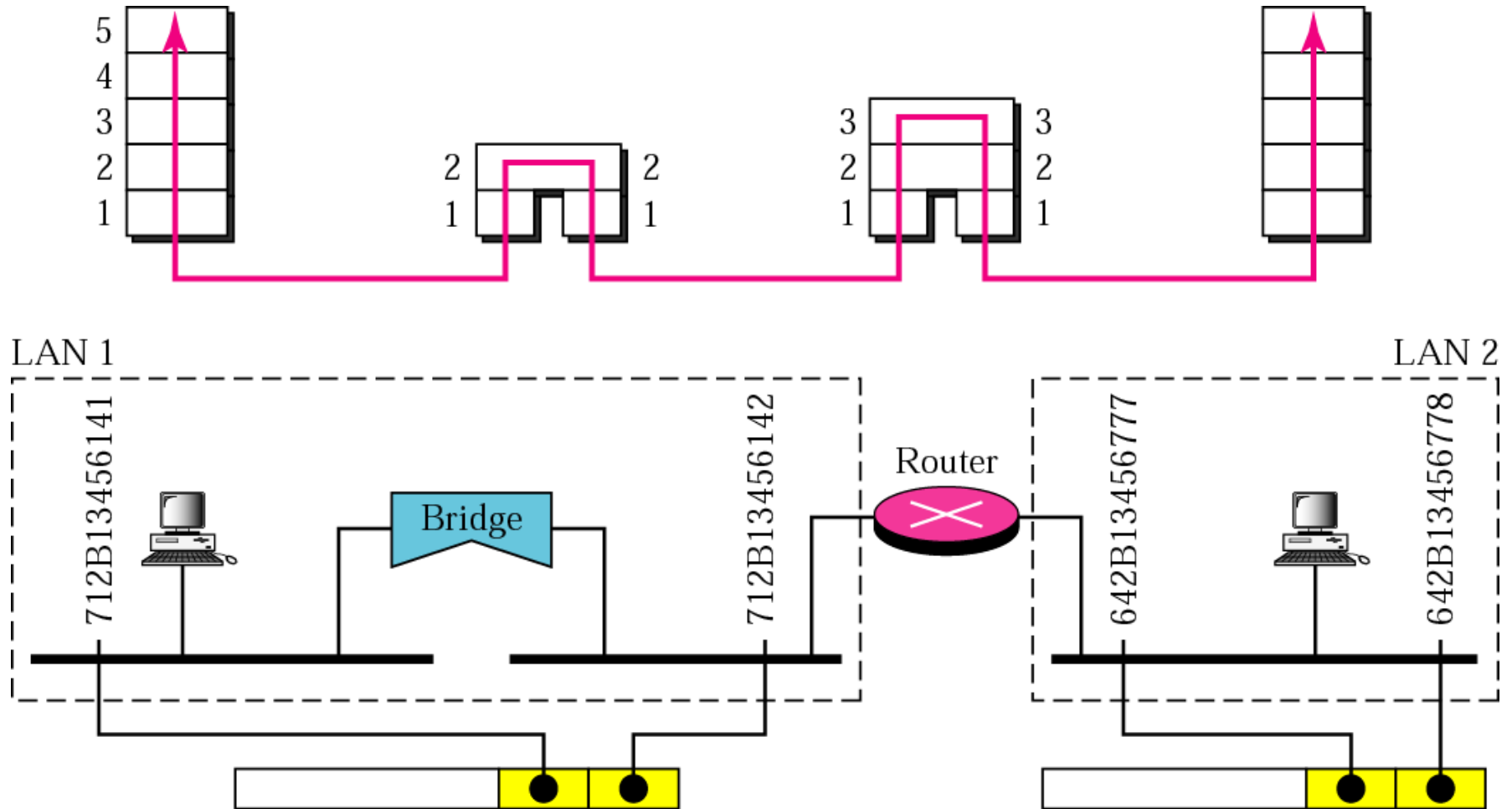
## Note

*A repeater or a bridge connects segments of a LAN.*

*A router connects independent LANs or WANs to create an internetwork (internet).*

Figure 3-30

# Routing example



## Note

*A router changes the physical addresses in a packet.*

# Comparing Hubs, Switches, Routers

|                   | Hub/<br>Repeater | Bridge/<br>Switch | Router |
|-------------------|------------------|-------------------|--------|
| Traffic isolation | no               | yes               | yes    |
| Plug and Play     | yes              | yes               | no     |
| Efficient routing | no               | no                | yes    |
| Cut through       | yes              | yes               | no     |