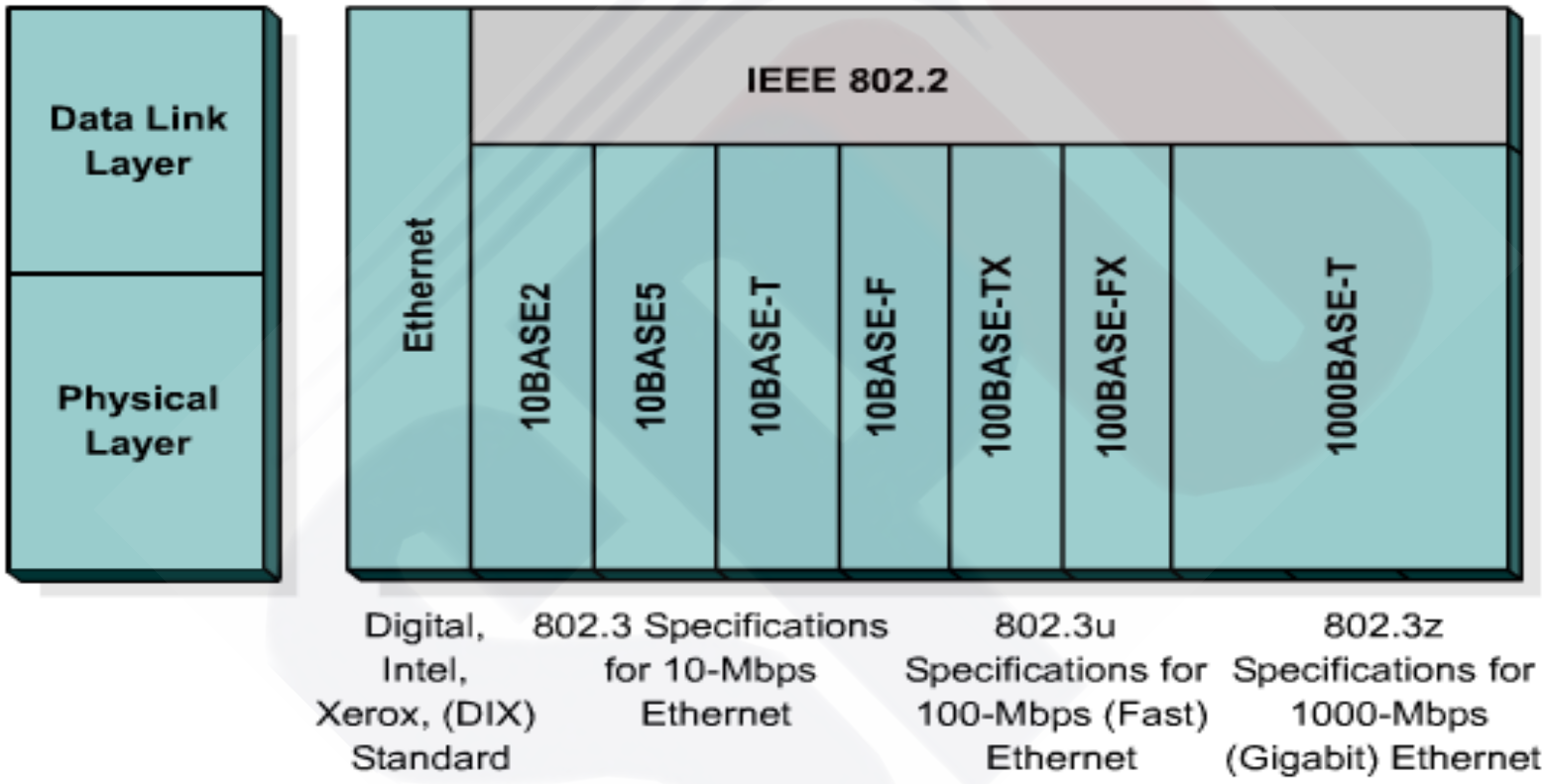
Ethernet Media Connector Requirements

	10BASE2	10BASE5	10BASE-T	100BASE-TX	100BASE-FX
Media	50-ohm coaxial (Thinnet)	50-ohm coaxial (Thicknet)	EIA/TIA Category 3, 4, 5 UTP, two pair	EIA/TIA Category 5 UTP, two pair	62.5/125 multimode fiber
Maximum Segment Length	185 m (606.94 feet)	500 m (1640.4 feet)	100 m (328 feet)	100 m (328 feet)	400 m (1312.3 feet)
Topology	Bus	Bus	Star	Star	Star
Connector	BNC	Attachment unit interface (AUI)	ISO 8877 (RJ-45)	ISO 8877 (RJ-45)	Duplex media interface connector (MIC) ST or SC connector

LAN Physical Layer Implementation



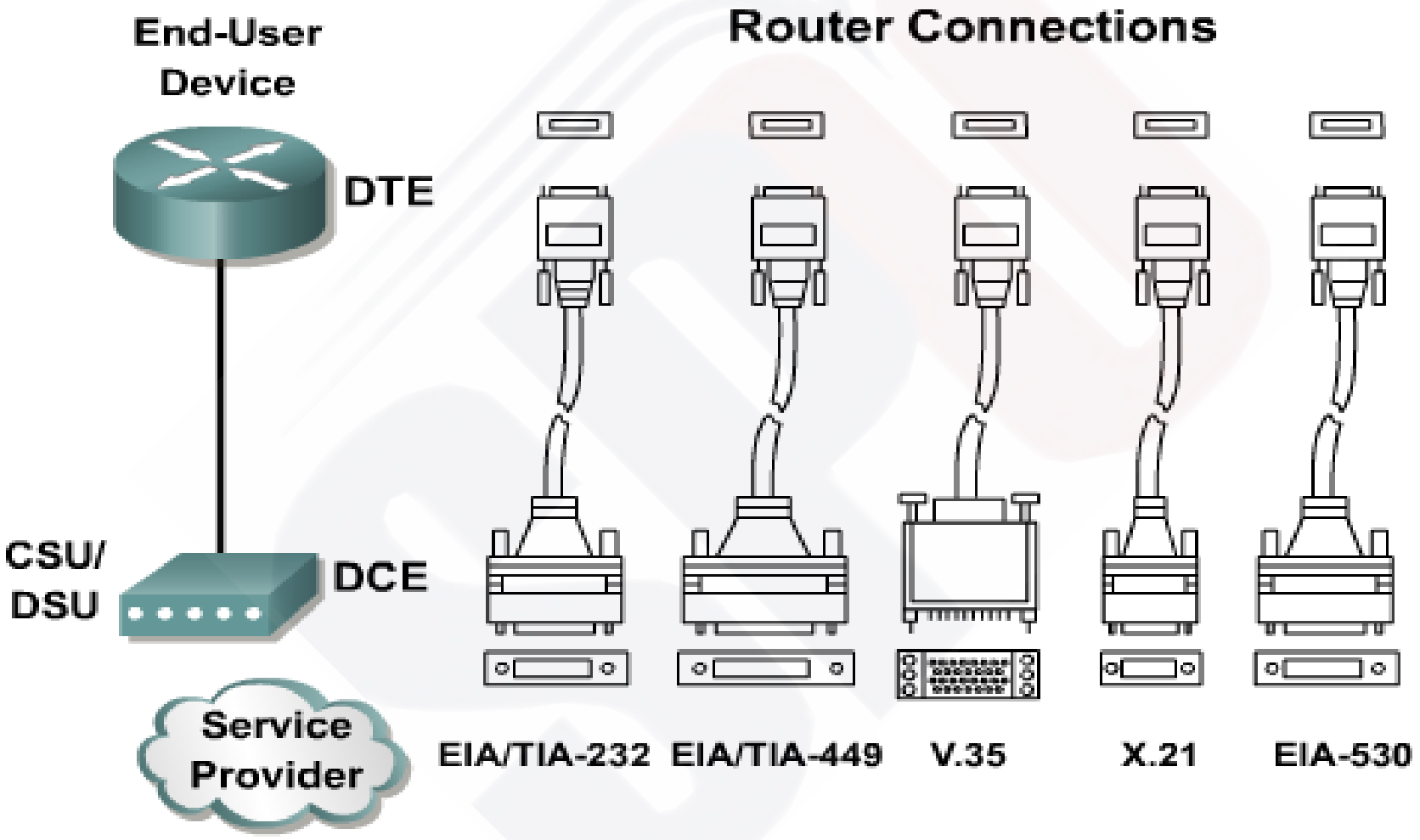
- Physical layer implementations vary.
- Some implementations support multiple physical media.

WAN Physical Layer

Cisco HDLC / PPP / Frame Relay	ISDN BRI (with PPP)	DSL Modem	Cable Modem
EIA/TIA-232 EIA/TIA-449 X.21 V.24 V.35 High Speed Serial Interface (HSSI)	RJ-45 Note: ISDN BRI cable pinouts are different than the pinouts for Ethernet	RJ-11 Note: Works over telephone line	BNC Note: Works over Cable TV line

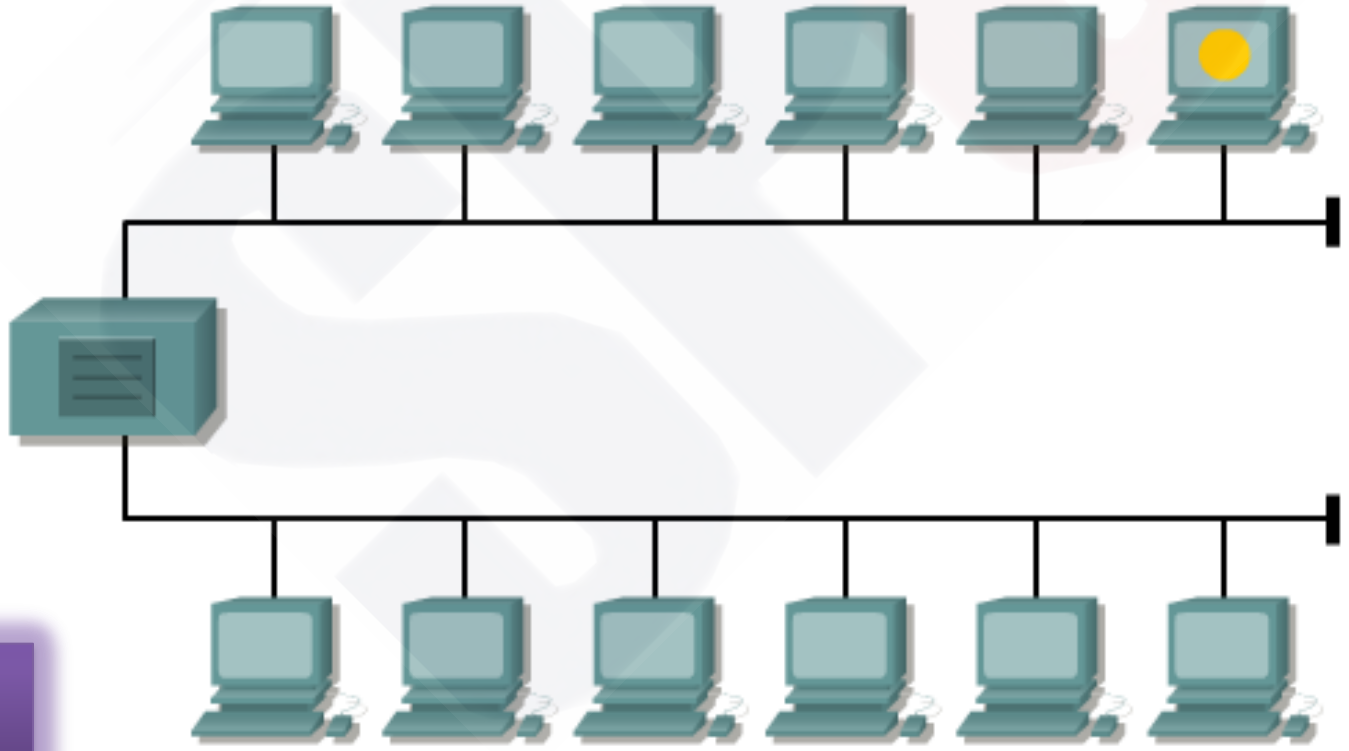
- Physical Layer implementation vary
- Cable specifications define speed of link

WAN Serial Connection Options



Repeater

A repeater is a network device used to regenerate a signal. Repeaters regenerate analog or digital signals distorted by transmission loss due to attenuation.**Repeater is a Physical Layer device**



The 4 Repeater Rule

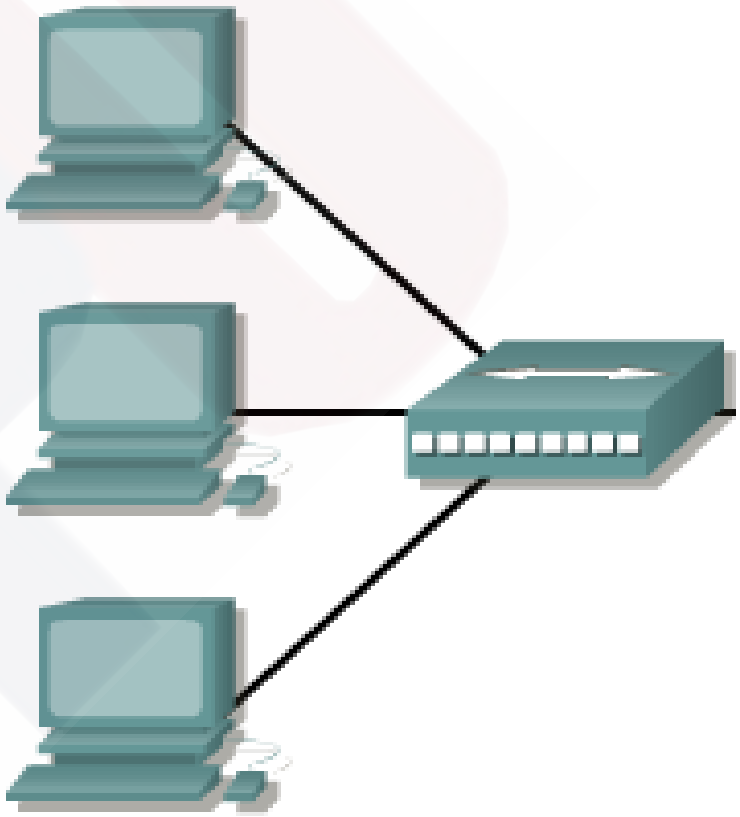
The Four Repeater Rule for 10-Mbps Ethernet should be used as a standard when extending LAN segments.

This rule states that no more than four repeaters can be used between hosts on a LAN.

This rule is used to limit latency added to frame travel by each repeater.

Hub

Hubs concentrate connections.In other words, they take a group of hosts and allow the network to see them as a single unit.
Hub is a physical layer device.



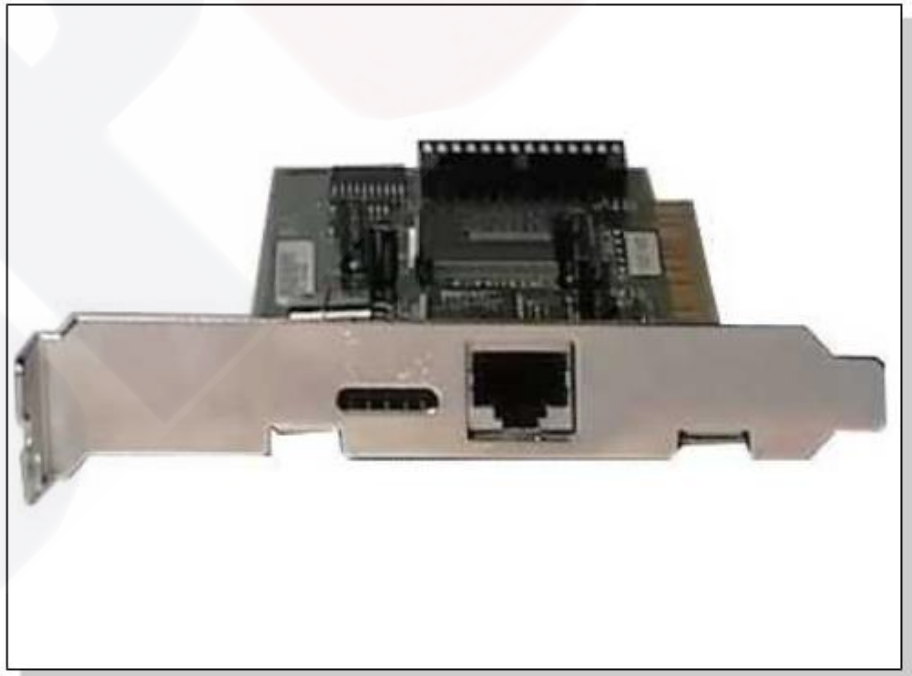
Hub

Network Interface Card

The function of a NIC is to connect a host device to the network medium.

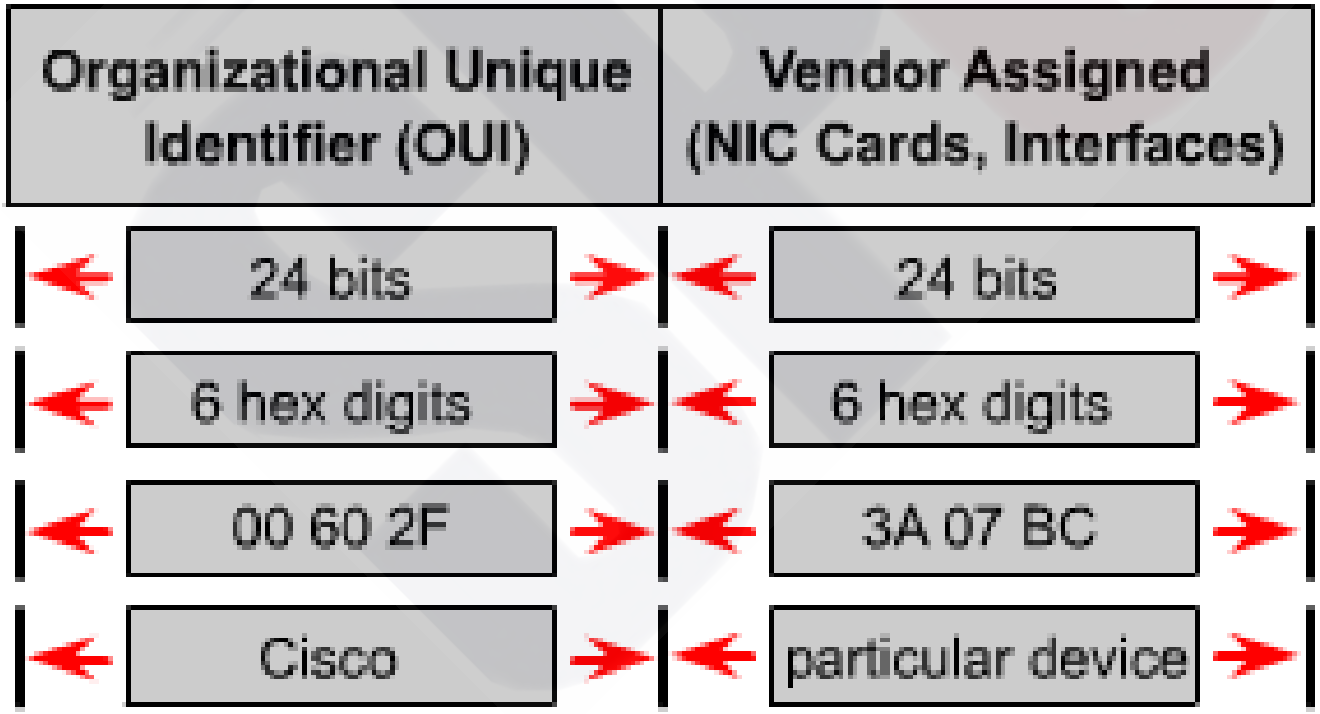
A NIC is a printed circuit board that fits into the expansion slot on the motherboard or peripheral device of a computer. The NIC is also referred to as a network adapter.

NICs are considered Data Link Layer devices because each NIC carries a unique code called a MAC address.



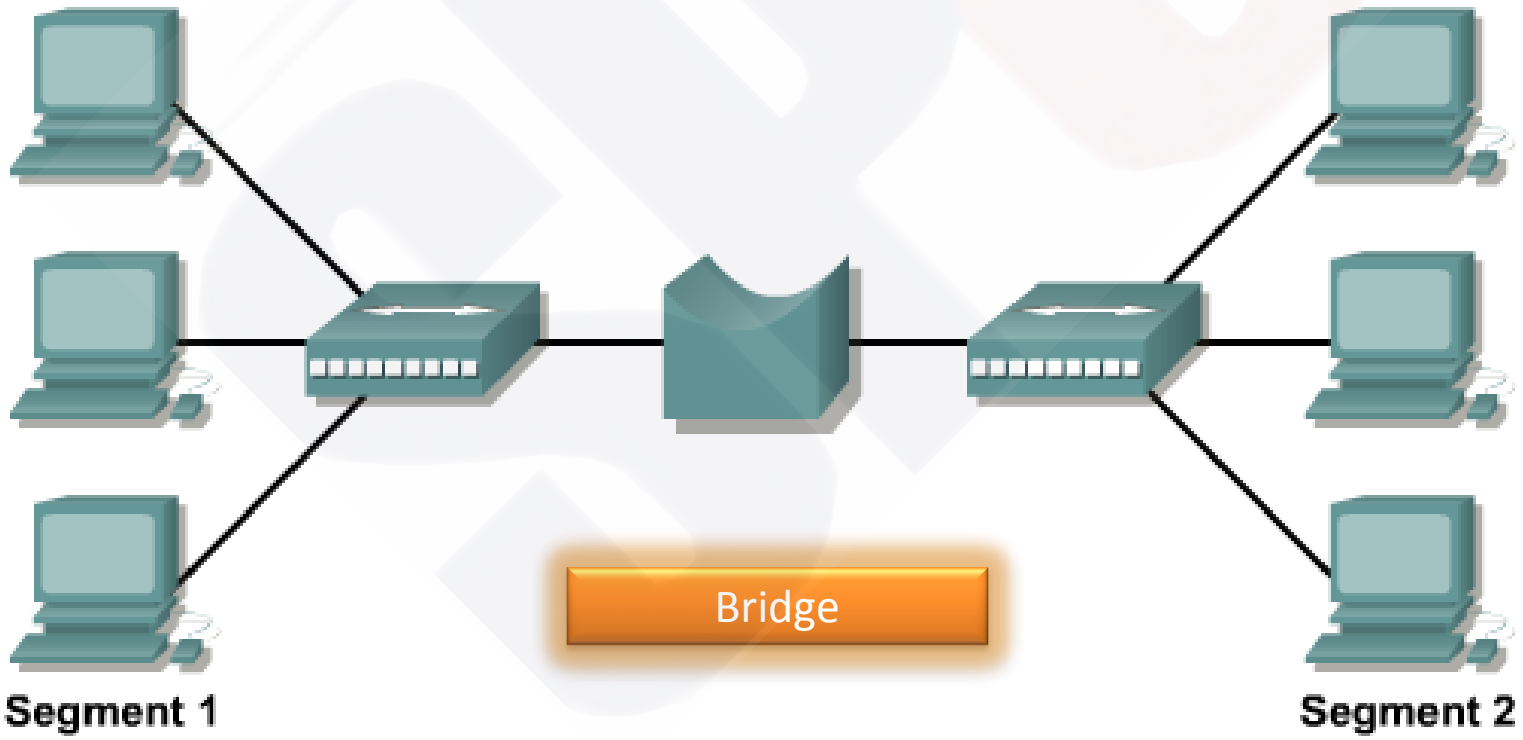
MAC Address

MAC address is 48 bits in length and expressed as twelve hexadecimal digits.MAC addresses are sometimes referred to as burned-in addresses (BIA) because they are burned into read-only memory (ROM) and are copied into random-access memory (RAM) when the NIC initializes.

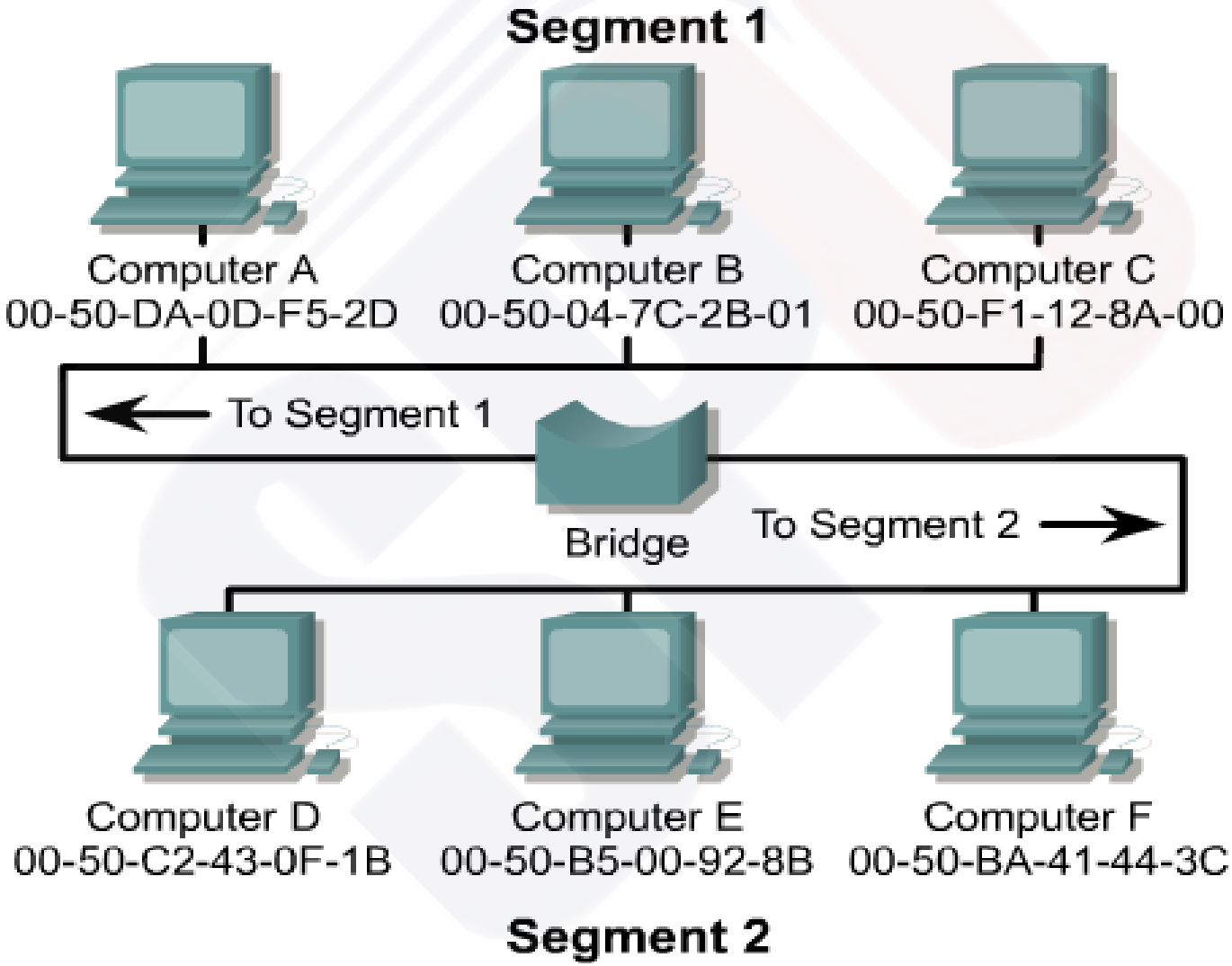


Bridge

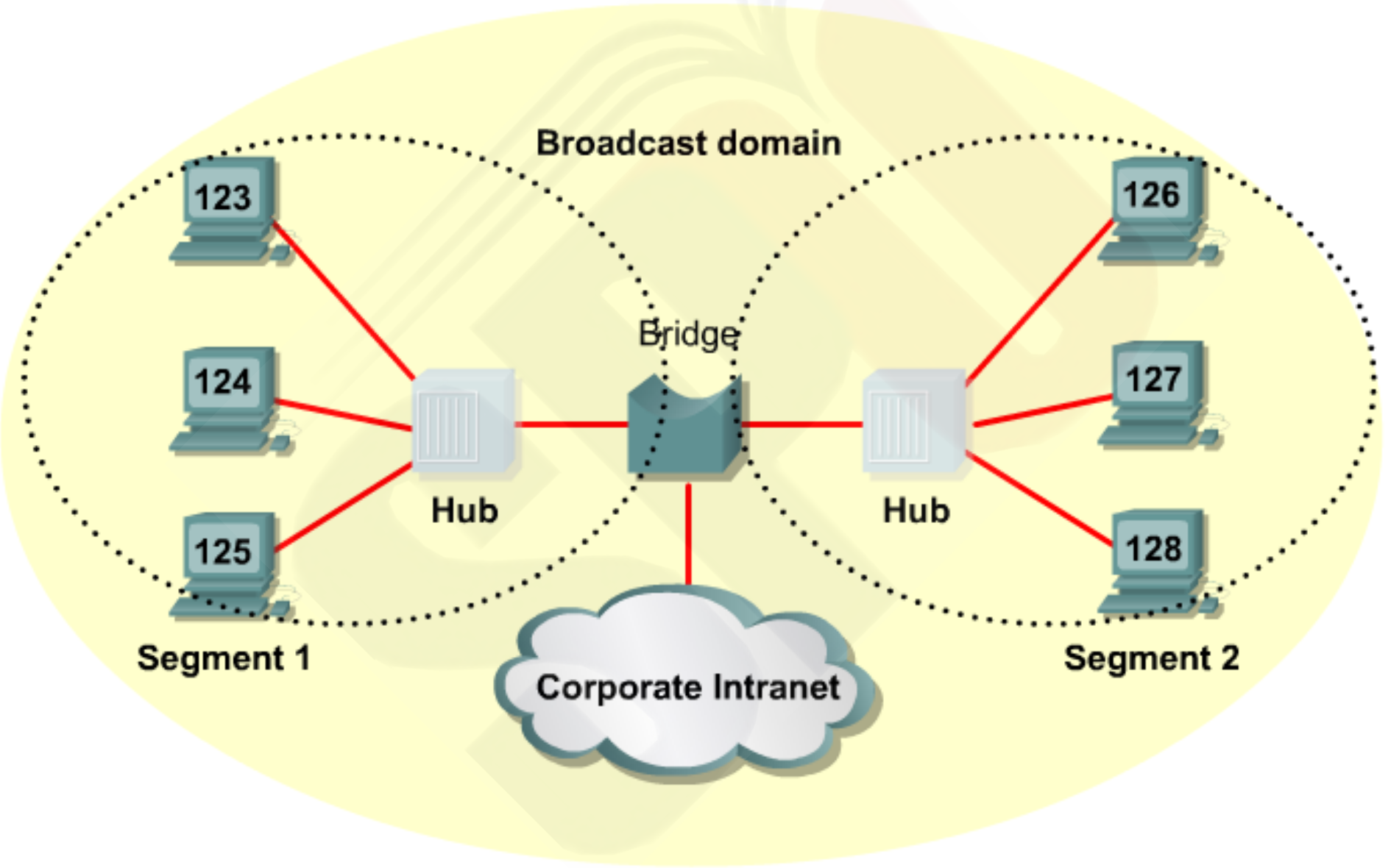
Bridges are Data Link layer devices. Connected host addresses are learned and stored on a MAC address table.Each bridge port has a unique MAC address



Bridges


Segment 1
Computer A
00-50-DA-0D-F5-2D
Computer B
00-50-04-7C-2B-01
Computer C
00-50-F1-12-8A-00
To Segment 1
Bridge
To Segment 2
Computer D
00-50-C2-43-0F-1B
Computer E
00-50-B5-00-92-8B
Computer F
00-50-BA-41-44-3C
Segment 2

Bridging Graphic

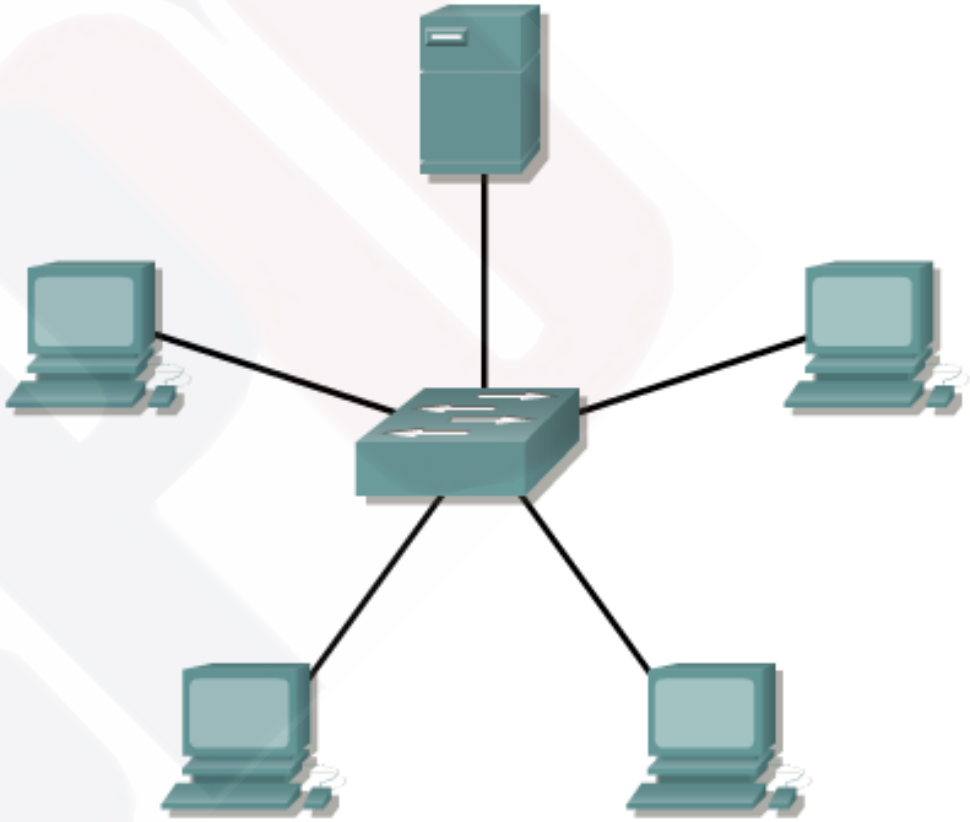


Switch

Switches are Data Link layer devices.

Each Switch port has a unique MAC address.

Connected host MAC addresses are learned and stored on a MAC address table.



Switching Modes

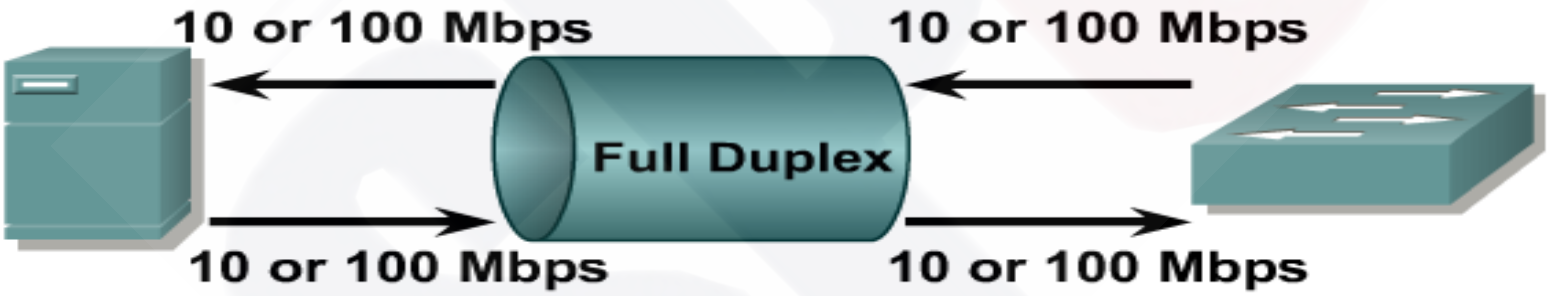
cut-through
A switch starts to transfer the frame as soon as the destination MAC address is received. No error checking is available.
Must use synchronous switching.

store-and-forward
At the other extreme, the switch can receive the entire frame before sending it out the destination port. This gives the switch software an opportunity to verify the Frame Check Sum (FCS) to ensure that the frame was reliably received before sending it to the destination.
Must be used with asynchronous switching.

fragment-free
A compromise between the cut-through and store-and-forward modes. Fragment-free reads the first 64 bytes, which includes the frame header, and switching begins before the entire data field and checksum are read.

Full Duplex

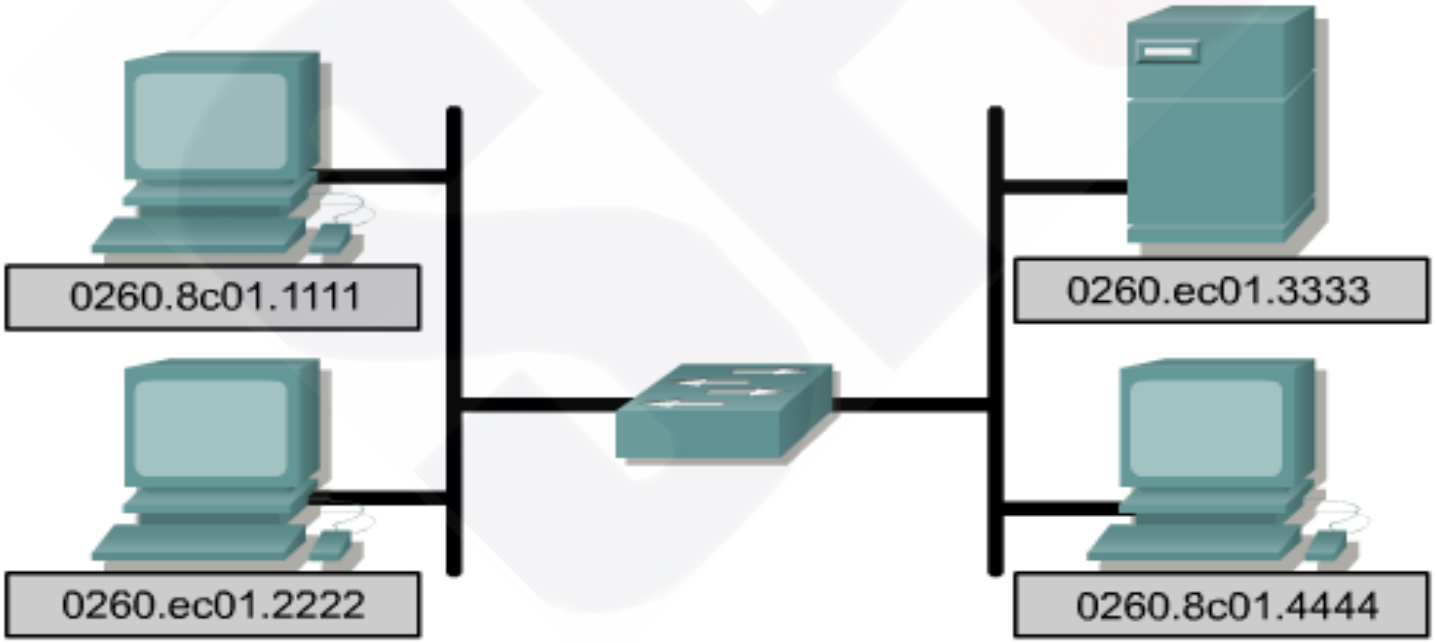
Another capability emerges when only two nodes are connected. In a network that uses twisted-pair cabling, one pair is used to carry the transmitted signal from one node to the other node. A separate pair is used for the return or received signal. It is possible for signals to pass through both pairs simultaneously. The capability of communication in both directions at once is known as full duplex.



- Doubles bandwidth between nodes
- Collision-free transmission
- Two 10- or 100- Mbps data paths

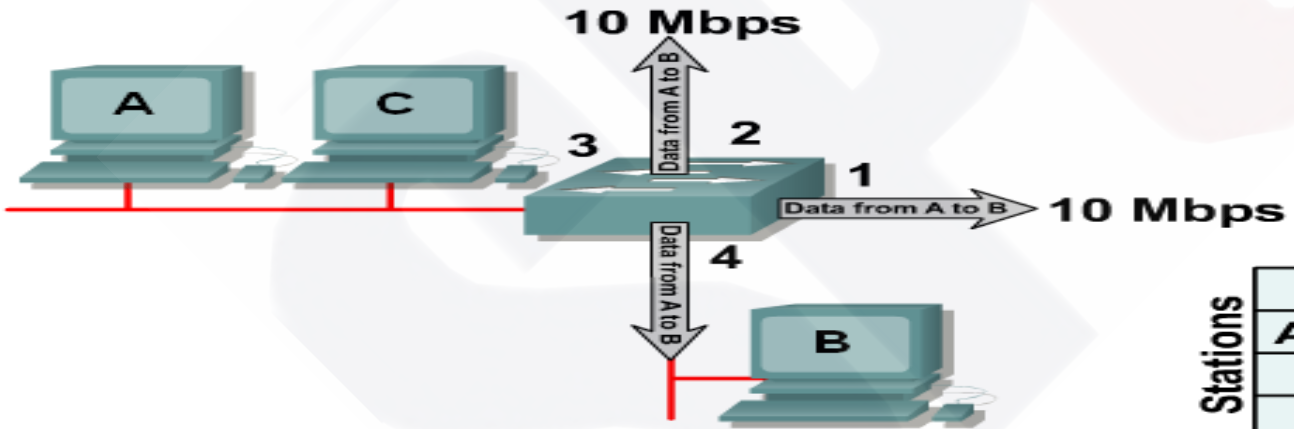
Switches – MAC Tables

Interface	MAC Address
E0	0260.8c01.1111
E0	0260.ec01.2222
E1	0260.ec01.3333
E1	0260.8c01.4444



Microsegmentation

A switch is simply a bridge with many ports. When only one node is connected to a switch port, the collision domain on the shared media contains only two nodes. The two nodes in this small segment, or collision domain, consist of the switch port and the host connected to it. These small physical segments are called micro segments.



Stations	Interface 1	2	3	4
A			X	

- Forward packets based on MAC address in forwarding table
- Operates at OSI Layer 2
- Learns a station's location by examining source address

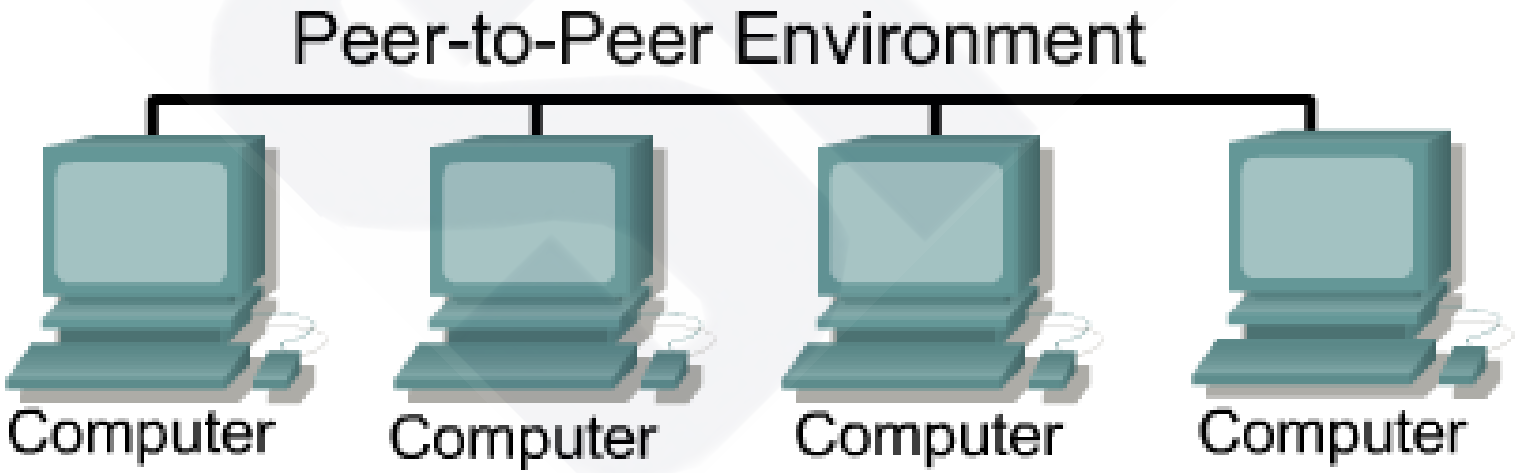
Peer-to-Peer Network

In a peer-to-peer network, networked computers act as equal partners, or peers.

As peers, each computer can take on the client function or the server function.

At one time, computer A may make a request for a file from computer B, which responds by serving the file to computer A. Computer A functions as client, while B functions as the server. At a later time, computers A and B can reverse roles.

In a peer-to-peer network, individual users control their own resources. Peer-to-peer networks are relatively easy to install and operate. As networks grow, peer-to-peer relationships become increasingly difficult to coordinate.



Client/Server Network

In a client/server arrangement, network services are located on a dedicated computer called a server.

The server responds to the requests of clients.

The server is a central computer that is continuously available to respond to requests from clients for file, print, application, and other services.

Most network operating systems adopt the form of a client/server relationship.