Ashur University
Engineering Collage
CyberSecutity Engineering Department



Computer Networks 2

Introduction and Review

Lecture 01

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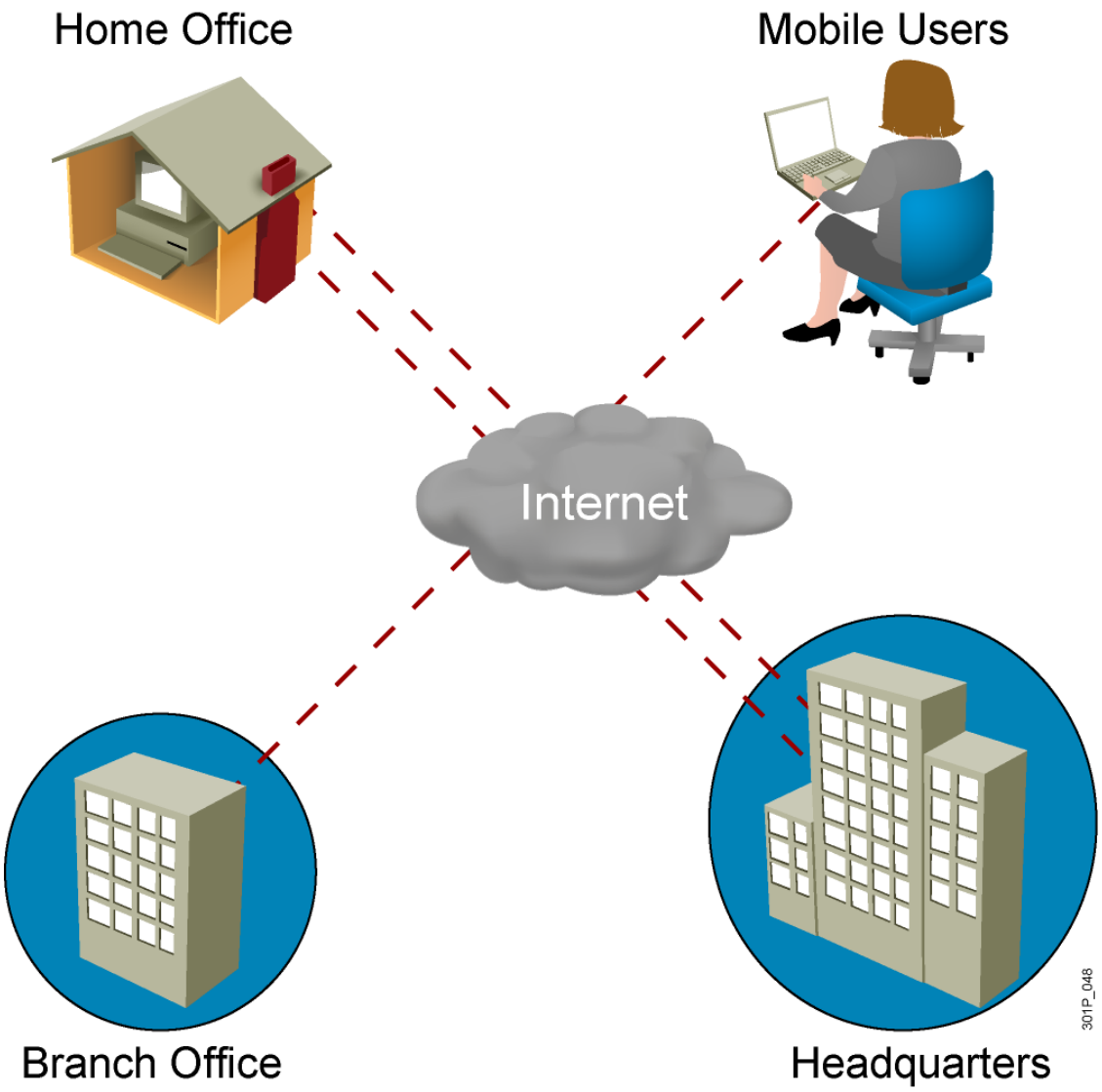
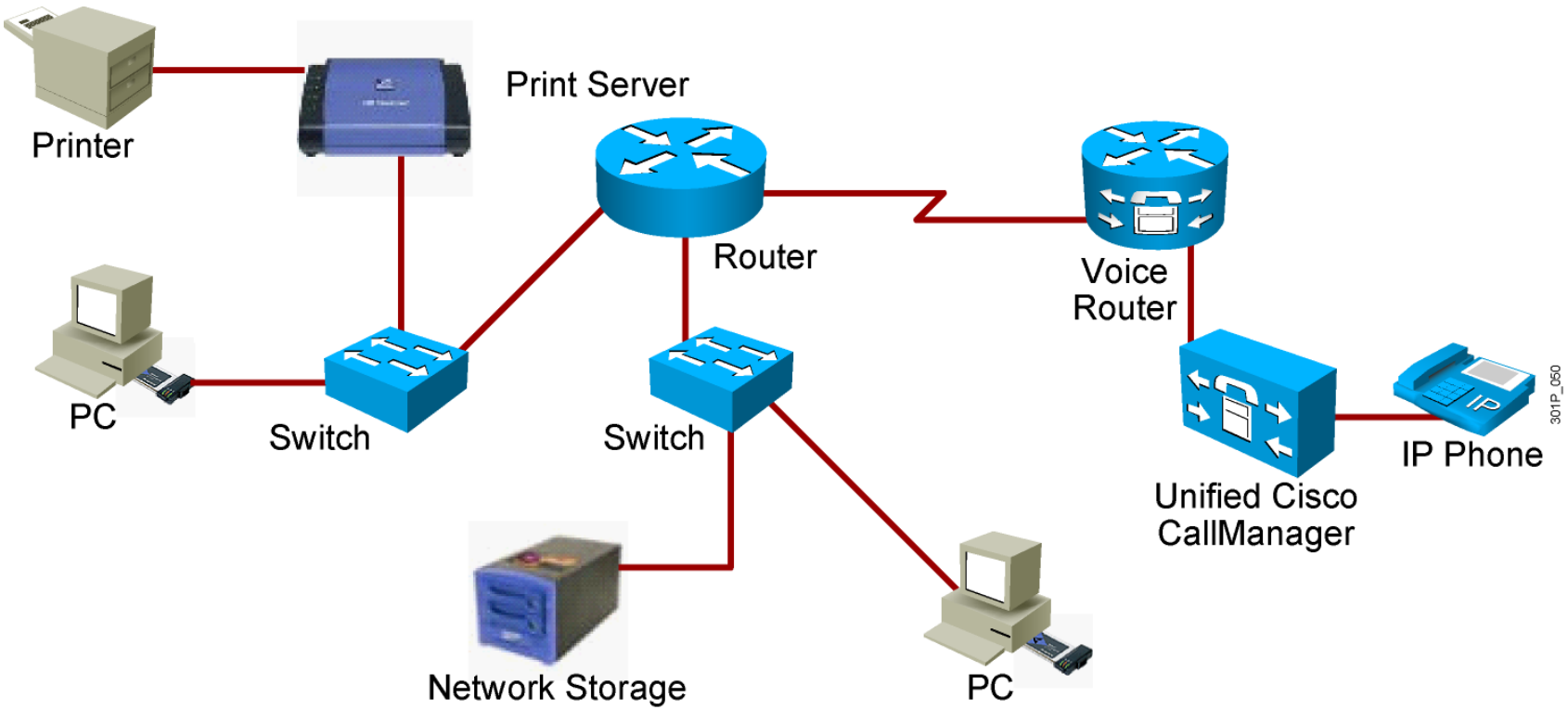
What Is a Network?



Resource-Sharing Functions and Benefits:



- Data and applications
- Resources
- Network storage
- Backup devices

LANs, MANs, & WANs:

- One early solution was the creation of local-area network (LAN) standards which provided an open set of guidelines for creating network hardware and software, making equipment from different companies compatible.
- What was needed was a way for information to move efficiently and quickly, not only within a company, but also from one business to another.
- The solution was the creation of metropolitan-area networks (MANs) and wide-area networks (WANs).

LANs:

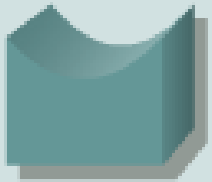
LANS are designed to:

- Operate within a limited geographic area
- Allow multi-access to high-bandwidth media
- Control the network privately under local administration
- Provide full-time connectivity to local services
- Connect physically adjacent devices

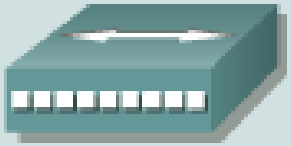
Using:



Router



Bridge



Hub



Ethernet Switch



Repeater

WANs

WANS are designed to:

- Operate over a large geographical area
- Allow access over serial interfaces operating at lower speeds
- Provide full-time and part-time connectivity
- Connect devices separated over wide, even global areas

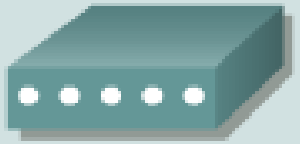
Using:



Router



Communication Server



Modem CSU/DSU TA/NT1

WANs vs. LANs:

	WANs	LANs
Area	Wide geographic area	Single building or small geographic area
Ownership	Subscription to outside service provider	Owned by Organization

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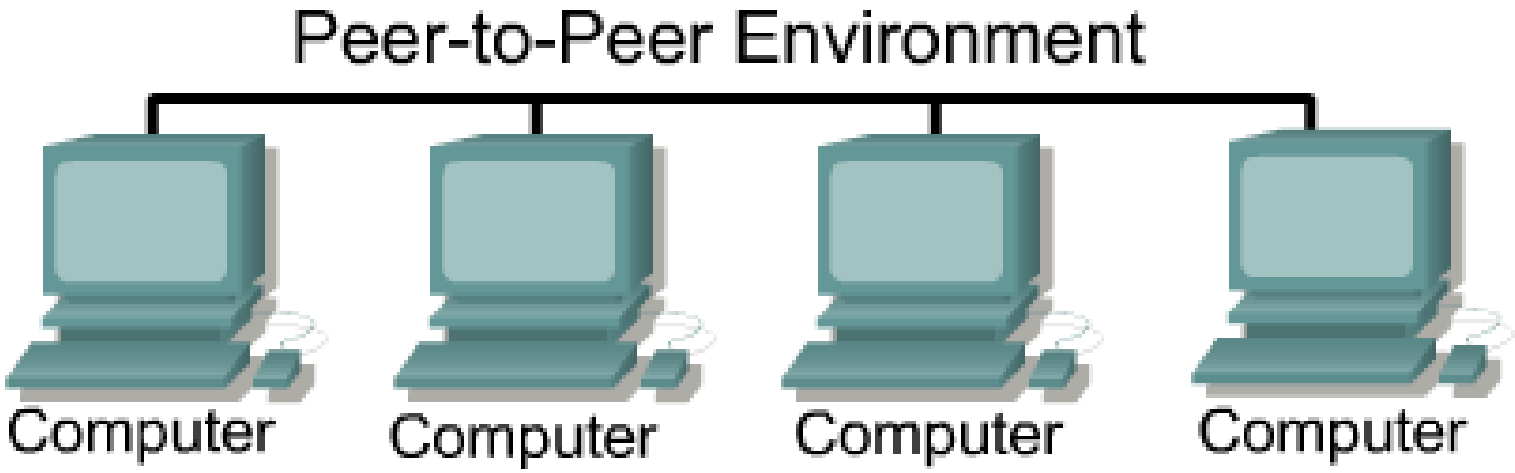
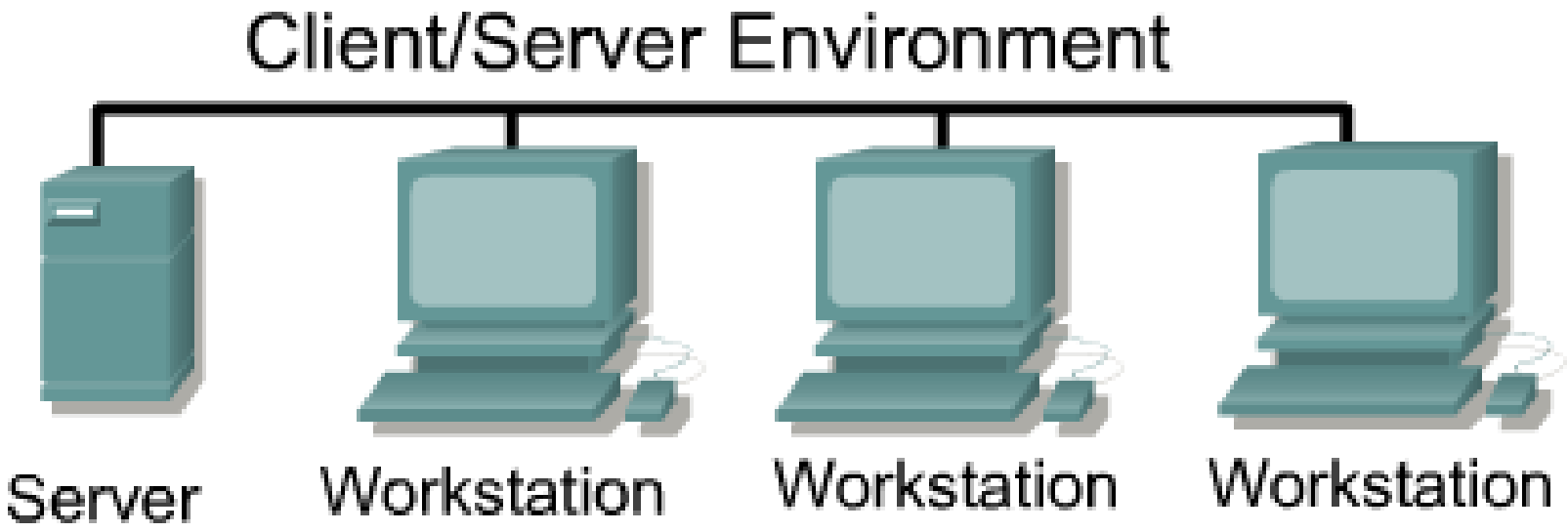
Peer-to-Peer Network:

- 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.

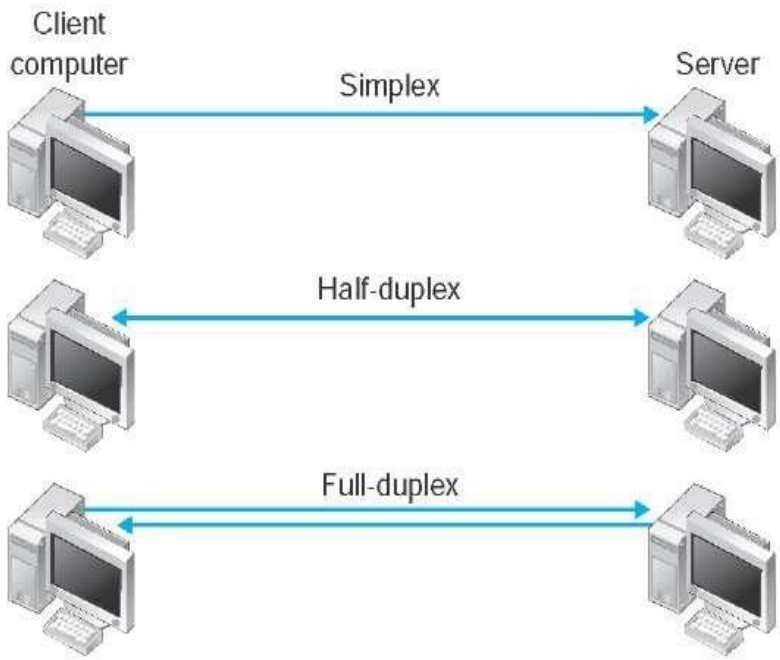


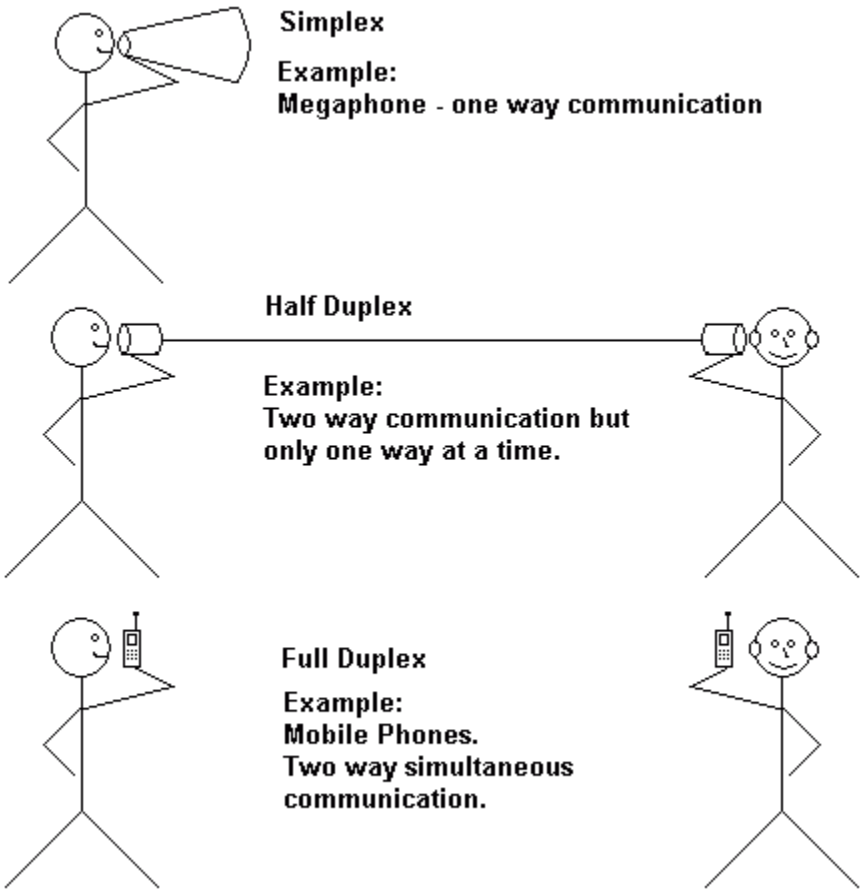
Client/Server Network:

- 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.

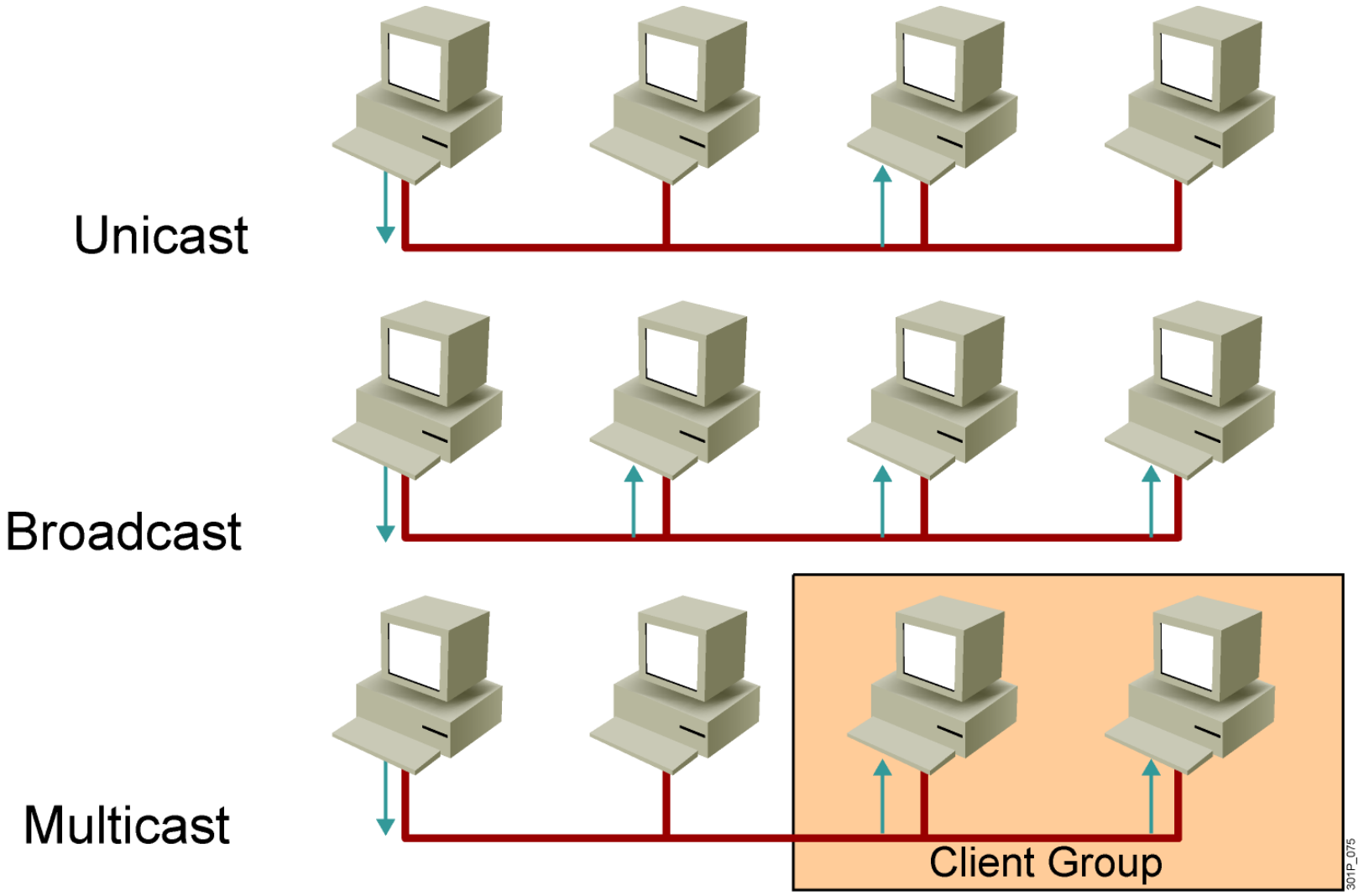


Transmission Modes:





Communicating Within the LAN:



Networking Devices:

- Equipment that connects directly to a network segment is referred to as a device.
- These devices are broken up into two classifications.
  - end-user devices
  - network devices
- End-user devices include computers, printers, scanners, and other devices that provide services directly to the user.
- Network devices include all the devices that connect the end-user devices together to allow them to communicate.

Network Interface Card:

A network interface card (NIC) is a printed circuit board that provides network communication capabilities to and from a personal computer. Also called a LAN adapter.

Internal network interface card



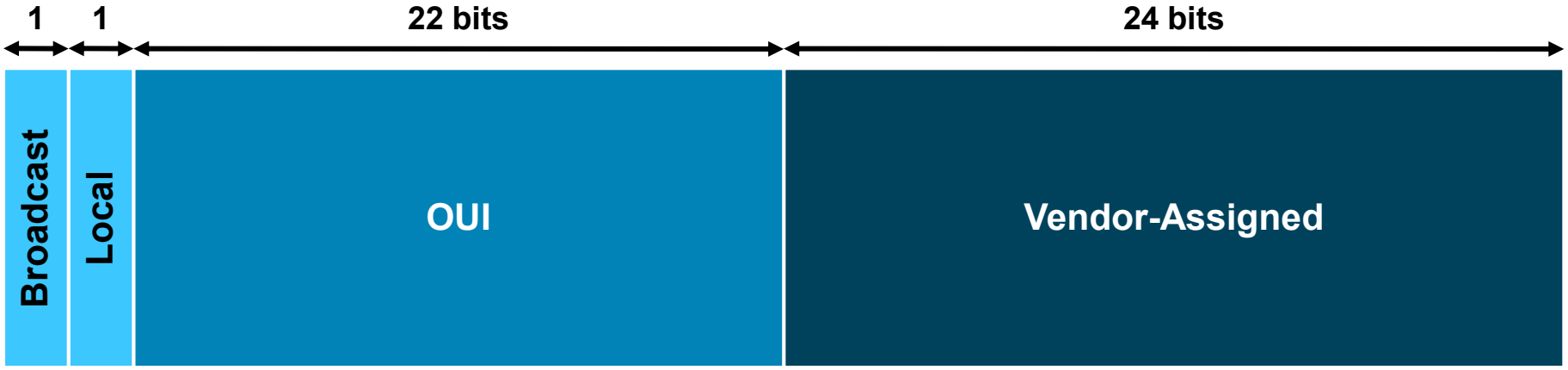
PCMCIA Network interface card



MAC Address:

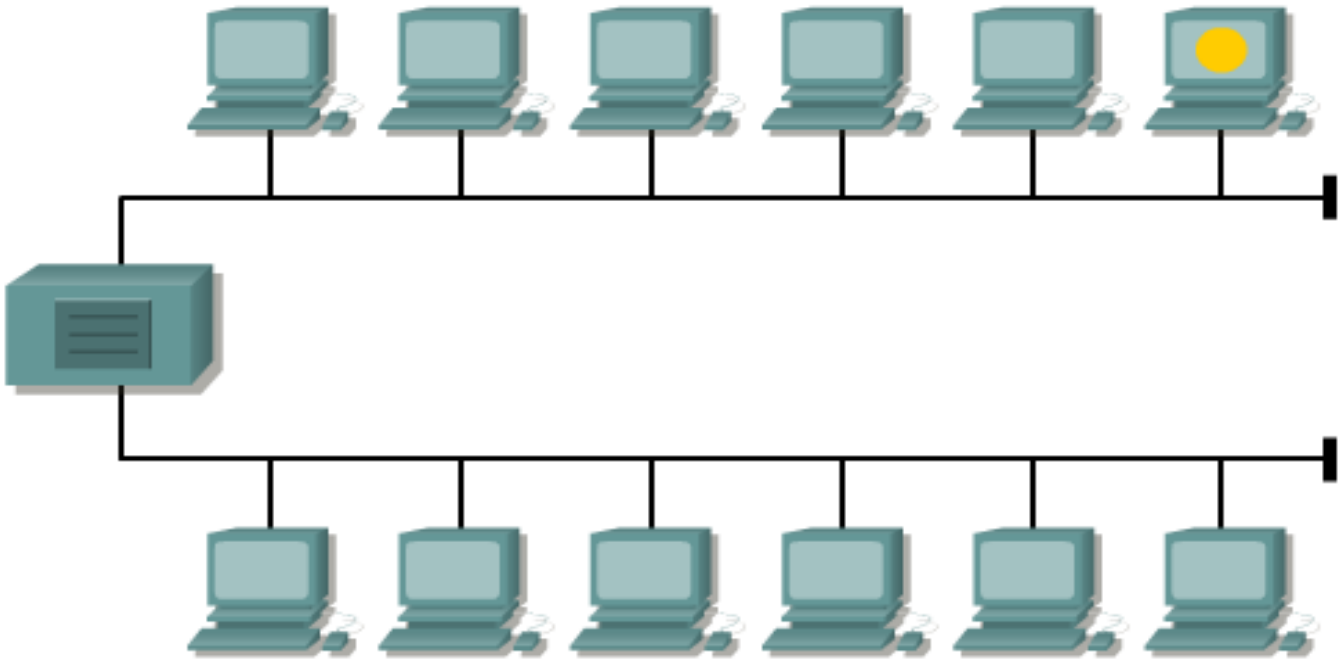
MAC address is 48 bits in length and expressed as twelve hexadecimal digits.MAC addresses are sometimes referred to as burned-in addresses (BIA) because they are burned into read-only memory (ROM) and are copied into random-access memory (RAM) when the NIC initializes.

- **Components of a MAC address:**
  - 1-bit broadcast: Identifies broadcast MAC address
  - 1-bit local: Identifies local MAC address
  - 22-bit OUI: Identifies the manufacturer of the NIC card
  - 24-bit vendor-assigned end-station address: Uniquely identifies the Ethernet hardware
- **MAC address notation:**
  - A MAC address is expressed as six groups of two hexadecimal digits, separated by hyphens (-) or colons (:), in transmission order.



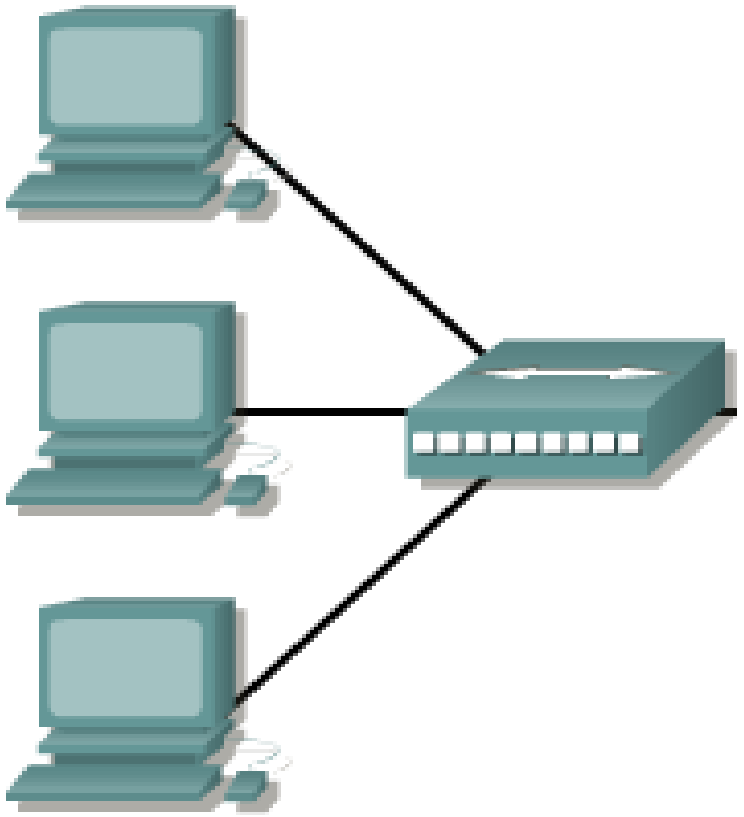
Repeater:

- A repeater is a network device used to regenerate a signal.
- Repeaters regenerate analog or digital signals distorted by transmission loss due to attenuation. A repeater does not perform intelligent routing.



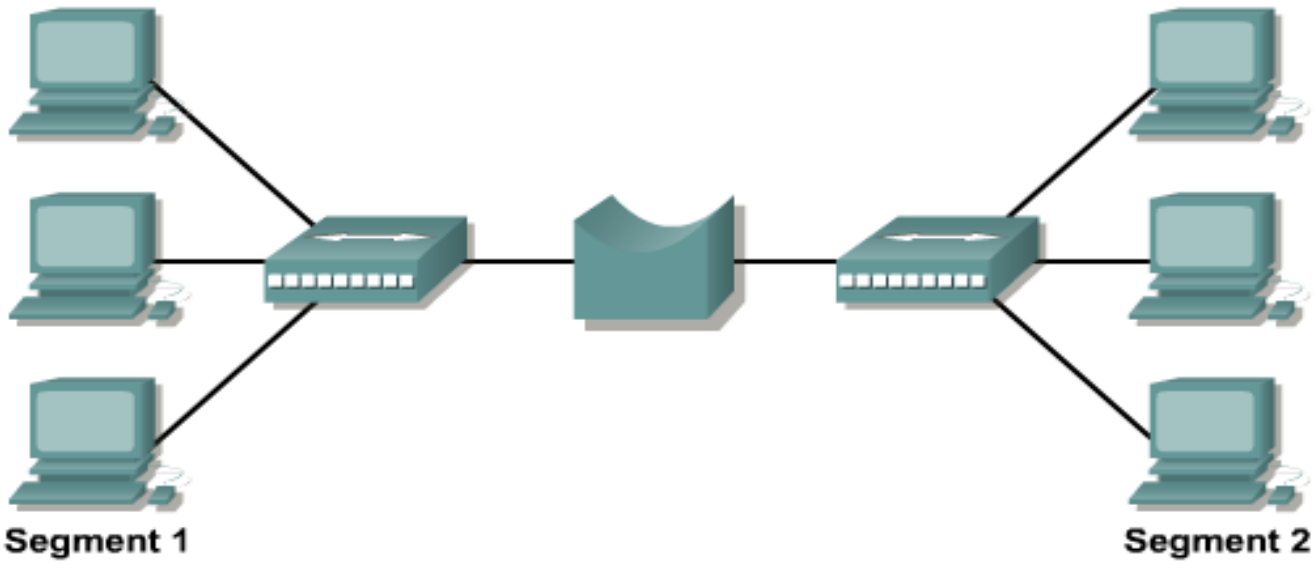
Hub:

- Hubs concentrate connections. In other words, they take a group of hosts and allow the network to see them as a single unit.
- This is done passively, without any other effect on the data transmission.
- Active hubs not only concentrate hosts, but they also regenerate signals.



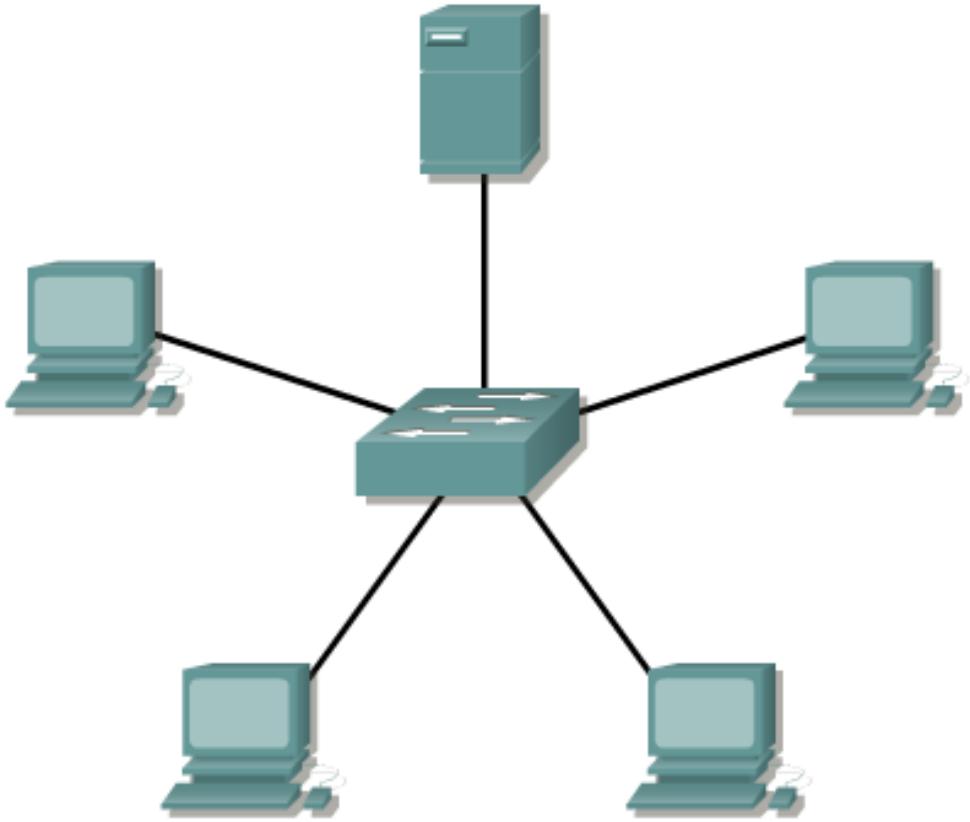
Bridge:

Bridges convert network transmission data formats as well as perform basic data transmission management. Bridges, as the name implies, provide connections between LANs. Not only do bridges connect LANs, but they also perform a check on the data to determine whether it should cross the bridge or not. This makes each part of the network more efficient.



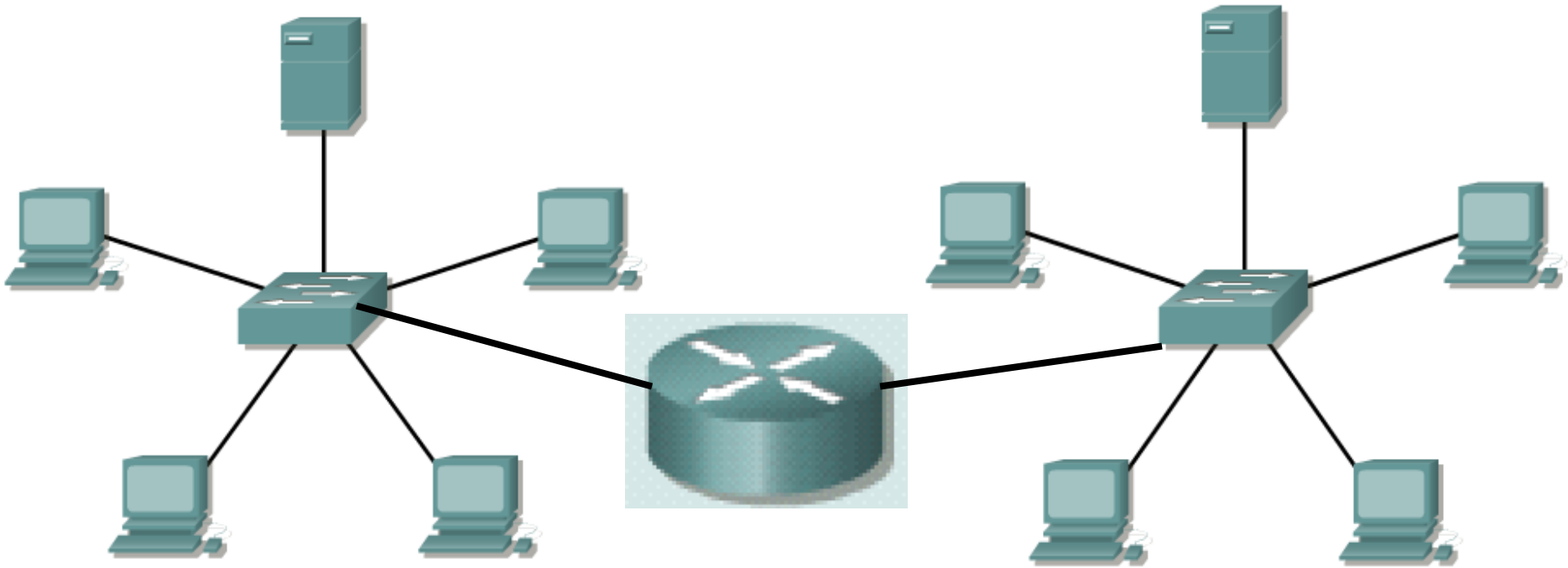
Switch:

- Workgroup switches add more intelligence to data transfer management.
- Switches can determine whether data should remain on a LAN or not, and they can transfer the data to the connection that needs that data.



Router:

Routers have all capabilities of the previous devices. Routers can regenerate signals, concentrate multiple connections, convert data transmission formats, and manage data transfers. They can also connect to a WAN, which allows them to connect LANs that are separated by great distances.



Reference

1. Introduction to Networks Companion Guide (CCNAv7)
2. Introduction to Networks Labs and Study Guide (CCNAv7)
3. Computer Networking: A Top-Down Approach