Introduction to Networks

Lecture 2:

Network Connectivity Devices

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Network Devices- Terminology

- Some terminology related to the operation of network devices is:

  - *Domain :*   is a specific part of a network.

  - *Bandwidth :*   is the amount of data that can be carried across a network in a given time period.

  - *Unicast data:* is data meant for a specific device.

  - *Broadcast data :* is data meant for all devices; a special broadcast address indicates this.

  - *Multicast data:* is data destined for a specific group of devices; a special address indicates this.

  - *A bandwidth domain,* known as a *collision domain* for Ethernet LANs, includes all devices that share the same bandwidth.

  - *A broadcast domain* includes all devices that receive each other's' broadcasts (and multicasts)

Network Devices

Multi

Uni

Broad
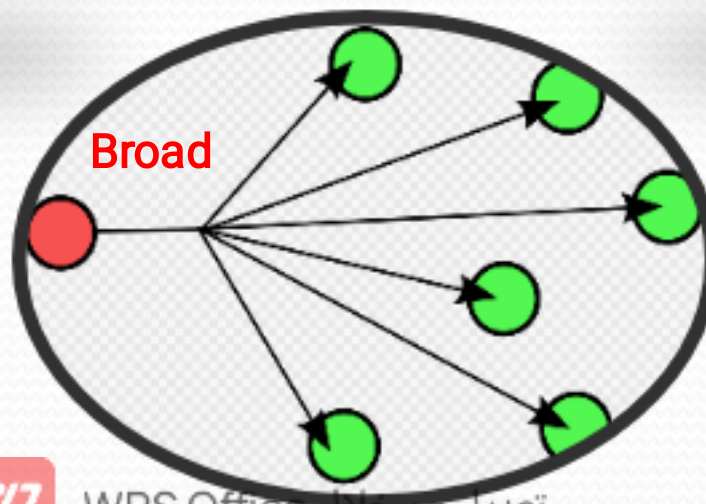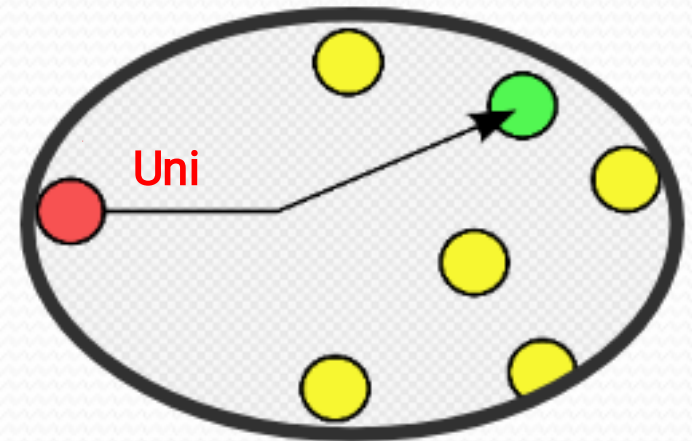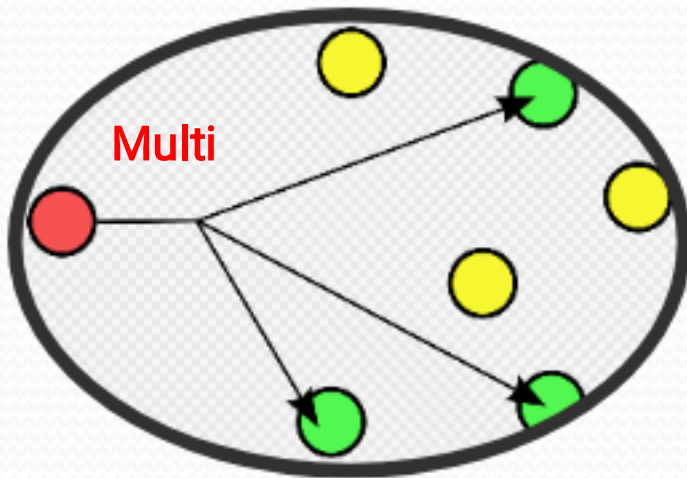
Network Devices

- Network devices are the devices that interconnect networks. Because these devices connect network entities, they are known as **connectivity devices.** These devices include:

❖ Hub

❖ Switch

❖ Router

HUB

A typical Ethernet LAN uses unshielded twisted-pair (UTP) cables with RJ-45 connectors.

- Because these cables have only two ends, an intermediary device is needed to connect more than two computers. That device is a hub. Hubs are devices used to link several computers together.

- A hub works at Layer 1 and connects **multiple devices** so that they are logically all on one LAN.

- NOTE: The physical connection point on a network device—a hub, switch, or router—is called an *interface* or a *port.*
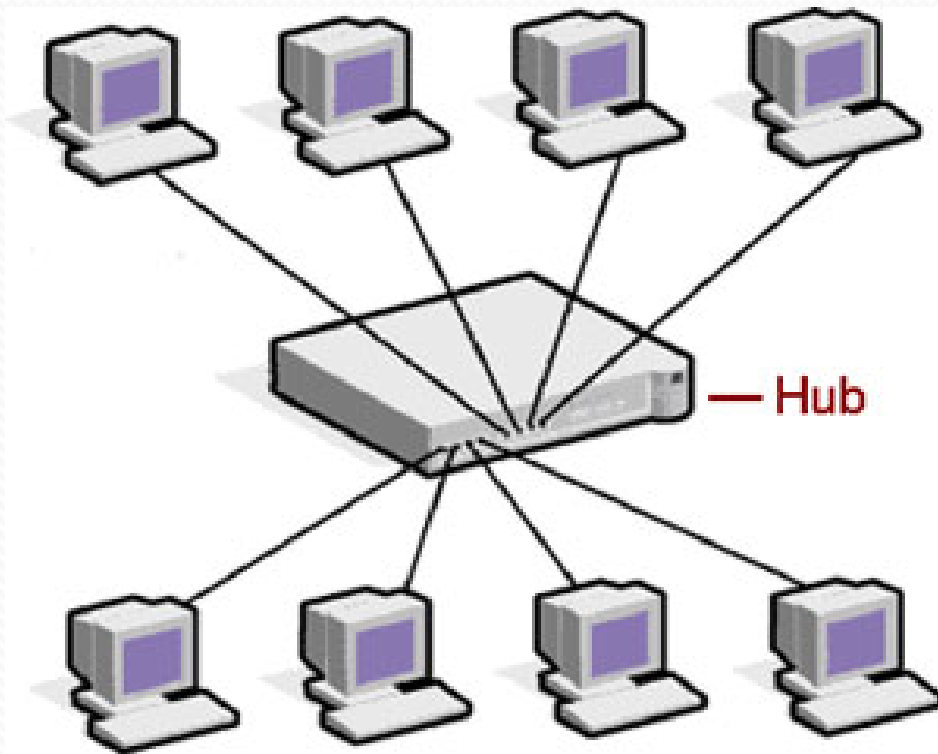
Network Devices - Hub

- A hub has no intelligence─it sends all data received on any port to all the other ports. So, devices connected through a hub receive everything that the other devices send, whether or not it was meant for them. This process called **broadcasting**).

- All devices connected to a hub are in one collision domain and one broadcast domain.

- Note: A hub just repeats all the data received on any port to all the other ports; thus, **hubs are also known as** *repeaters*.

Network Devices - Hub

Hub

16-port Linksys hub: port 16 shared with uplink

8-port Linksys hub: port 8 shared with uplink

5-port Linksys hub: port 1 shared with uplink

8-port SMC Hub: port 8 shared with uplink

Network Devices- Switch

- LAN switches are **Layer 2** devices and have some intelligence—they send data to a port only if the data needs to go there.

- A device connected to a switch port does not receive any of the information addressed to devices on other ports. Therefore, the main advantage of using a switch instead of a hub is that the traffic received by a device is reduced because only frames addressed to a specific device are forwarded to the port on which that device is connected.
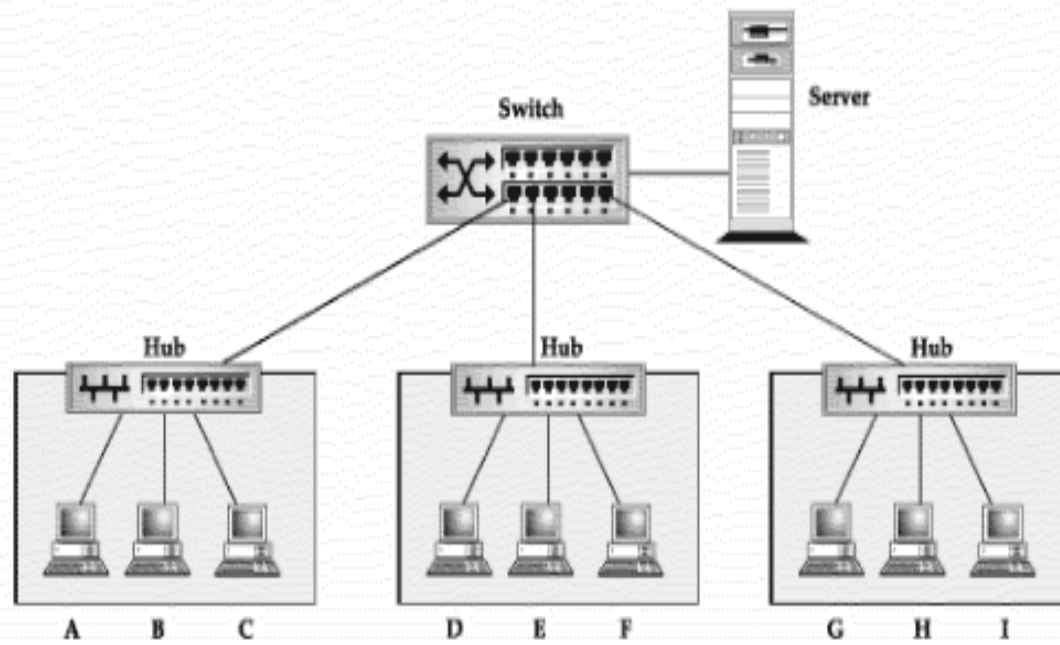
Network Devices- Switch

Switches read the source and destination MAC addresses in the frames and therefore can keep track of who is where, and who is talking to whom, and send data only where it needs to go.

- If the switch receives a frame whose destination address indicates that it is a broadcast (information meant for everyone) or multicast (information meant for a group), by default it sends the frame out all ports (except for the one on which it was received).

- All devices connected to one switch port are in the same collision domain, but devices connected to different ports are in different collision domains. By default, all devices connected to a switch are in the same broadcast domain.

Network Devices- Switch

Network Devices - Router

- A *router* goes one step further than a switch. It is a Layer 3 device that has much more intelligence than a hub or switch.

- By using logical Layer 3 addresses, routers allow devices on different LANs to communicate with each other and with distant devices—for example, those connected through the Internet or through a WAN.

- The logical Layer 3 addresses is the TCP/IP's IP addresses..

- The router reads the source and destination logical addresses in the packets and therefore keeps track of who is where, and who is talking to whom, and sends data only where it needs to go.

Network Devices - Router

- All devices connected to one router port are in the same collision domain, but devices connected to different ports are in different collision domains.

- Routers block broadcasts (destined for *all* networks) and multicasts by default; routers forward only *unicast* packets (destined for a specifc device) and packets of a special type called *directed broadcasts.*

Network Devices- Router

- Routers work at the OSI model **network layer**. The main functions of a router are f rst to determine the best path that each packet should take to get to its destination and second to send the packet on its way.

- Sending the packet out the appropriate interface, along the best path, is also called *switching the packet* because the packet is encapsulated in a new frame, with the appropriate framing information.

- Routers are normally used to connect one LAN to another. Typically, when a WAN is set up, there will be at least two routers used.
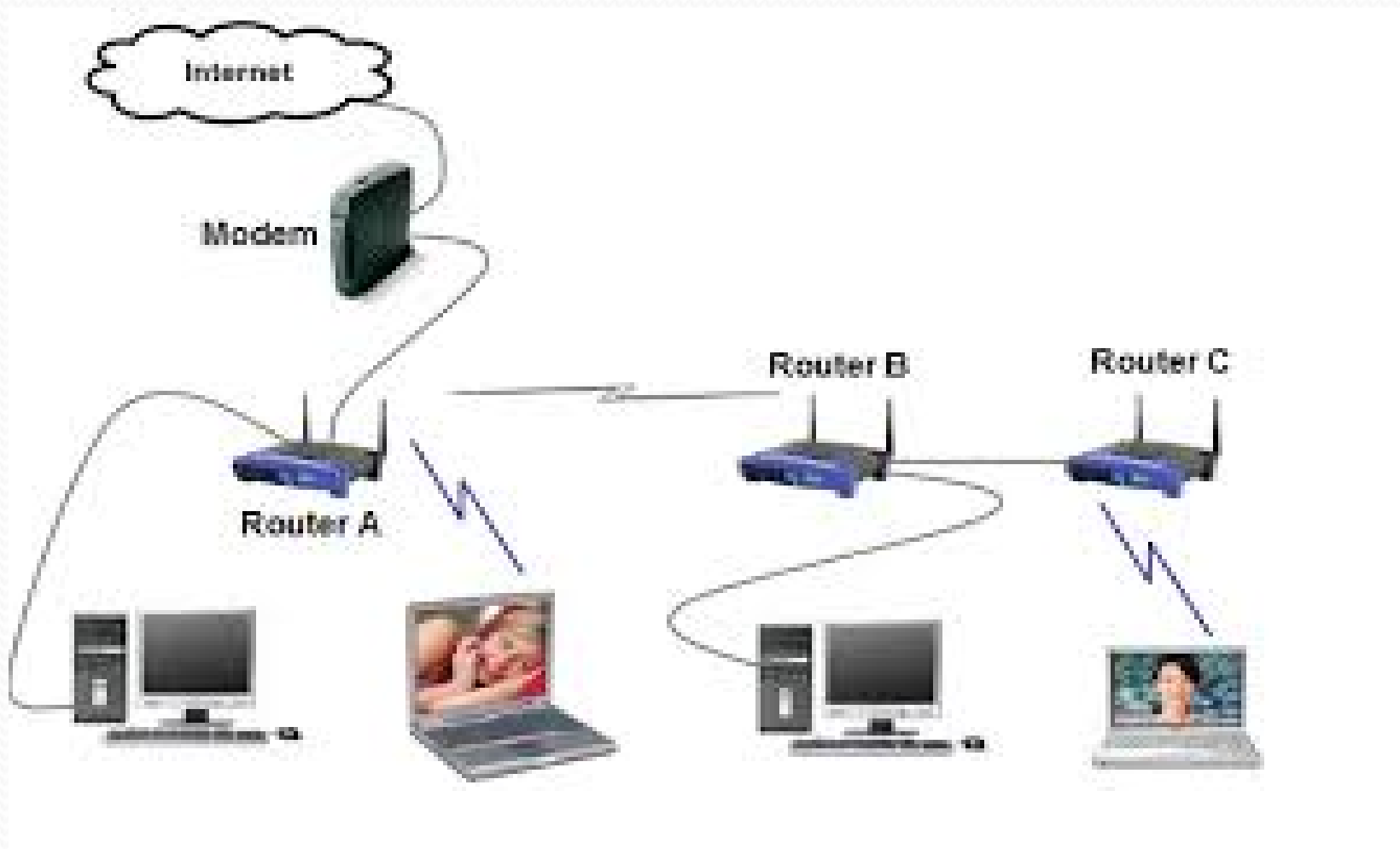
Network Devices- Router

Reset   Internet   Ports   Power

Network Devices- Router

Thank You