CCNA 1 v3.1 Module 8 Ethernet Switching

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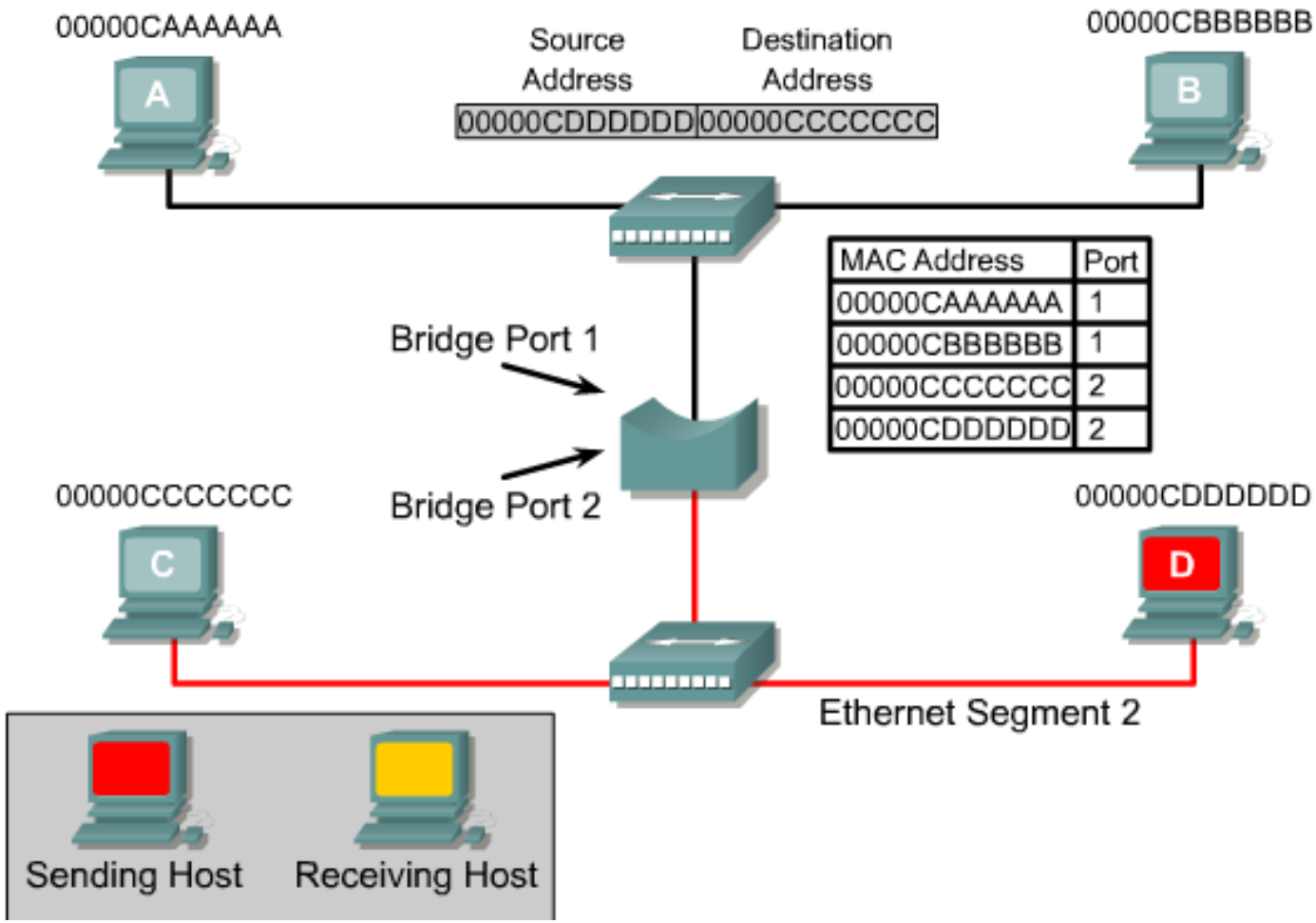
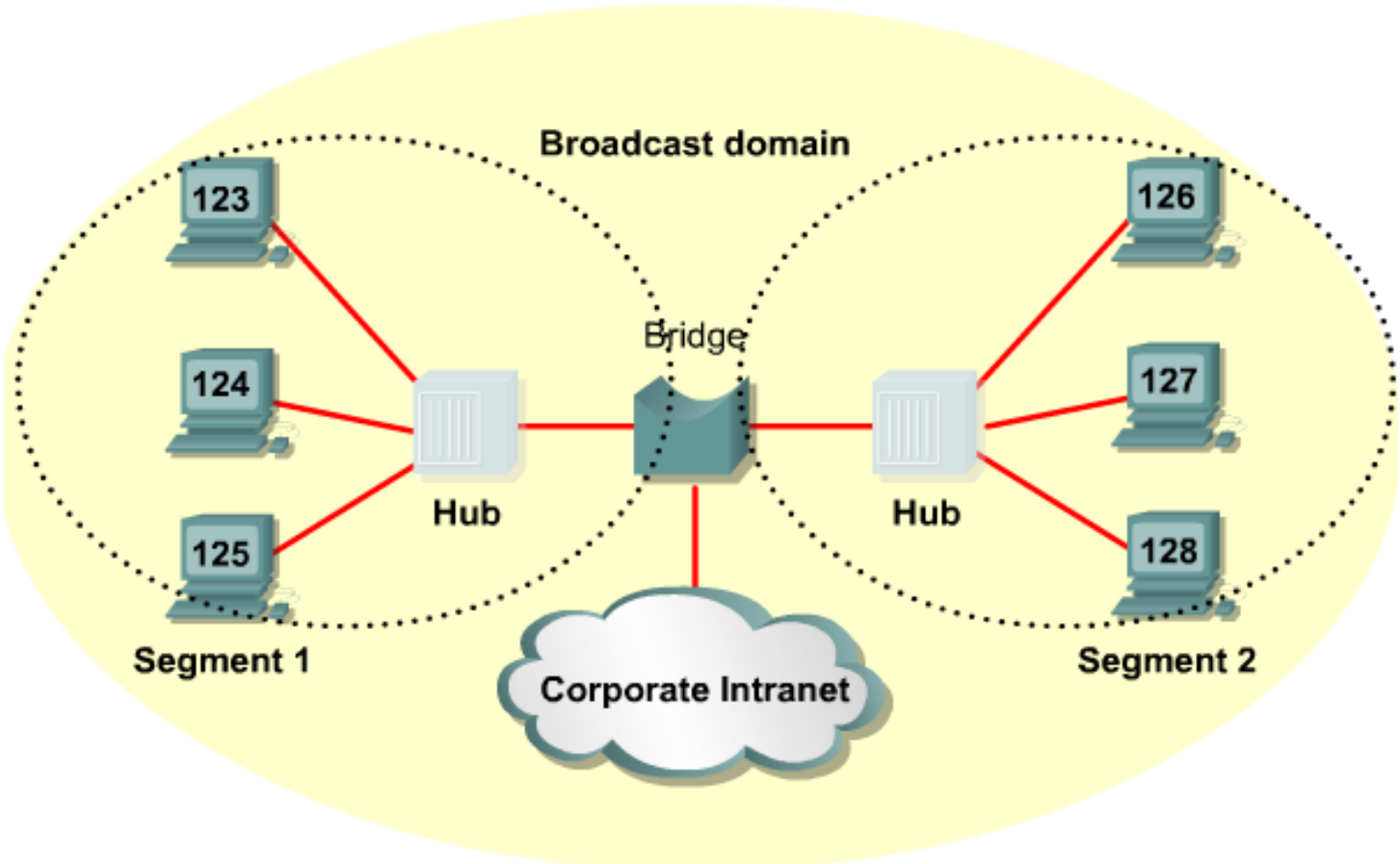
Objectives

Upon completion of this module, the student will be able to perform tasks related to the following:	
8.1	Ethernet Switching
8.2	Collision Domains and Broadcast Domains

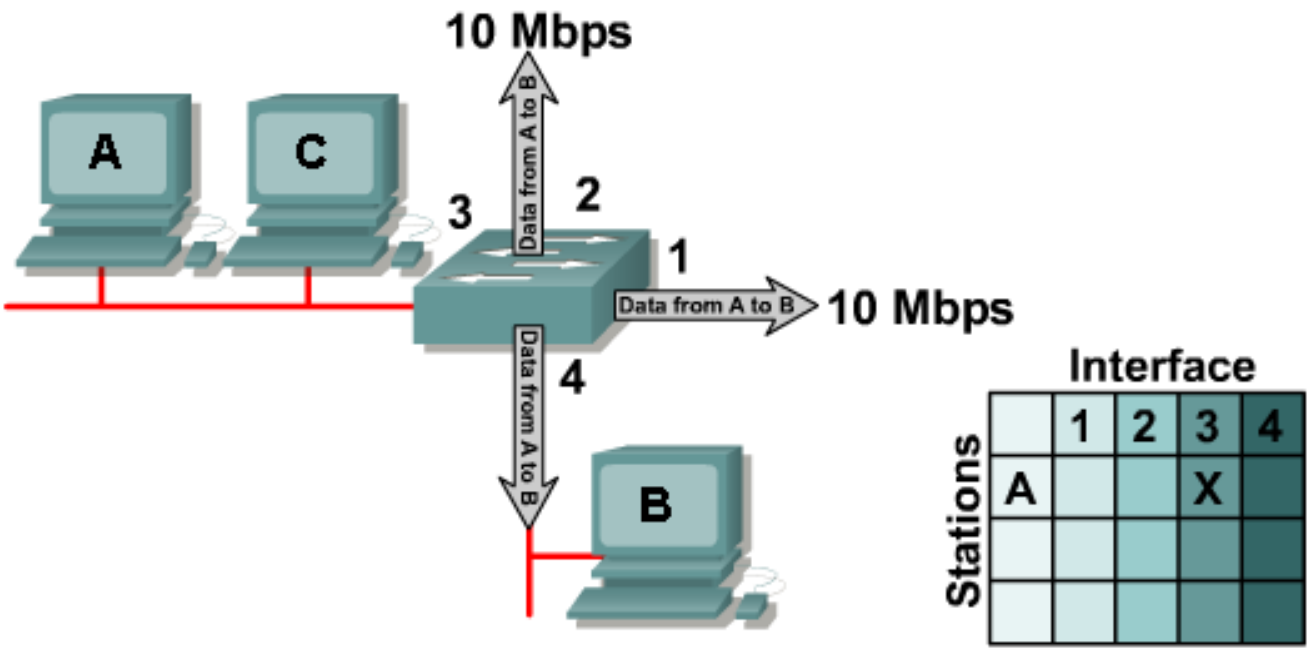
Layer 2 Bridging



Bridges

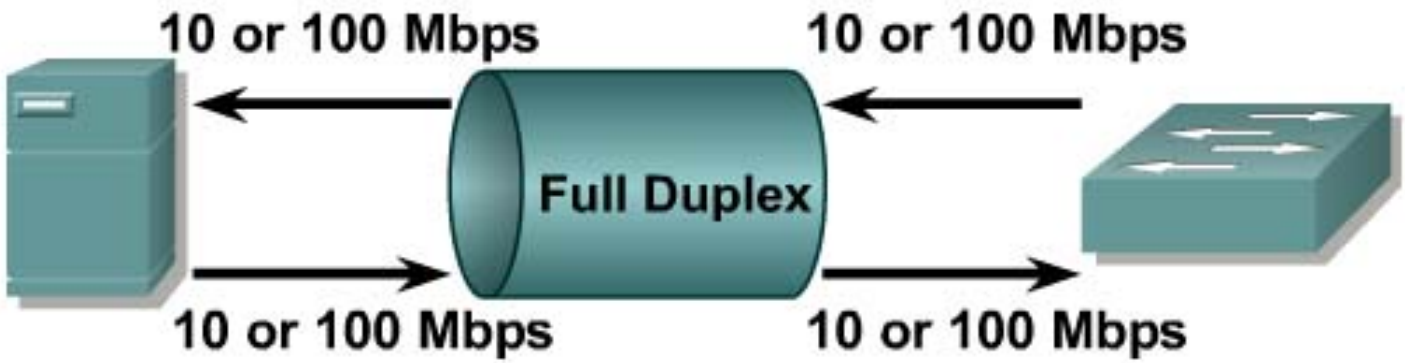


Switch Operation



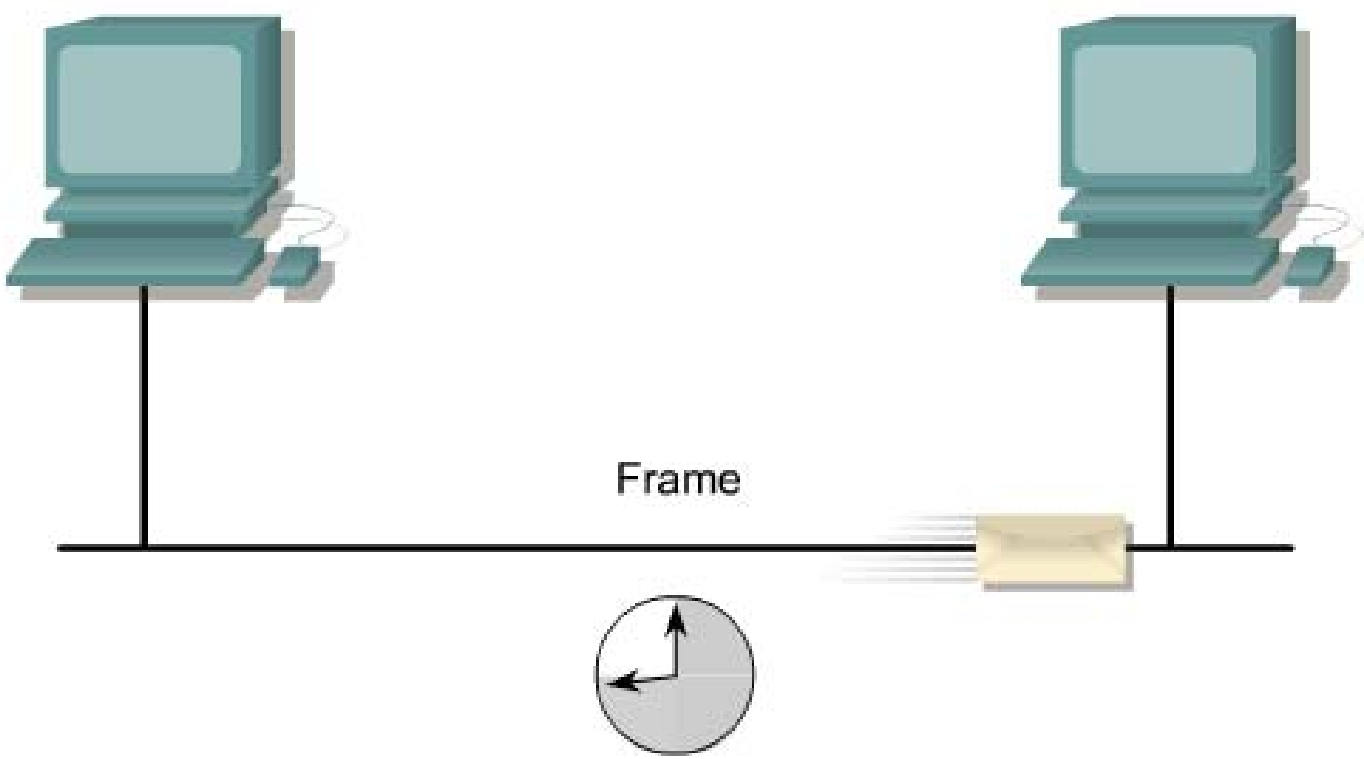
- Forward packets based on MAC address in forwarding table
- Operates at OSI Layer 2
- Learns a station's location by examining source address

Full Duplex



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

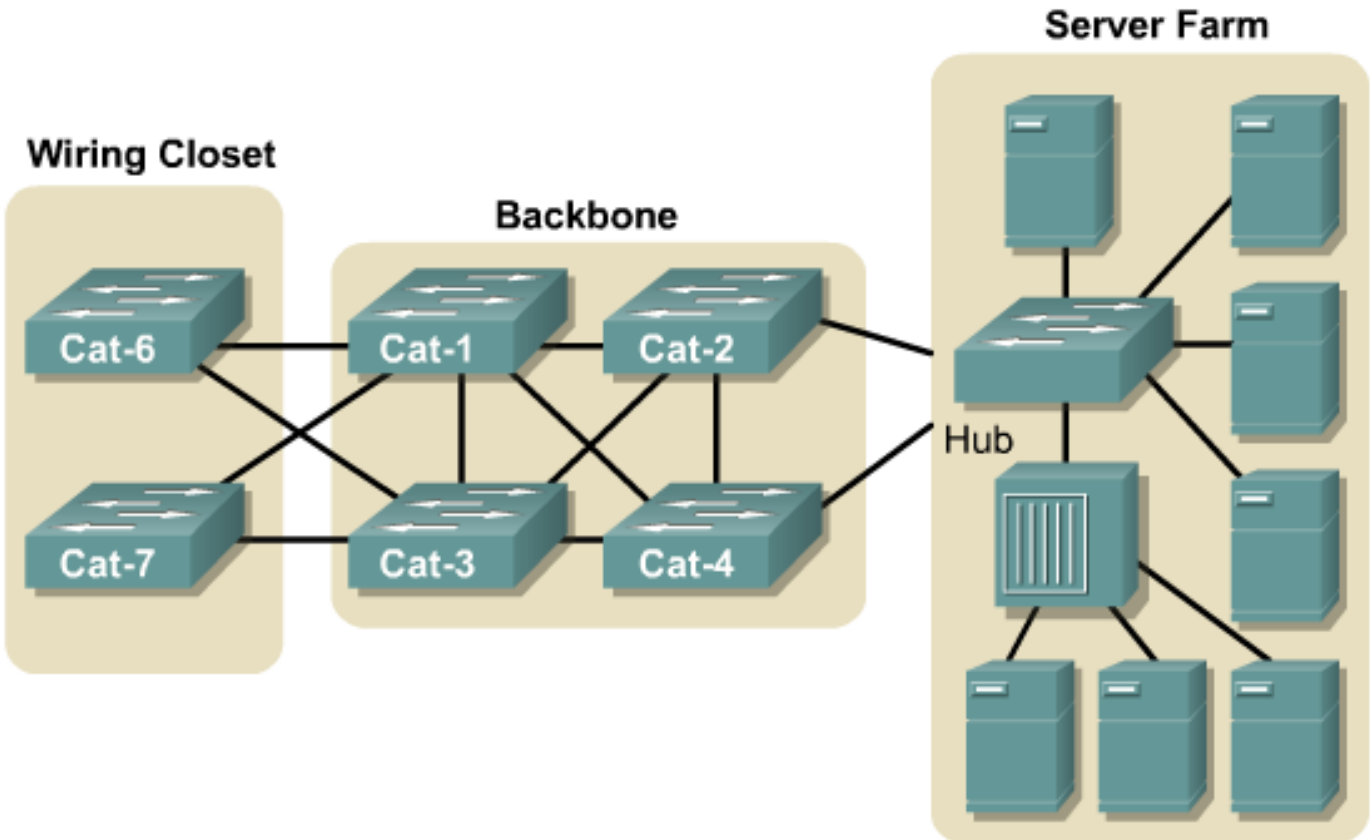
Network Latency



Switch Modes

- **Store and Forward -** A switch receives the entire frame before sending it out the destination port.
- **Cut-Through -** A switch starts to transfer the frame as soon as the destination MAC address is received.

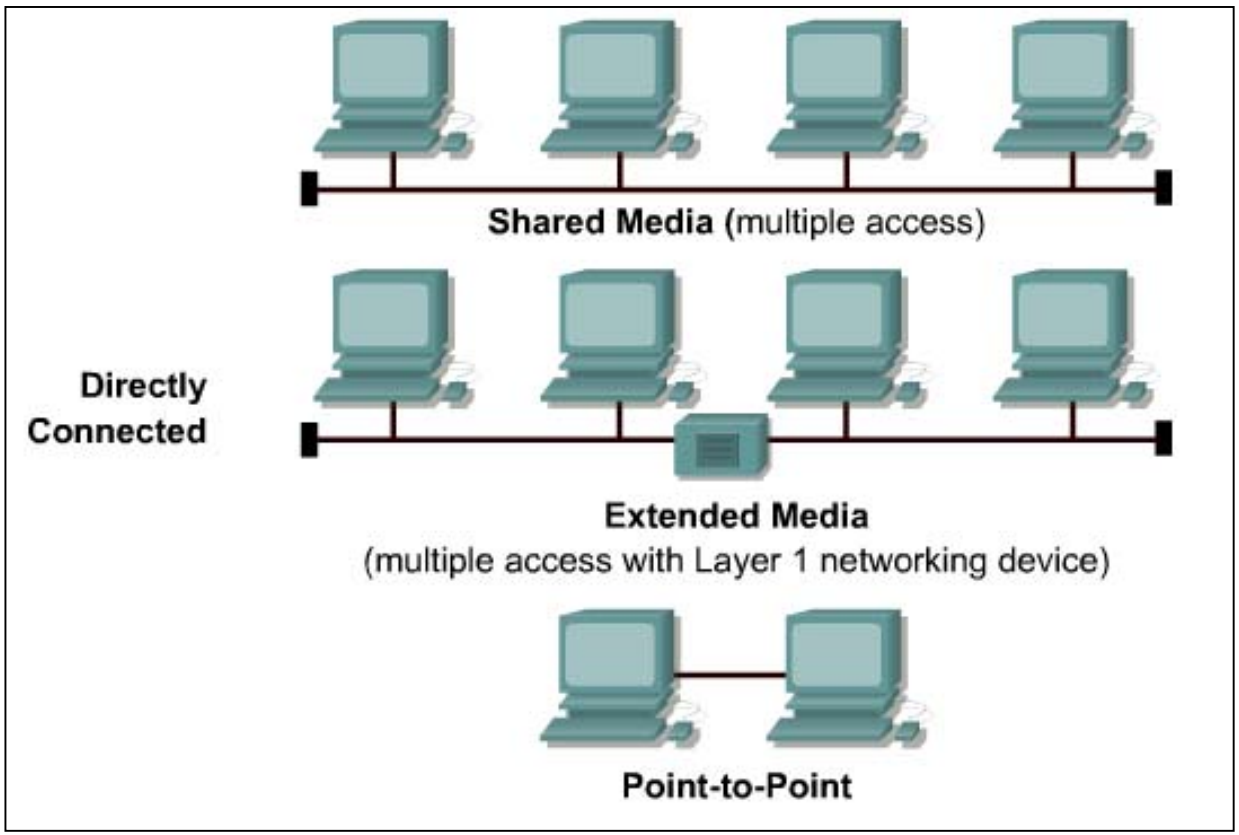
Spanning-Tree Operation



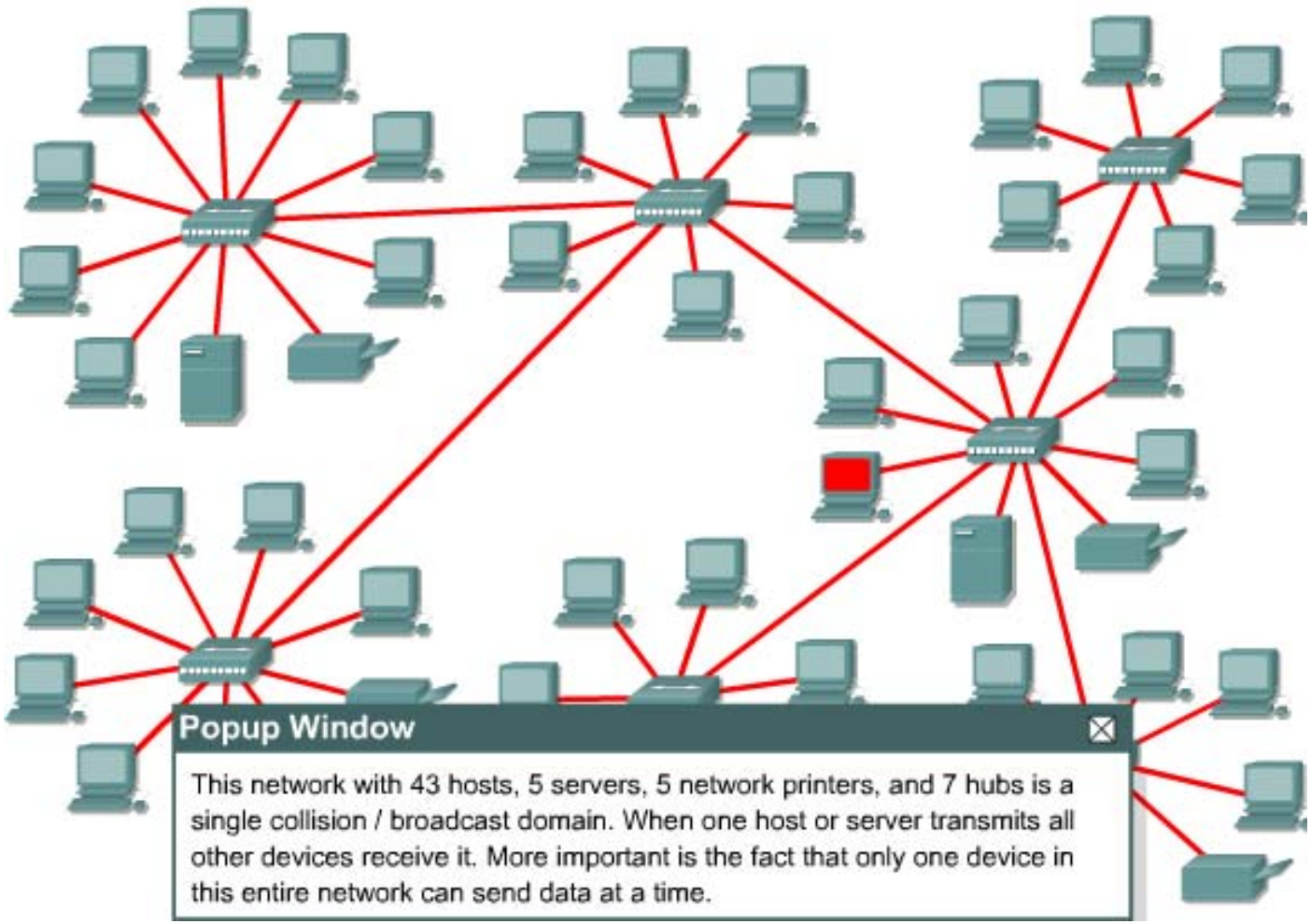
STP States

States	Purpose
Blocking	Receives BPDUs only
Listening	Building "active" topology
Learning	Building bridging table
Forwarding	Sending and receiving user data
Disabled	Administratively down

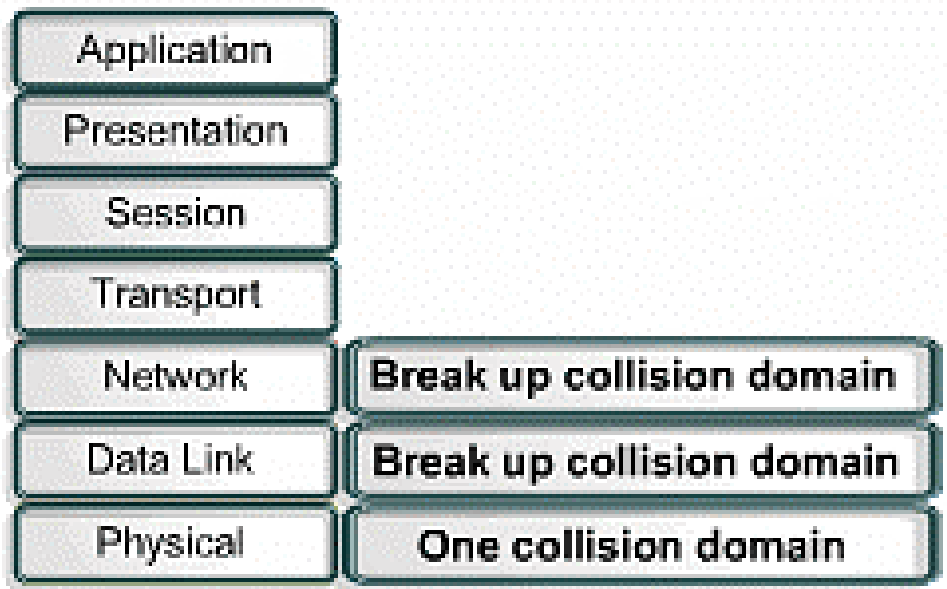
Types of Networks



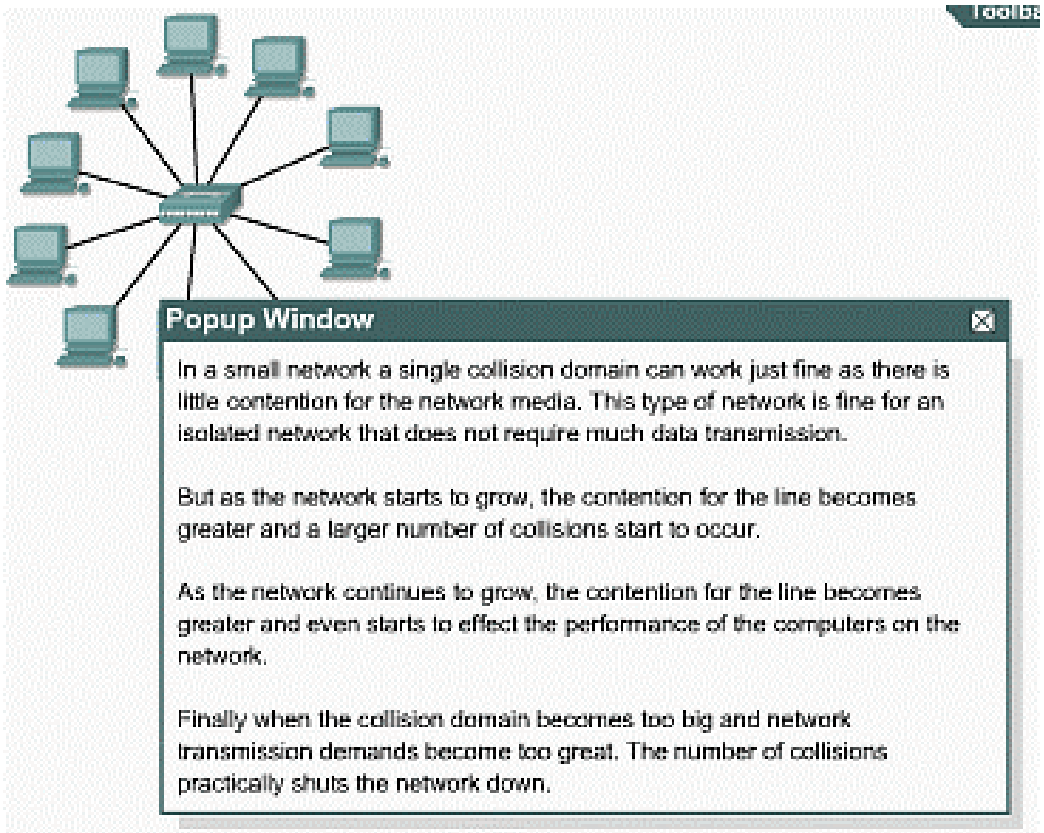
Collisions in Collision Domain



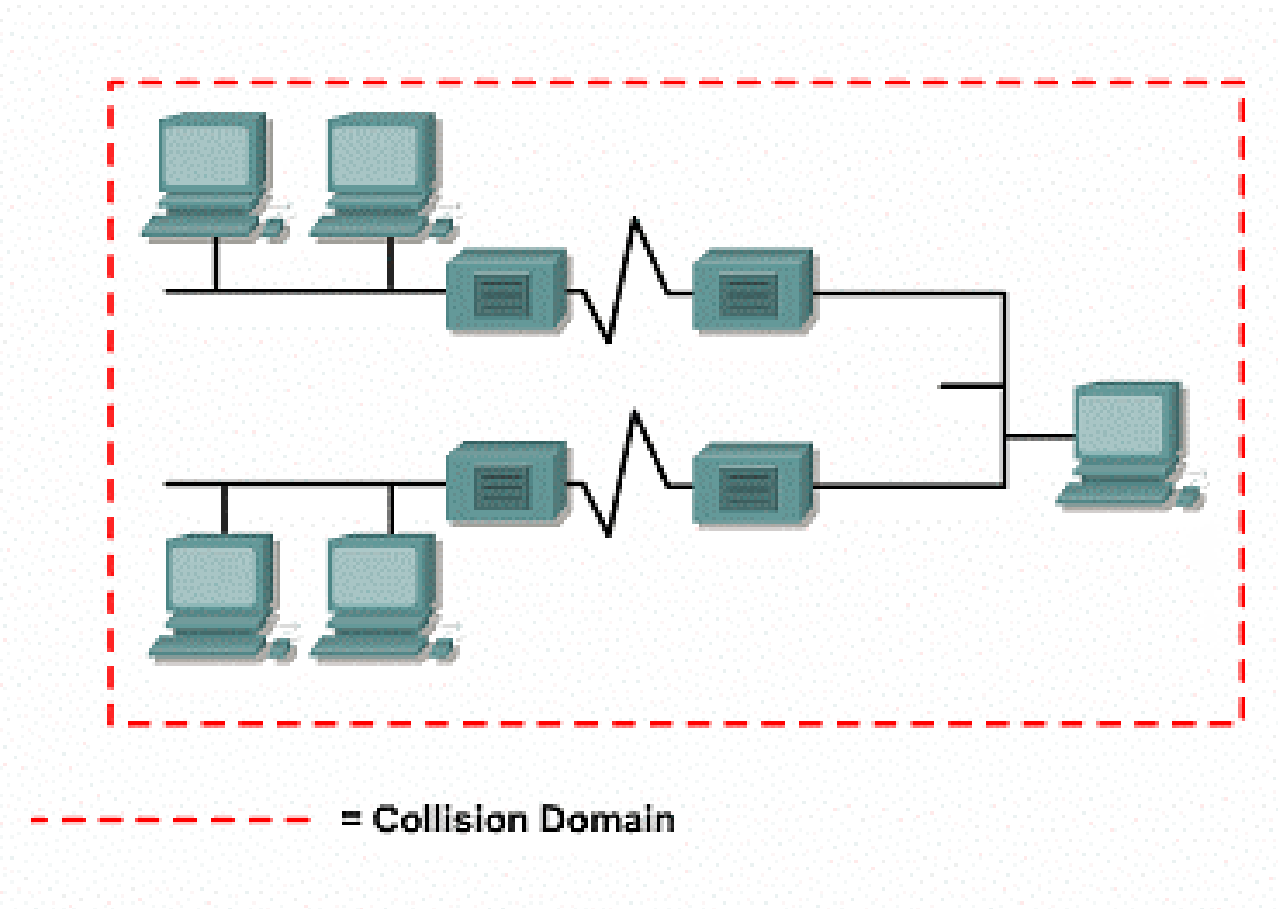
Collision Domain Segmentation



Increasing a Collision Domain



Four Repeater Rule



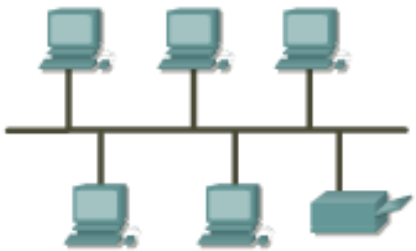
Round-Trip Delay Calculation

(repeater delays + cable delays + NIC delays) x 2 < maximum round-trip delay
Repeater delays for 10BASE-T Per repeater < 2 microseconds Cable delays ~ 0.55 microseconds per 100 meters NIC delays ~ 1 microsecond per NIC
Maximum round-trip delay (the 10BASE-T bit time of 0.1 microseconds times the minimum frame size of 512 bits) is 51.2 microseconds.

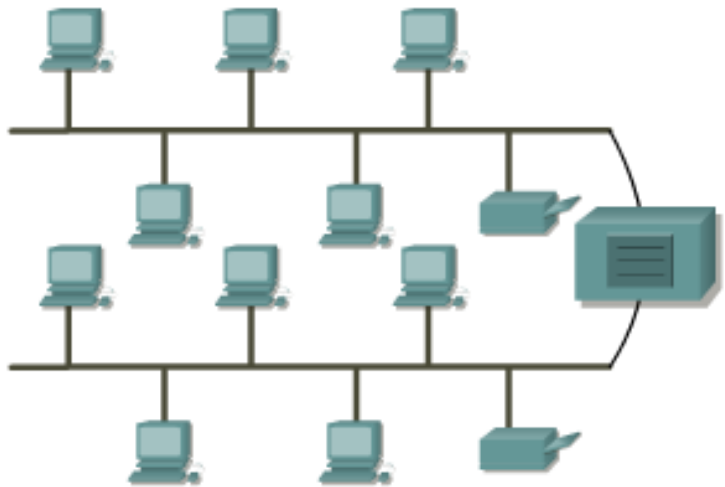
For a 500m length of UTP connected by four repeaters or hubs and two NICs, the total delay would be well below the maximum round-trip delay.

Layer 1 Devices Extend Collision Domains

Shared Access is a Collision Domain

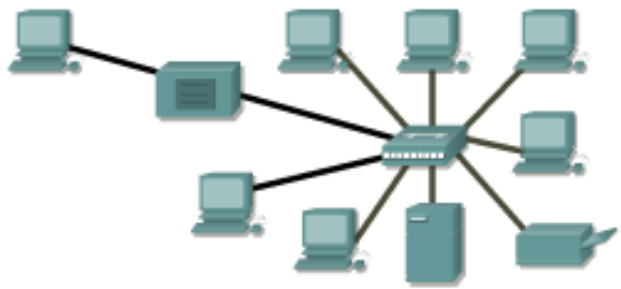


Collision Domain- Extended by Repeater

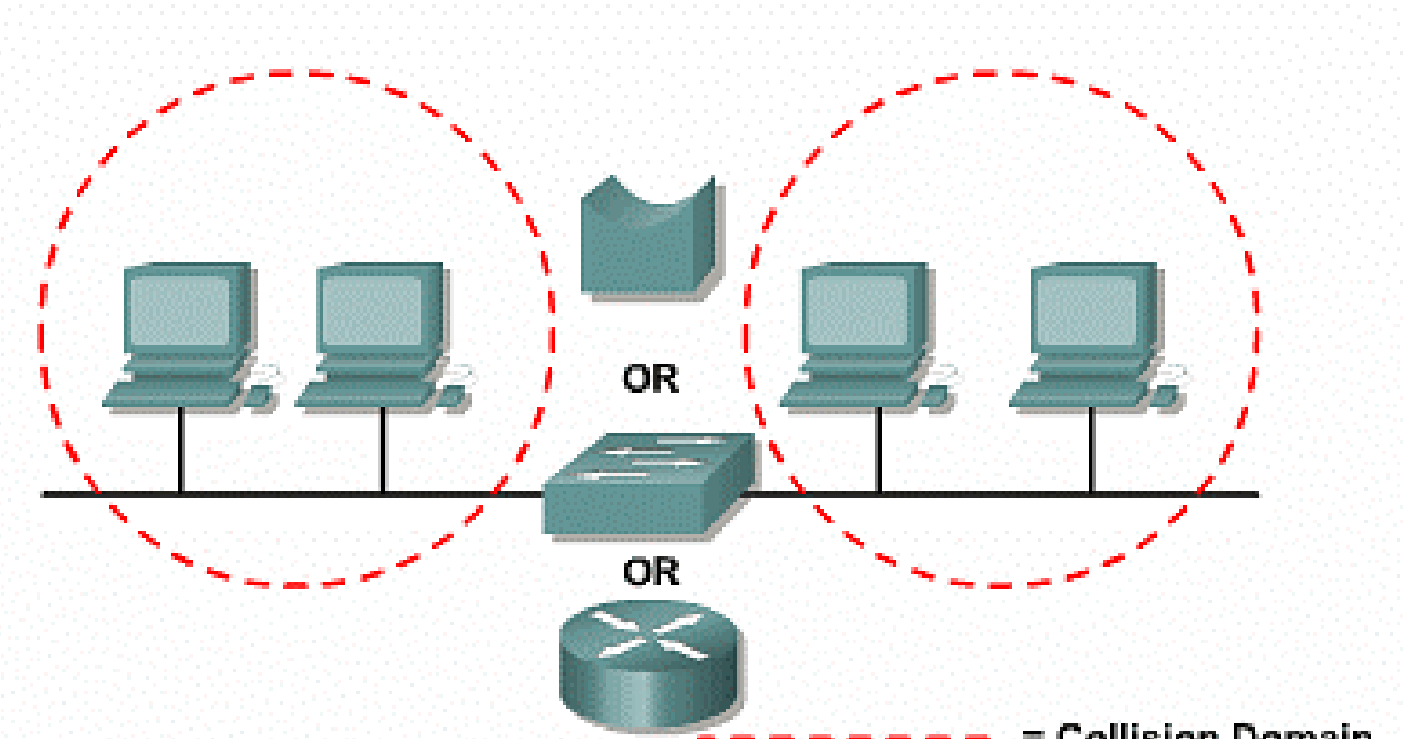


Collision Domain- Created by hub

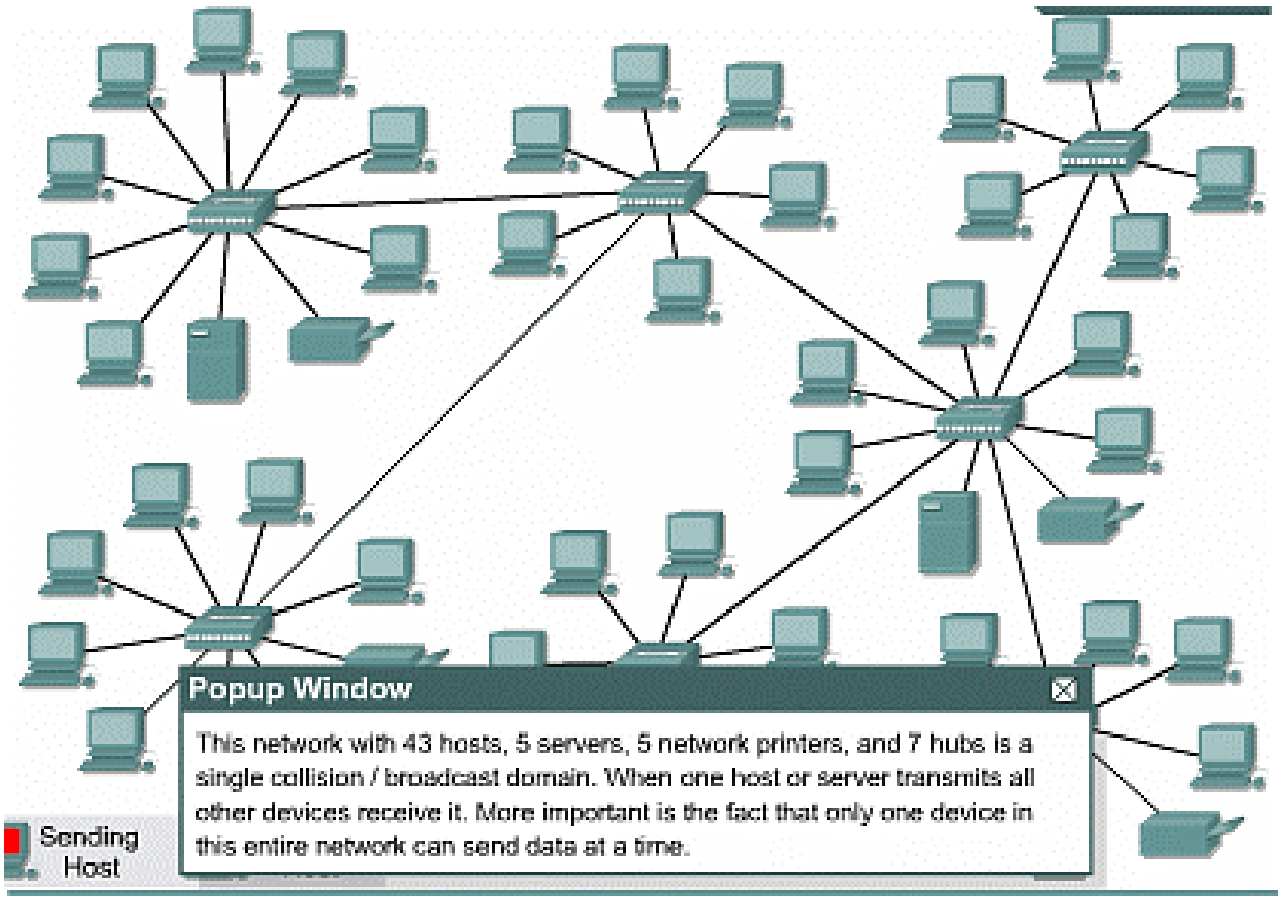
Collision Domain- Extended by Repeater



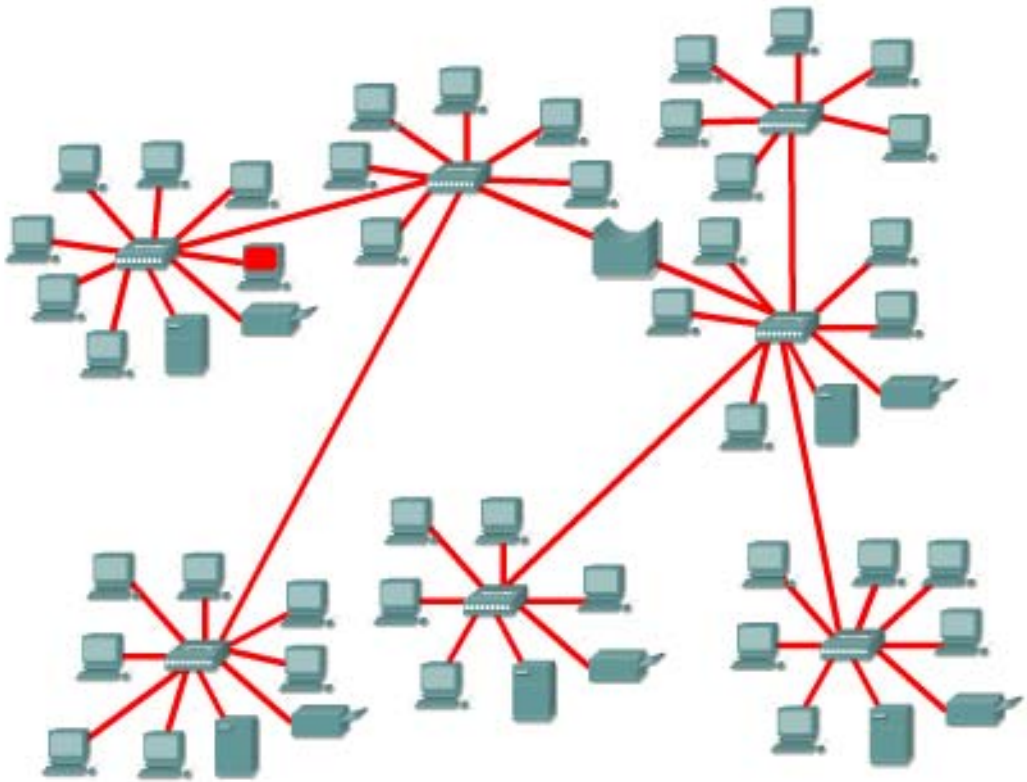
Limiting the Collision Domains



Segmenting a Collision Domain with a Bridge

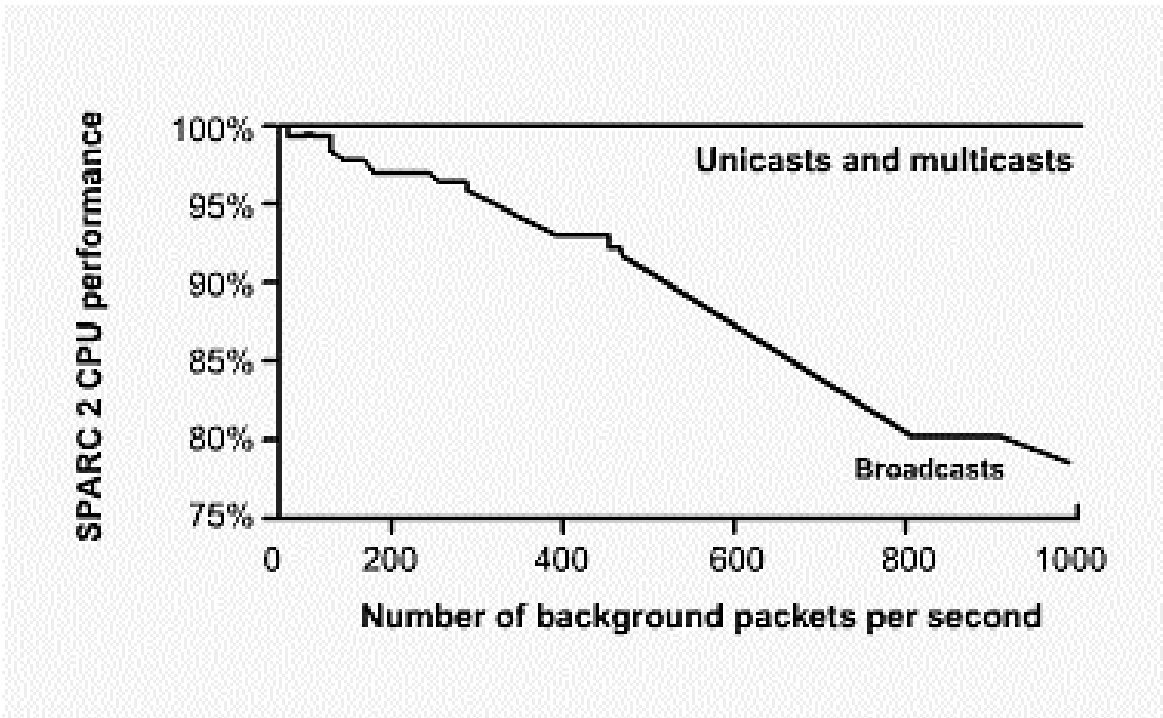


Broadcasts in a Bridged Environment



A broadcast is picked up by all stations. A broadcast is also forwarded across all bridges whether the receiving host is on the other side of the bridge or not. This eliminates the benefits of having a bridged network.

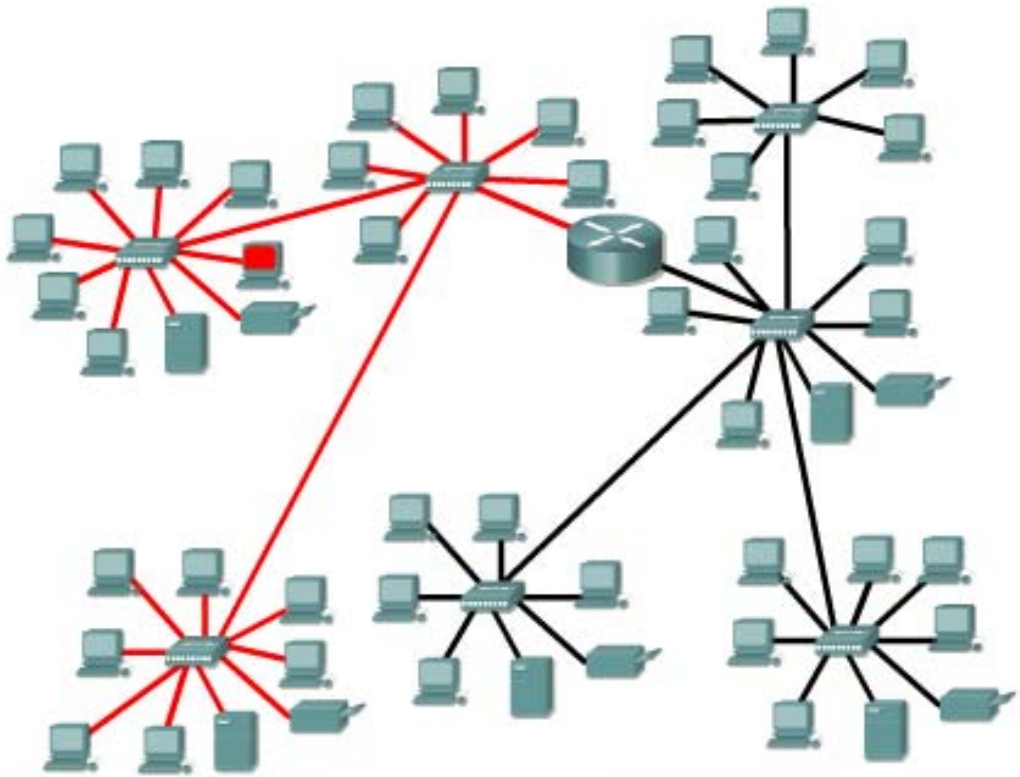
Effects of Broadcast Radiation on Hosts in a IP Network



Average Number of Broadcasts and Multicasts for IP

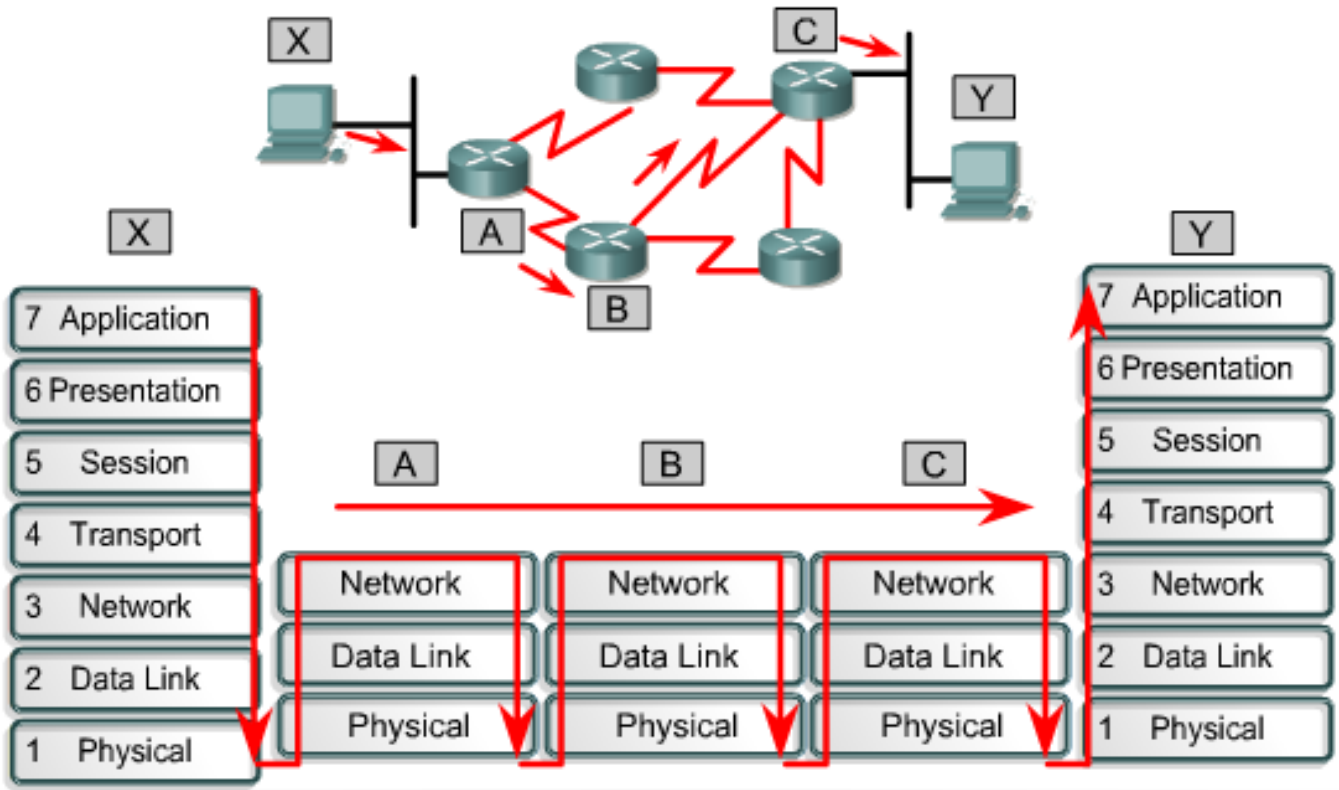
Number of Hosts	Average Percentage of CPU Loss per Host
100	.14
1000	.96
10000	9.15

Broadcast Domain Segmentation



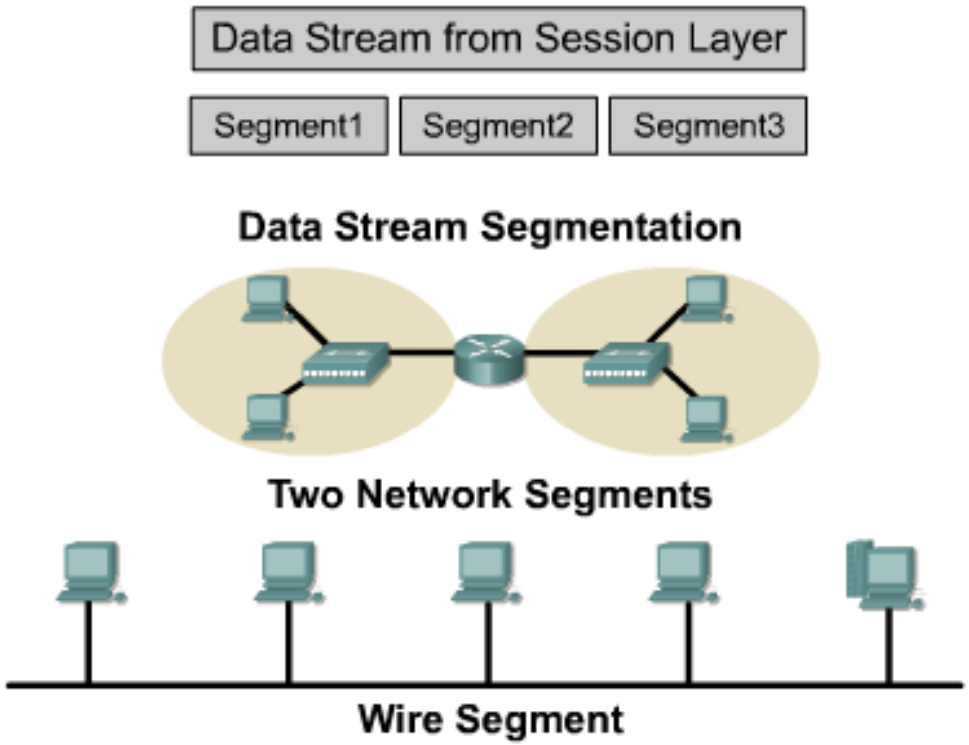
By using a router in place of a bridging device a layer two broadcast is contained. Layer three devices are the only devices that contain broadcasts.

Data Flow Through a Network



Data flow in a network focuses on layers one, two and three of the OSI model. This is after being transmitted by the sending host and before arriving at the receiving host.

Segments



There are different types of segments in networking. The meaning of the term **segments** depends on the context of a sentence.

Summary

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An understanding of the following key points should have been achieved:

- Common switching modes:
  - Store-and-forward
  - Cut-through
  - Fragment-free
- Spanning-Tree Protocol is used to resolve and eliminate loops in a network.
- Layer 1 devices do not break up collision domains.
- Layer 2 and Layer 3 devices break up collision domains.
- Layer 1 and Layer 2 devices do not block broadcasts.