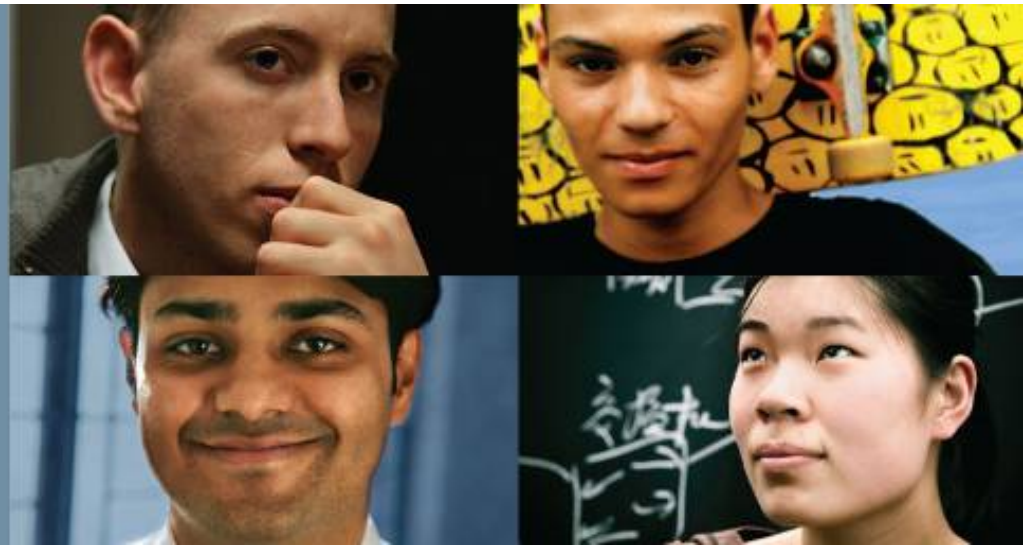
TNE10006/TNE60006: Networks and Switching



Ethernet Switching

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Outline

- Collision Domains
- Bridge/Switch Operation
- MAC Address Table
- Broadcast Collision Domains
- Frame Forwarding Techniques

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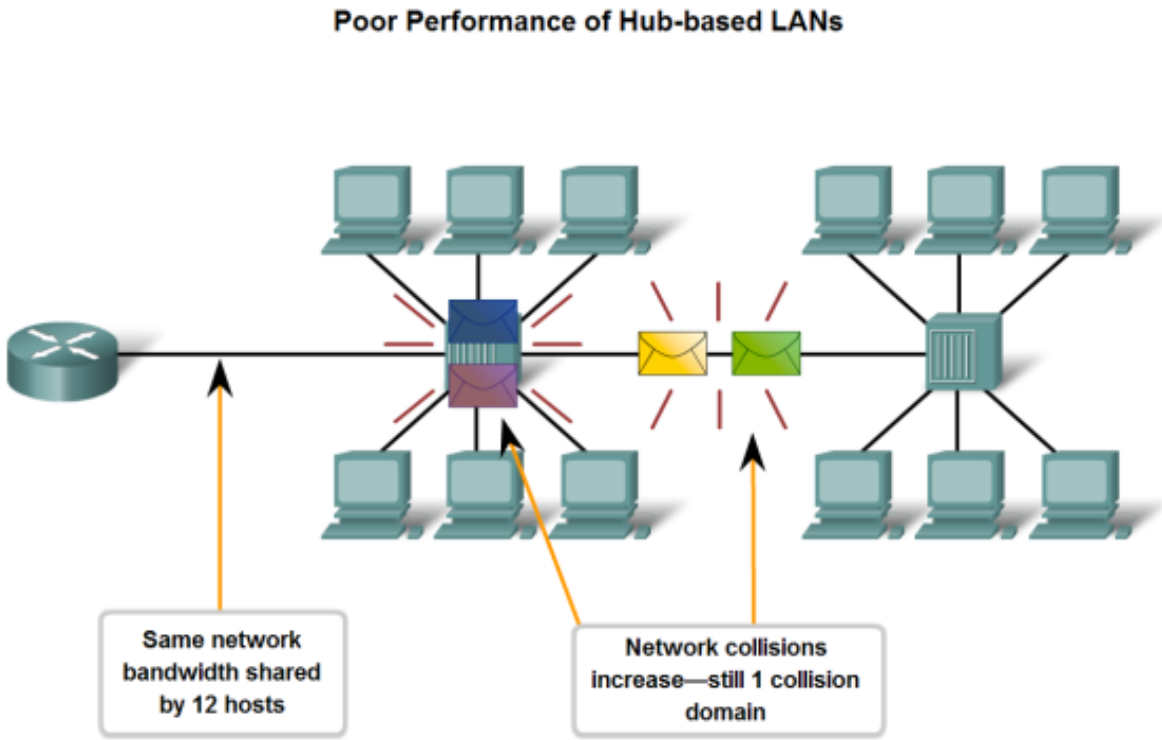
Collision Domains

- Collisions still happen on a shared network
- Probability increases with number of hosts
- Define a collision domain

  Portion of network where, if two hosts want to talk at the same time, a collision will occur



Collision Domains

- By definition

  An entire shared network is a Collision Domain

  Any two hosts on a hub/shared-segment have the possibility of colliding

- How can we decrease collisions without restricting who can send data?

Bridges – Operation

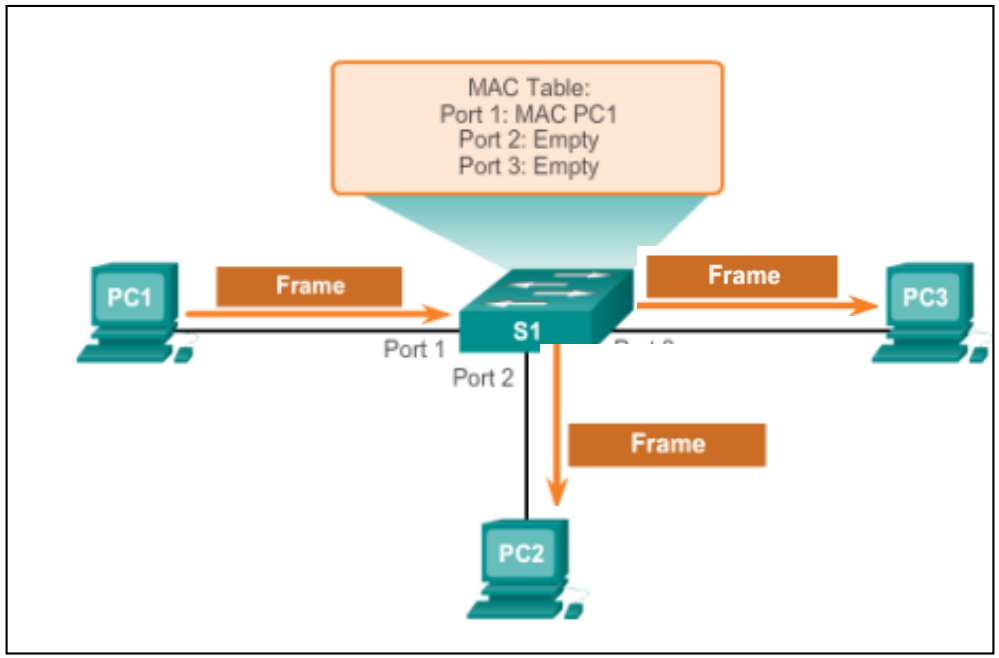
- Ethernet packets contain a source MAC address

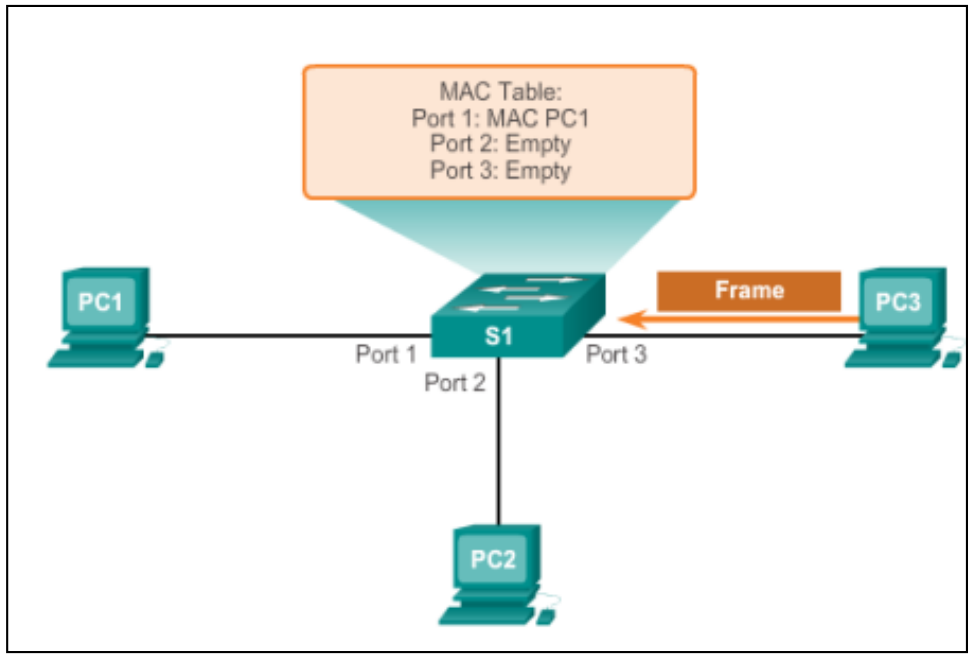
  By listening to traffic we can determine where each Ethernet host is connected to the network

- A bridge connects two shared-Ethernet segments together

  Learns which MAC addresses are on each side of the switch

Switch MAC Address Table





1. The switch receives a broadcast frame from PC 1 on Port 1
2. Store the source MAC address and switch port into the address table
3. Destination address is broadcast – flood the frame to all ports, except the port on which it received the frame.
4. Destination device replies to broadcast with a unicast addressed to PC 1.

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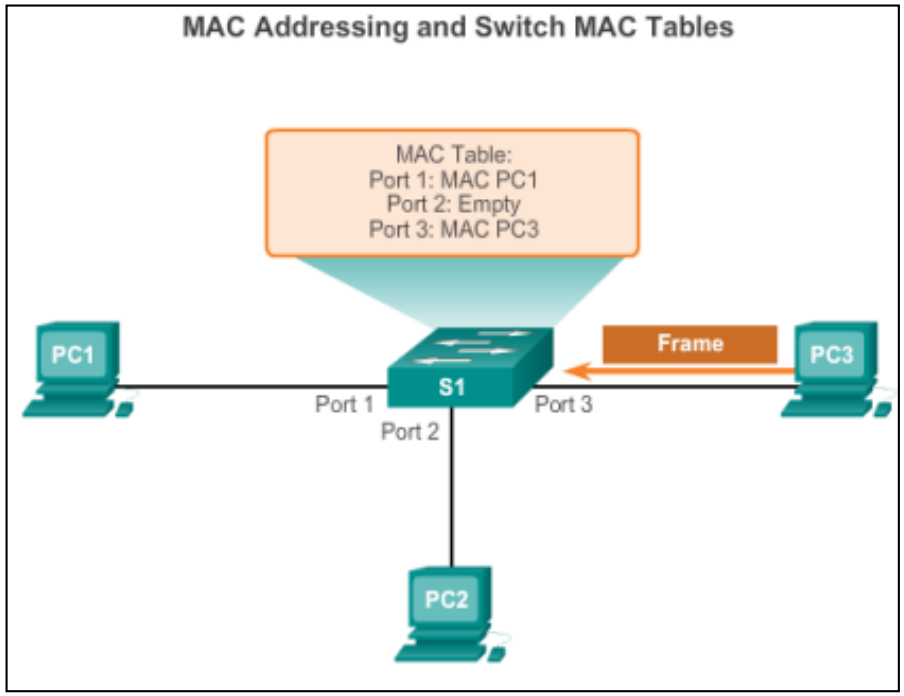
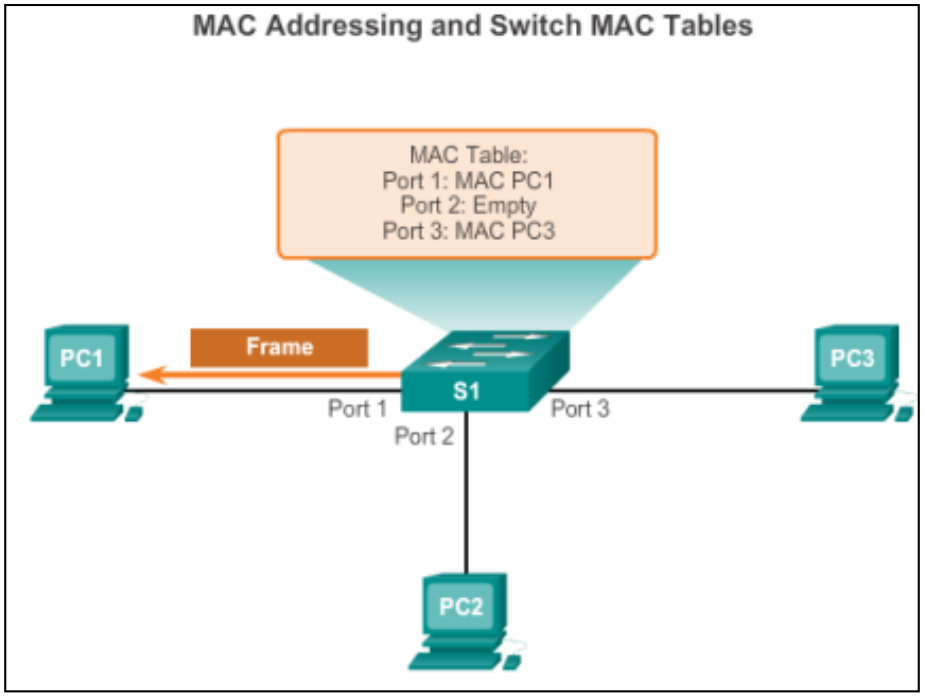
Switch MAC Address Table





5. Store the source MAC address of PC 3 and switch port into the address table

6. Destination address and associated port is found in the MAC address table

7. The switch can now forward frames between source and destination devices without flooding

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Collision Domains Revisited

- A broadcast (ff:ff:ff:ff:ff:ff) packet is always forwarded out all switch ports
  - Typically an ARP request
  - All Ethernet stations need to receive it as the responder is unknown
- A switch will create multiple Collision domains in a LAN
  - Increases number of concurrent traffic sources
- A switch will not create multiple Broadcast Collision domains
  - All attached end-hosts will receive a broadcast packet

Frame Forwarding Methods on Cisco Switches

Store-and-forward

A store-and-forward switch receives the entire frame, and computes the CRC. If the CRC is valid, the switch looks up the destination address, which determines the outgoing interface. The frame is then forwarded out the correct port.

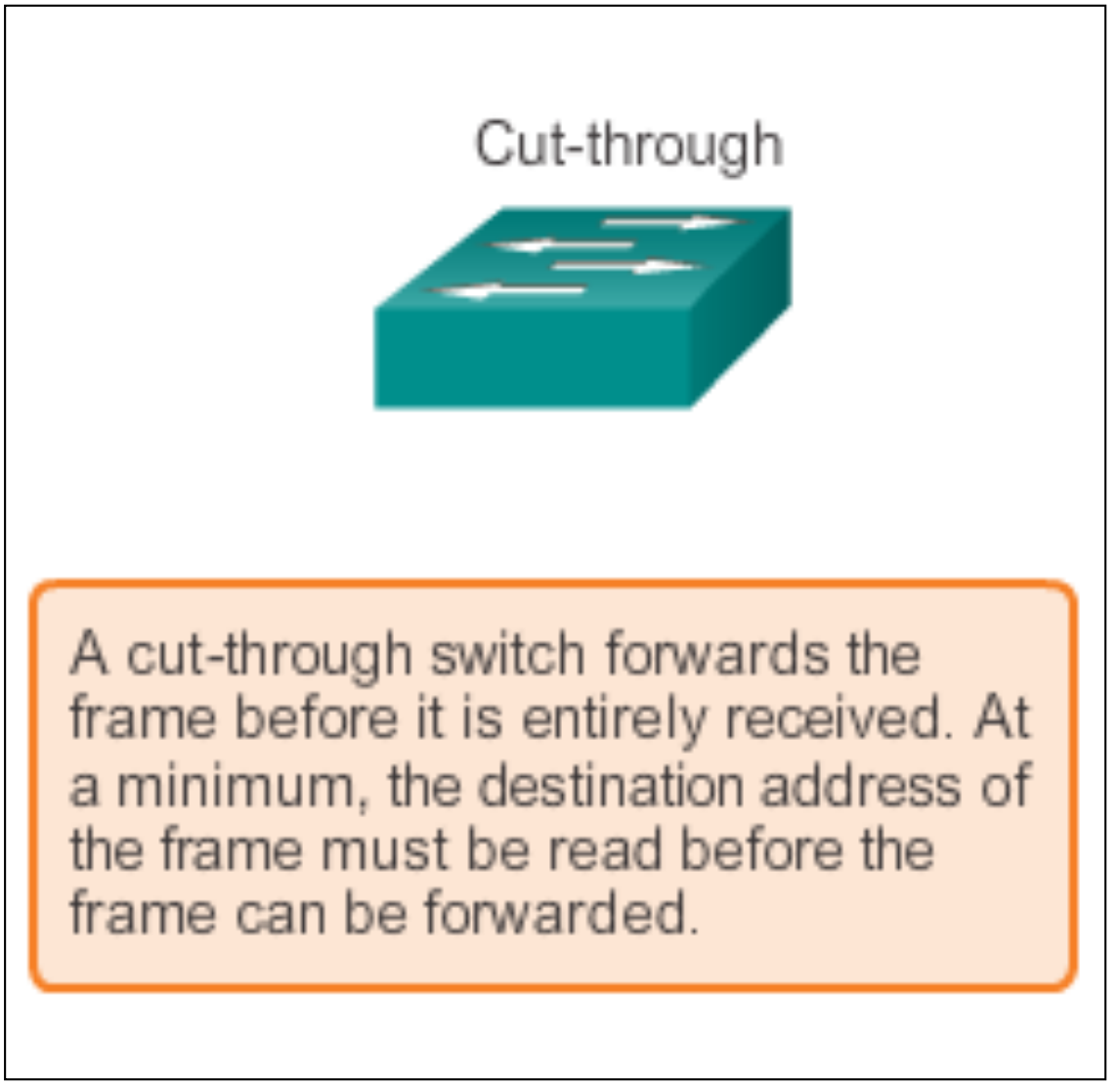
Cut-through Switching

Fast-forward switching:

- Lowest level of latency immediately forwards a packet after reading the destination address, typical cut-through method of switching

Fragment-free switching:

- Switch stores the first 64 bytes of the frame before forwarding, most network errors and collisions occur during the first 64 bytes



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Summary

In this lecture, we covered:

- Collision Domains
- Bridge/Switch Operation
- MAC Address Table
- Broadcast Collision Domains
- Frame Forwarding Techniques