

# Lecture 2c - Ethernet Switching

Type

Lecture

Materials

Empty

Reviewed

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1. Collision Domains

2. Bridges - Operation

3. Switch MAC Address Table

4. Collision Domains Revisited

5. Switching

6. Quizzes:

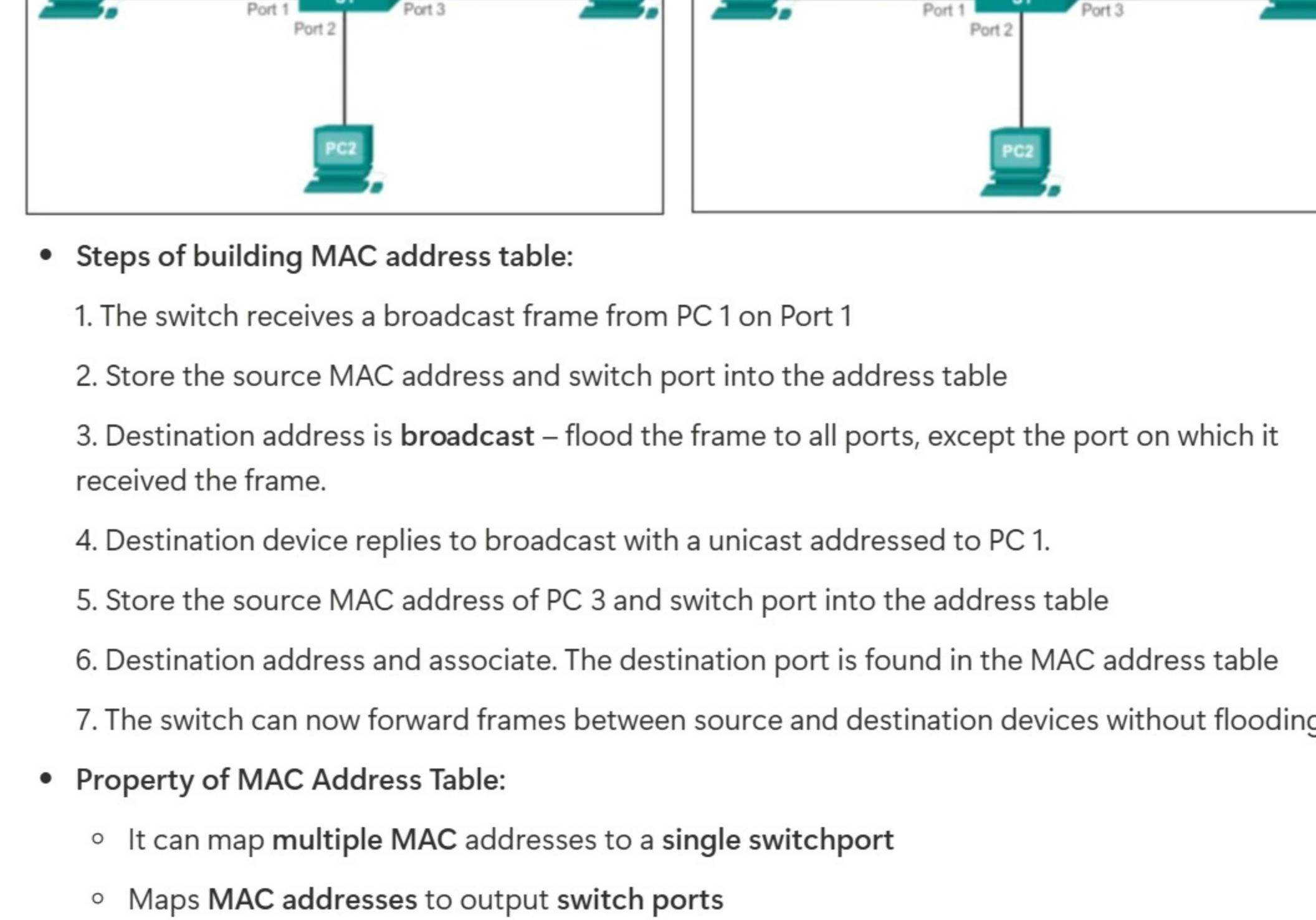
## 1. Collision Domains

- Definition: Portion of network where, if **two hosts** want to talk at the same time, a **collision** will occur.
- By definition
  - An entire shared network is a **Collision Domain**
  - Any two hosts on a hub/shared-segment have the possibility of colliding
- Collisions still happen on a shared network
- Probability **increases** with number of hosts

## 2. 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.

## 3. Switch MAC Address Table



- Steps of building 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.
5. Store the source MAC address of PC 3 and switch port into the address table
6. Destination address and associate. The destination port is found in the MAC address table
7. The switch can now forward frames between source and destination devices without flooding

- Property of MAC Address Table:

- It can map **multiple MAC addresses** to a **single switchport**
- Maps **MAC addresses** to output **switch ports**
- Switches **observe the source address** of incoming frames to build the table
- Used by the switch to make **forwarding decisions**

## 4. 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 domains**
  - All attached end-hosts will receive a broadcast packet

## 5. Switching

- **Store-and-forward Switch**

- 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 to the correct port.

- **Cut-through Switching**

- This switch forwards the frame **before** it is **entirely received**. At a **minimum**, the **destination address** of the frame must be read before the frame can be forwarded.

- **There are 2 types:**

- **Fast-forward switching:** The lowest level of latency **immediately forwards** a packet after reading the **destination address**, a 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**.

## 6. Quizzes:

- In wired Ethernet connections, separate cables are used for sending and receiving data, allowing for ... communication between the switch and connecting devices.  
⇒ **Full-duplex**

- Do collisions occur in a switched Ethernet network?  
⇒ **No**

- Each device in a switched network is in an **isolated collision domain** with the switch, therefore, there are no other transmitters for frames to collide with.
- Moreover, transmission between the switch and a connected device is **full-duplex**, allowing for the switch and the device to send and receive **simultaneously** without collisions.

- What is TRUE about the MAC Address Table? What is FALSE?

TRUE	FALSE
Switches observe the source address of incoming frames to build the table	Switches perform ARP requests to build the table
It can map multiple MAC addresses to a single switchport	Maps MAC addresses to IP address for all connected devices
Maps MAC addresses to output switchports	It can only map one MAC address to a switchport
Used by the switch to make forwarding decisions	Used only for informational purposes

- What figure describes Unicast Frame Flooding?

MAC Address	Interface
64-E7-D8-AB-63-87	GigabitEthernet 1/0/1
64-E7-D8-15-8B-AA	GigabitEthernet 1/0/2



⇒ If the **destination address** of a frame is **not** in the MAC address table, the frame is **sent out to all ports** except the incoming port. This is known as **Unicast Frame Flooding**.