

Summary of the Ping Process from PC1 to PC5:

1. ARP Request from PC1 to Resolve PC5's MAC Address:

- **Actions:**

PC1 wants to send a ping (ICMP Echo Request) to **PC5**.

To do so, it needs to know **PC5's MAC address**.

Since **PC1** doesn't know **PC5's MAC address**, it sends an **ARP request** to resolve **PC5's MAC address**.

The ARP request is broadcasted across the local network.

- **PC1 sends ARP Request to Switch 1.**
- **Switch 1** floods it to all ports (except the port on which it was received).
- **Switch 1** learns that **PC1's MAC address** is on its port.
- **Switch 2** floods the ARP request to all its ports.
- **Switch 2** learns that **PC1's MAC address** is on the port where **PC1** is connected.

- **ARP Request Details:**

- **Source MAC Address:** **PC1's MAC address**
 - **Destination MAC Address:** Broadcast (FF:FF:FF:FF:FF:FF) – because **PC1** doesn't know **PC5's MAC address**
 - **Source IP Address:** IP address of **PC1**
 - **Destination IP Address:** IP address of **PC5**
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2. ARP Reply from PC5 to PC1:

- **Actions:**

PC5 receives the ARP request because it recognizes that the request is asking for its own IP address.

PC5 responds with an **ARP reply**, containing its MAC address.

The ARP reply is **unicast** directly to **PC1** (not a broadcast).

- **Switch 2** forwards it to the port where **PC1** is connected, via **Switch 1**.
- **Switch 2** learns that **PC5's MAC address** is on its port.

- **ARP Reply Details:**

- **Source MAC Address:** **PC5's MAC address**
 - **Destination MAC Address:** **PC1's MAC address** (this is the address **PC1** was asking for)
 - **Source IP Address:** IP address of **PC5**
 - **Destination IP Address:** IP address of **PC1**
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3. ARP Cache Update:

- **Action:**

After receiving the ARP reply, **PC1** updates its ARP table with **PC5's MAC address**.

Similarly, **PC5** updates its ARP table with **PC1's MAC address**.

4. ICMP Echo Request from PC1 to PC5:

- **Actions:**

Now that **PC1** has **PC5's MAC address** (from the ARP resolution), **PC1** can send the **ICMP Echo Request**.

PC1 sends the **ICMP Echo Request** to **PC5** using **PC5's MAC address** as the destination.

Switch 1 receives the frame and performs the following actions:

- **Switch 1** checks its **MAC address table** to find **PC5's MAC address**.
If **PC5's MAC address** is known, **Switch 1** forwards the frame to the corresponding port. If not, it floods the frame.
- Assuming **Switch 1** knows that **PC5's MAC address** is on the port leading to **Switch 2**, it forwards the frame to **Switch 2**.
- **MAC Address Learning:**
Switch 1 learns that **PC1's MAC address** is on the port where **PC1** is connected.

Switch 2 receives the frame and checks its **MAC address table** to find the appropriate port for **PC5's MAC address**.

Switch 2 forwards the frame out of the port where **PC5** is connected.

- **ICMP Echo Request Frame Details:**

- **Source MAC Address:** **PC1's MAC address**
 - **Destination MAC Address:** **PC5's MAC address** (learned via ARP)
 - **Ethernet Type:** IP (0x0800) – indicating that the payload is an IP packet.
 - **Source IP Address:** IP address of **PC1**
 - **Destination IP Address:** IP address of **PC5**
 - **ICMP Type:** Echo Request
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5. PC5 Receives the ICMP Echo Request:

- **Actions:**

PC5 receives the **ICMP Echo Request**, verifies that the destination IP address matches its own, and processes the request.

PC5 then generates an **ICMP Echo Reply** and sends it back to **PC1**.

PC5 sends the **ICMP Echo Reply** directly to **PC1's MAC address** (via **Switch 2**).

- **ICMP Echo Reply Frame Details:**

- **Source MAC Address:** **PC5's MAC address**
 - **Destination MAC Address:** **PC1's MAC address** (learned via ARP earlier)
 - **Ethernet Type:** IP (0x0800)
 - **Source IP Address:** IP address of **PC5**
 - **Destination IP Address:** IP address of **PC1**
 - **ICMP Type:** Echo Reply
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6. Switch 2 Forwards the ICMP Echo Reply to Switch 1:

- **Action:**

Switch 2 receives the **ICMP Echo Reply**, checks its MAC address table, and finds that **PC1's MAC address** is associated with the port where **Switch 1** is connected.

Switch 2 forwards the **ICMP Echo Reply** to **Switch 1**.

7. Switch 1 Forwards the ICMP Echo Reply to PC1:

- **Action:**
Switch 1 receives the **ICMP Echo Reply** from **Switch 2**.
It checks its MAC address table to find the port where **PC1** is connected.
Switch 1 forwards the **ICMP Echo Reply** to **PC1**.

8. PC1 Receives the ICMP Echo Reply:

- **Action:**
PC1 receives the **ICMP Echo Reply** from **PC5**.
The ping process is complete, and **PC1** now knows that **PC5** is reachable.

Summary of the Ping Process:

- **PC1** sends an **ARP request** to **PC5** to resolve **PC5's MAC address**.
- **PC5** responds with an **ARP reply**, and **PC1** stores **PC5's MAC address** in its ARP table.
- **Switch 1** and **Switch 2** learn **PC1's MAC address** and **PC5's MAC address** as part of the ARP request/reply process.
- **PC1** sends an **ICMP Echo Request** to **PC5**.
- The request is flooded by **Switch 1** and **Switch 2** until **PC5** receives it.
- **PC5** processes the request, sends an **ICMP Echo Reply** back to **PC1**.
- The reply is forwarded by **Switch 2** to **Switch 1**, and then to **PC1**.
- **PC1** receives the reply, completing the ping process.