

Project Report

Applied Industrial Internet of Things

Configuration of Address Resolution Protocol (ARP) using Cisco Packet Tracer

1. Title Page

Project Title: Configuration of Address Resolution Protocol (ARP) using Cisco Packet Tracer

Course: Applied Industrial Internet of Things

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2. Aim

To construct a simple Local Area Network (LAN) and understand the concept and operation of Address Resolution Protocol (ARP) using Cisco Packet Tracer.

3. Problem Statement

In a Local Area Network (LAN), devices communicate using IP addresses for logical identification, while data is transmitted based on MAC addresses. A device must know the MAC address of another device before communication can begin. The Address Resolution Protocol (ARP) is responsible for resolving an IP address into its corresponding MAC address.

The goal of this project is to:

- Construct a LAN using PCs and a switch in Cisco Packet Tracer.
 - Configure IP addresses for the devices.
 - Demonstrate the process of ARP through ping tests and ARP table inspection.
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4. Scope of the Solution

- Demonstrates how ARP functions in a basic LAN environment.
 - Provides hands-on experience with Cisco Packet Tracer for simulating networking concepts.
 - Helps in understanding the fundamental concept of IP-to-MAC resolution.
 - Applicable to Industrial IoT systems where efficient LAN communication is critical.
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5. Components Used

Software

- Cisco Packet Tracer (Simulation IDE)

Networking Devices (within Packet Tracer)

- **3 PCs (PC-PT)**
- **1 Switch (2960-24TT or 8-port switch)**

- **Copper Straight-Through Cables** (to connect PCs to the switch)
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6. Methodology

Step 1: Network Setup

- Place **3 PCs** and **1 switch** in the workspace.
- Connect each PC to the switch using **Copper Straight-Through Cables**.
 - PC0 → Switch Fa0/1
 - PC1 → Switch Fa0/2
 - PC2 → Switch Fa0/3

Step 2: IP Address Configuration

Assign IP addresses to the PCs as follows:

- PC0 → 192.168.1.1 / 255.255.255.0
- PC1 → 192.168.1.2 / 255.255.255.0
- PC2 → 192.168.1.3 / 255.255.255.0

Step 3: Connectivity Test (Ping)

- Open the Command Prompt in PC0.
- Execute:
 - ping 192.168.1.2
 - ping 192.168.1.3
- The first ping may fail due to ARP request; subsequent pings should succeed.

Step 4: Viewing ARP Table

- In PC0, type:
 - arp -a
- The table will display the mapping of IP addresses to MAC addresses.

Step 5: Observe ARP Packets (Simulation Mode)

- Switch Packet Tracer to Simulation Mode.
 - Ping from PC0 to PC1/PC2.
 - Observe **ARP Request (broadcast)** and **Reply (unicast)** packets being exchanged.
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7. Results & Observations

1. Successful connectivity was established between all PCs.
2. ARP tables displayed the correct IP-to-MAC mappings.
3. In Simulation Mode:
 - ARP Requests were broadcasted to all devices.

- ARP Replies were unicasted back to the requesting device.
4. The first ping request experienced a slight delay, as ARP resolution occurred. Subsequent pings were successful without delay.

8. Conclusion

This project successfully demonstrated the working of the Address Resolution Protocol (ARP) in a LAN environment using Cisco Packet Tracer. It showed how devices resolve IP addresses into MAC addresses for successful communication. The simulation highlighted both ARP Requests (broadcast) and ARP Replies (unicast), providing clear insight into the ARP process.

9. References

1. Cisco Networking Academy – Packet Tracer Resources
2. Tanenbaum, A. S., *Computer Networks*, 5th Edition
3. Forouzan, B. A., *Data Communications and Networking*

10. Annexure

Screenshots to Attach

- Network Topology (LAN with PCs and switch)
- IP Configuration of each PC
- Ping test results
- ARP table output
- Simulation view showing ARP packets