Lab 2 : Routing and switching
Lecturer : Prof. Oumaima FADI
T.A: Prof. Abdoulghaniyu HARAZEEM

Lab 2 – Routing and switching

Objective:

The goal of this lab is to set up a network between different machines and learn how to perform the necessary network configurations.

We will focus on the following:

- IP addressing configuration on Linux and Windows machines;
- Discovering network commands and configuration files;
- Learning about ARP and ICMP protocols;
- Using Linux sniffer tools like tcpdump and Wireshark.

Instructions:

1. The lab report must be submitted one week after the session in electronic format to Moodle platform
2. The lab must be done in class in groups of maximum 2 students.
3. Groups should remain the same for both reports and upcoming labs.

Lab Procedure

We will use virtual machines. Each group must have 2 VMs on their computer:

- 1 Ubuntu machines
- 1 Windows machine

1. Network Setup

1.1. Hardware Connection

When the network controller of virtual machines is set to “Host only”, the machines can communicate with each other. Make sure this setting is applied.

This is equivalent to physically connecting real machines through networking equipment.

Questions:

1. In your opinion, which networking equipment can be used to connect three physical machines?
2. What is the difference between a Hub and a Switch?

1.2. Machine Configuration

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Now that the network is ready, you must configure the machines at the system level so that they recognize each other and can communicate.

For Linux machines, you can configure the network in two ways:

- By editing configuration files and rebooting the machine.
- By running commands manually.

For Windows machines, you should already know how to proceed. a. Choosing IP addresses:

- Select an IP class.
- Choose a network address within this class.
- Assign an IP address to each machine. (It will be assigned automatically since we are on host only).
- Draw a diagram of your network with all addresses (important for later). b. Configuration using ifconfig:
- Command:
- ifconfig

2. ARP Protocol Exploration

The arp command allows you to view or modify the ARP cache (IP ↔ MAC mapping).

Useful options:

- arp -a → show ARP table
- arp -d <hostname> → delete entry
- arp -s <hostname> <MAC> → add manual ARP entry

1. Display the ARP packets on wireshark and explain

2. **ICMP Protocol Exploration**

The ping command uses ICMP ECHO_REQUEST / ECHO_REPLY messages.

1. Send 5 pings:
2. ping -c 5 192.168.1.1
3. Use Wireshark to capture ping requests & replies.

Use tcpdump to capture packets (clear ARP cache before testing)

4. Ping from 192.168.1.1 to 192.168.1.2.
5. Analyze ping operation: ICMP + ARP packets appear.

6. Analyze captured packets with tcpdump and Wireshark.
7. Identify ICMP messages:

   - Request = ICMP Echo Request

   - Reply = ICMP Echo Reply

3. Topologies configurations

Bus topology using Packet Tracer:

Let pcA, pcB, and pcC in a bus topology network.

a- Configure ip addresses for the hosts (link each one with a switch)
b- Ping : pcA=>pcB and pcB=>pcC
c- What are the pros and cons of this topology

Answer the same questions for the star,ring and mesh topology.

- Lab 1 : Routing and switching
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