

Lab #6 : Data Link Layer (Switch + ARP protocol)

Communication Networks

Academic Year : 2025/2026

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Duration : 2 sessions

Objectives : Study and experiment some concepts related to OSI layer 2. Understand the difference between a switch and a hub. Understand the ARP protocol.

A. General questions about OSI data link layer layer :

1. What are the main functions of the data link layer?
2. What is a MAC address?
3. What is a switch?
4. What is the difference between a switch and a hub?
5. Give some protocols of data link layer ?

B.

1. Execute the following command to show the MAC address of the Ethernet NIC of your PC:

ipconfig /all

Your Answer :

2. Realize the following network configuration using Packet Tracer.
3. Add 3 PCs : PC0, PC1, PC2 and one switch : Switch0.
4. Connect PC0, PC1 and PC2 to Switch0.
5. Configure the IP addresses of the 3 PCs according to the following table :

PC	IP address	Mask
PC0	10.10.10.1	255.0.0.0
PC1	10.10.10.2	255.0.0.0
PC2	10.10.10.3	255.0.0.0

6. Do you think that PC0 knows the IP and MAC addresses of PC2 ?

Your Answer :

7. Do you know ARP protocol ? What does it do ?
8. In which layer is it implemented ?
9. Open the command prompt of PC0 and execute the following command to show the ARP table of PC0:

arp -a

Report the result :

10. Explain the obtained result.

Your Answer :

11. Do the same thing for PC1 and PC2 (show ARP table).
12. Show the MAC address table of Switch0 by following these steps:
 - a. Click on Switch0.
 - b. Select the CLI tab. A command prompt is opened.
 - c. Execute the following command

show mac-address-table

Report the result :

13. Now, switch to the simulation mode.
14. Add a simple PDU and send it from PC0 to PC2.
15. Why are there two PDUs of different types (colors) waiting for transmission at PC0 ?

Your Answer :

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16. Play the simulation and observe the following points :

- a. The number of PDUs transmitted by PC0.

Your Answer :

- b. In which order are the two PDUs transmitted ?

Your Answer :

- c. The behavior of the switch after receiving the first PDU (Broadcast or forward the PDU to the corresponding port). Explain why ?

- d. The behavior of the switch after receiving the second PDU (Broadcast or forward the PDU to the corresponding port). Explain why ?

- e. After successful receiving the ICMP PDU (second PDU) by PC2 then by PC0, what does Switch0 do?

Your Answer :

17. Stop the simulation.

18. Show the ARP of PC0.

Report the result :

19. Do the same thing for PC1 and PC2 (show ARP table).

20. Explain the obtained result.

Your Answer :

21. If you send another simple PDU from PC0 to PC2, do you think that it will generates two PDUs of different types or only the ICMP PDU ?

Your Answer :

22. Show the MAC address table of Switch0.

Report the result :

23. Now, consider adding two PCs

- a. PC3 with IP address : 10.10.10.4 AND Subnet Mask : 255.255.255.0

- b. PC4 with IP address : 10.10.10.5 AND Subnet Mask : 255.255.255.0

24. Add a Hub and connect it to PC3, PC4 and to the switch.

25. Show the ARP table of PC3 and PC4.

26. Switch to the simulation mode.

27. Add a simple PDU and send it from PC0 to PC4.

28. Play the simulation and observe the following points :

- a. The behavior of the switch and the hub when receiving a PDU (Broadcast or forward the PDU to the corresponding port).

- b. After successful receiving the ICMP PDU by PC2 then by PC0, what does Switch0 do?

Your Answer :

- c. Is the hub doing the same thing

Your Answer :

29. Stop the simulation.

30. Show again the ARP table of all PCs.

31. Show again the MAC address table of Switch0.

32. Can you show the MAC address table of Hub0 ? why ?

33. In the event list, track the number of layers involved in message forwarding for Switch0 and Hub0 ? Is there any difference ?