

Tutorial 5: Ethernet

Q1. (a) In a Local Area Network, ARP request is a layer 2 broadcast message. All the devices in the LAN received the Address Resolution Protocol (ARP) request except the sending device.

(i) What is the purpose of the ARP? (2 marks)

Sending node needs a way to find the MAC address of the destination for a given Ethernet link.

(ii) What is the action taken by a node if the node's IP address matched the IP address in the ARP request? (2 marks)

The node that matches the IP address in the broadcast will reply. If no device responds to the ARP request, the packet is dropped because a frame cannot be created.

(iii) What happens if no device on the LAN responds to the ARP request? (2 marks)

The packet is dropped because a frame cannot be created.

(iv) Name and explain **ONE (1)** reason ARP can cause a problem in a network. (3 marks)

ARP spoofing occurs when an attacker sends falsified ARP messages over a local area network.

These messages associate the attacker's MAC address with the IP address of a legitimate network device, such as a router or another host.

(v) What is the ARP table used for? (4 marks)

Used to find the data link layer address that is mapped to the destination IPv4 address. As a node receives frames from the media, it records the source IP and MAC address as a mapping in the ARP table.

(b) Determine the correct sublayer for the following descriptions. (6 marks)

Descriptions	MAC or LLC?
1. Controls the network interface card through software drivers	LLC
2. Works with the upper layers to add application information for delivery of data to higher level protocols	LLC
3. Works with hardware to support bandwidth requirements and checks errors in the bits sent and received	MAC
4. Controls access to the media through signaling and physical media standards requirements	MAC
5. Supports Ethernet technology by using CSMA/CD or CSMA/CA	MAC
6. Remain relatively independent of physical equipment	LLC

Q3. (a) Inspect the following MAC addresses; is this a proper MAC address? If not, why?

(i) 77:EE:33:AA:DD (2 marks)

No, it is not a proper MAC address. A MAC address should consist of six pairs of hexadecimal digits separated by colons or dashes, making a total of 12 hexadecimal digits.

(ii) 01-34-45-7U-8B-P9 (2 marks)

No, it is not a proper MAC address. A MAC address should consist of six pairs of hexadecimal digits separated by colons or dashes, making a total of 12 hexadecimal digits. The range of number should be within 0 - 9 or A - F.

(iii) FI00:5678.910C (2 marks)

No, it is not a proper MAC address. A MAC address cannot present with colons or periods in the same time. It should be FI:00:56:78:91:0C or FI00.5678.910C.

Tutorial 5: Ethernet

Q4. Refer to the Figure 1 to answer the following questions:

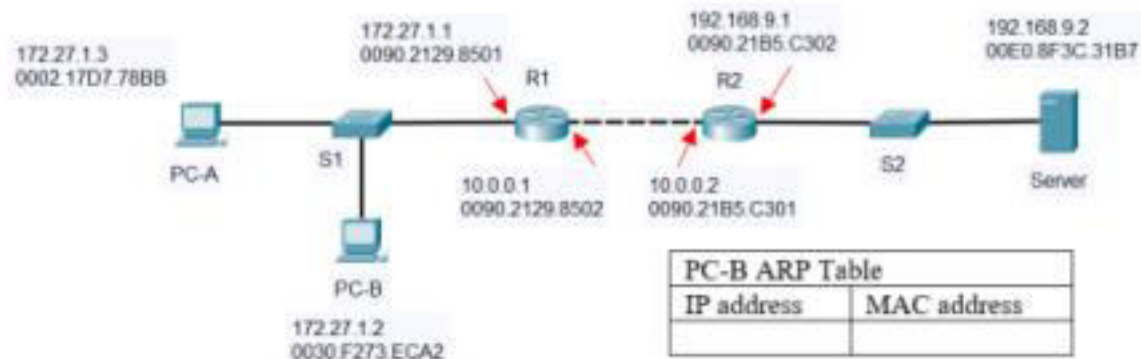


Figure 1: Network Topology

- i) Refer to Figure 1. PC-B is sending data to PC-A. Therefore, a frame needs to be created to send to the destination device. By referring to the PC-B ARP table, determine whether the Address Resolution Protocol (ARP) will be activated in this scenario. Justify your answer.

(4 marks)

(past year question Feb 2023)

ARP will be activated in this scenario. PC-B does not have the MAC address of PC-A in its ARP table, ARP will be activated. PC-B will send out an ARP request on the network asking for the MAC address associated with the IP address of PC-A. Once PC-A responds with its MAC address, PC-B will update its ARP table with this information and then create the frame to send data to PC-A.

Yes. ARP will be activated. PC-B will send out a broadcast ARP request to everyone for IP address and MAC address of PC-A. PC-A will send a Unicast ARP reply to PC-B. PC-B will update its ARP table with this information and then create the frame to send data to PC-A. (tutor answer)

Q5.

Refer to the Figure 1 below to answer the question 4 (a) to (e). Consider an IP datagram being sent from node A to node D.

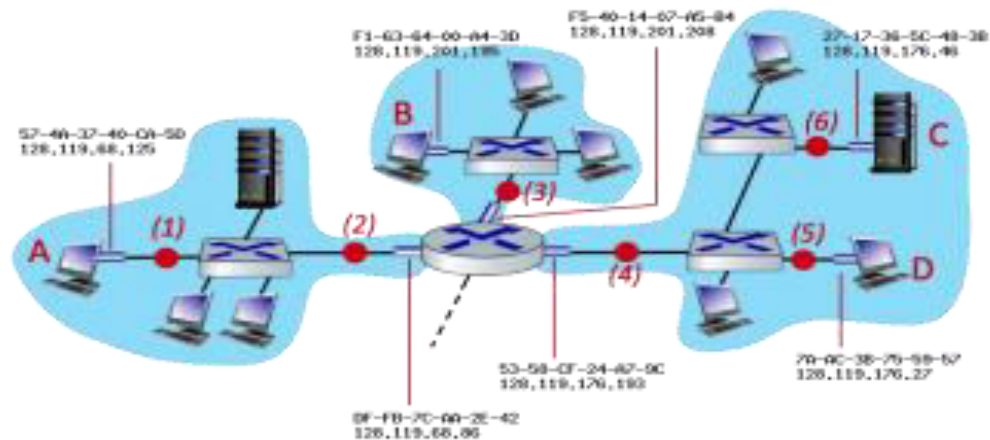


Figure 1: A Network Topology

2 updated by Sangeetha V Feb 2024

BAIT1013 Introduction to Computer Networks



Tutorial 5: Ethernet

- (a) Identify the source MAC address, destination MAC address, source IP address, destination IP address at point 1.

(4 Marks)

Source MAC Address	57-4A-37-40-CA-5D
Destination MAC Address	DF-FB-7C-AA-2E-42
Source IP Address	128.119.68.125
Destination IP Address	128.119.176.27

- (b) Do the source and destination MAC address change at point 2? Answer Yes or No. (1 Mark)

No

- (c) Do the source and destination MAC address change at point 4? Answer Yes or No. (1 Mark)

Yes

- (d) Identify the source MAC address and destination MAC address at point 4. (2 Marks)

Source MAC Address	53-58-CF-24-A7-9C
Destination MAC Address	7A-AC-3B-76-55-67

(e) Do the source and destination MAC address change at point 5? Answer Yes or No. (1 Mark)

No

Q6.

The user at PCA has sent a packet to the SERVER. A junior network engineer traced the frame that is traveling from the PCA to the SERVER, and he indicated that at Point A the IP address and Media Access Control (MAC) address in the frame is wrongly written in the Table 1 below.

Source MAC address	00:00:00:11:22:22
Destination MAC address	00:00:00:34:66:BB
Source IP address	192.16.1.1
Destination IP Address	10.1.1.2

Table 1

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Tutorial 5: Ethernet

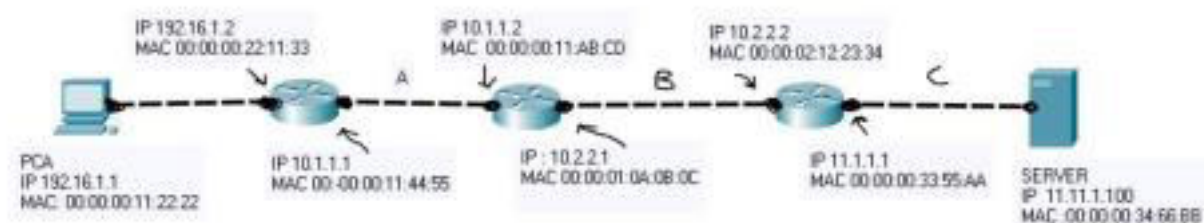


Figure 2: A Network Topology

(a) Refer to Figure 2 above, rewrite the correct answer to Table 1.

(6 marks)

Source MAC address	00:00:00:11:44:55
Destination MAC address	00:00:00:11:AB:CD
Source IP address	192.16.1.1
Destination IP Address	11.11.1.100

(b) Explain **THREE (3)** differences between IP address and MAC address *[You are required to relate your answer with the Figure 2]*

(6 Marks)

IP address	MAC address
IP address is end to end Responsible to send data from network to network from Original Sender to Final Destination	MAC address is point to point Responsible to send data from NIC to NIC
logical address because assigned logically	physical address because physically assigned to the host NIC
IP address in the frame NEVER changes	MAC address in the frame changes from point to point