

 **20 minutes**

[L3] Quiz 4

This quiz covers random access MAC protocols and ARP.

* Required

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1. [Collision] In Computer Networking, a **collision** happens when network nodes share a medium (aka, collision domain) and two or more transmissions take place simultaneously. In this case, their respective signals overlap resulting in a deformed signal arriving at the receiver node. Among the following options, which one can not be considered a solution to handle collisions? * (4 Points)

- ☐ We can implement bit error detection and correction systems to avoid retransmissions.
- ☐ We can partition the medium in frequencies, ensuring that each node transmit within their own frequency band.
- ☐ We can define random transmission attempts, which reduces the chances of simultaneous transmissions.
- ☐ We can try to avoid collisions to happen by sensing the medium before each transmission.

2. [CSMA] In an attempt to reduce collisions, CSMA nodes "sense" the medium before effectively start new transmissions. If there is another transmission currently taking place, the node waits for the medium to become idle. Among the following options, which are examples of situations where collisions can still occur? * (4 Points)

- ☐ Some physical media (e.g., wireless) are resistant to signal detection and ongoing transmissions may go unnoticed.
- ☐ In sensitive applications, some transmitting nodes may still transmit even if they sense the medium busy in order to provide high priority communication.
- ☐ A distant node started a transmission but the signal has not yet reached the current transmitting node (long propagation delay) and, therefore, it could not be sensed in time to stop the new transmission.
- ☐ All of the above

3. [CSMA/CD] In CSMA/CD the medium is continuously sensed by each node. Not only in order to start transmissions (as in pure CSMA, they only do it if the medium is idle), but also to figure whether transmitted signals were successfully transmitted or a collision occurred. Assume that a node detected a collision in its last transmission. How CSMA/CD nodes use this information to handle collisions? * (4 Points)

- ☐ When collision is detected, transmitting nodes interrupt ongoing transmissions and try to be faster than other transmitting nodes by immediately re-transmitting the packet.
- ☐ When collision is detected, nodes can identify the signal resulting from the collision, extract the original signals, and recover the packet.
- ☐ When collision is detected, transmitting nodes interrupt ongoing transmissions and wait for an amount of time before a new transmission attempt that depends on the number of consecutive collisions for the same packet.
- ☐ When collision is detected, transmitting nodes interrupt ongoing transmissions and suspend future transmissions unless a new less busy medium is available to be used.

4. [MAC Address] What is a MAC address? * (4 Points)

- ☒ A unique identifier assigned to a network interface card (NIC) by the manufacturer.
- ☐ An IP address assigned to a device on a local network.
- ☐ A temporary address used for anonymous internet browsing.
- ☐ A protocol used for secure communication between devices on a network.

5. [ARP] The Address Resolution Protocol (ARP) is used create an association between IP address and MAC address of destination nodes. By knowing the pair <IP, MAC> a transmitting node knows which interface it should transmit the frame to. If the MAC address is missing for a given IP address, how the transmitting node can figure it out? (assuming the destination node is located within the same subnet) * (4 Points)

- ☒ It broadcasts an ARP query containing the IP address of interest to all nodes in the subnet. Whoever has the IP, answers the query with its own MAC.
- ☐ It sends an ARP query containing the IP address of interest to the network controller or edge router, who already has a list of all possible <IP, MAC> pairs.
- ☐ It searches for the IP address of interest on the IEEE dataset of MAC addresses that is available through an API.
- ☐ It sends an automatic request email to the network administrator who is the only authority able to hardcode the <IP,MAC> entry to the ARP table.

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