# LAB 2 – Application Layer

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Section - 001

Total in points (Maximum 100 points)–

Professors Comments –

Affirmation of Independent Effort – Ankit Sati

**Problem 1**

1. IP address(48 bit) of my computer is marked below. - Address: IntelCor\_31:68:61 **(f0:9e:4a:31:68:61)**

Graphical user interface, table

Description automatically generated with medium confidence

1. IP address of destination frame. For this question we need to look at the **acknowledgement** message.

Address: ARRISGro\_1d:ae:80 **(58:19:f8:1d:ae:80)**

This is not the Ethernet address of gaia.cs.umass.edu. It is the mac address for my **router** or

internet gateway address. A screenshot of a computer

Description automatically generated with medium confidence

1. The hexadecimal frame type field in the ethernet header of this packet is **0x0800**.

It indicates that the upper layer protocol is **Internet Protocol version 4 (IPv4)**

Source: ARRISGro\_1d:ae:80 (58:19:f8:1d:ae:80)

Address: ARRISGro\_1d:ae:80 (58:19:f8:1d:ae:80)

.... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)

.... ...0 .... .... .... .... = IG bit: Individual address (unicast)

**Type: IPv4 (0x0800)**

1. This gets **55 bytes** as shown in the screenshot below.

Text

Description automatically generated

1. No, this is the address of the router to which my PC is connected to.

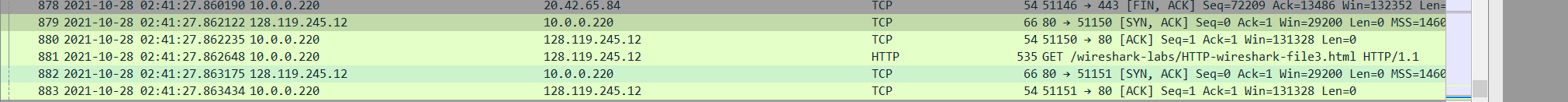
Source: ARRISGro\_1d:ae:80 (58:19:f8:1d:ae:80)

Address: ARRISGro\_1d:ae:80 **(58:19:f8:1d:ae:80)**

.... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)

.... ...0 .... .... .... .... = IG bit: Individual address (unicast)

First ACK message.



1. Yes, this is the Ethernet address of my PC.

Destination: IntelCor\_31:68:61 **(f0:9e:4a:31:68:61)**

Address: IntelCor\_31:68:61 (f0:9e:4a:31:68:61)

.... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)

.... ...0 .... .... .... .... = IG bit: Individual address (unicast)

1. The Hex value of the first two frames is given below.

0x00000800 - **0x0800**.

It indicates that the upper layer protocol is **Internet Protocol version 4 (IPv4)**

1. The total distance is 13 bytes.

Screenshot attached below for reference.

Graphical user interface, application

Description automatically generated

**Problem 2 – Observing ARP Protocol in action**

1. The 3 columns represent **the IP Address at the network layer, the MAC Address** to physically communicate with the hardware that is located at that IP address, and whether or not it is changing **dynamic or static.**
2. **the IP Address at the network layer**
3. **the MAC Address to physically communicate**
4. **dynamic or static.**

A picture containing graphical user interface

Description automatically generated

**ARP IN ACTION**

1. The values are mentioned below.

Destination: Broadcast (ff:ff:ff:ff:ff:ff)

Address: Broadcast (f:ff:ff:ff:ff:ff)

.... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)

.... ...0 .... .... .... .... = IG bit: Individual address (unicast)

Source: ARRISGro\_1d:ae:80 (58:19:f8:1d:ae:80)

Address: ARRISGro\_1d:ae:80 (58:19:f8:1d:ae:80)

.... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)

.... ...0 .... .... .... .... = IG bit: Individual address (unicast)

1. The Hexadecimal value is **0x0806.**

the bit flags represent a **mulitcast (broadcast) that is sent to hte subnet** and not the internet

1. The answers given below for the files.
2. It begins from **20 bytes**. (21 if you count 0)
3. The value of the opcode field is **001.**
4. **Yes** it does contain the IP of the sender.
5. This information can be seen in the **Target IP Address.**
6. **ARP reply.**
7. This is like the one above which equal to **20 bytes**. (21 if you count 0)
8. The value of the opcode field is **002.**
9. This information is available in the **sender MAC address**.
10. Both the values are mentioned below.

Values taken from part 1.

Destination: ff:ff:ff:ff:ff:ff

Source: 58:19:f8:1d:ae:80

1. There is no reply because, this host computer is not the router that maintains the ARP table and therefore does not give the sender an answer. Only the router running the network will respond to the ARP request.

**It is an IP address within the same subnet that the router has already mapped in its ARP table and does not need to be rediscovered and chronicled.**

**Extra credit**

**EX1.**

* This not a common scenario because generally IP’s are traced to a specific ethernet address. If we have entered the correct IP, It will be able to resolve and locate it in the ARP table. This can lead to two scenarios.

Scenario 1 – It will not be able to update the value since there is a look ahead and look back counter which can trace a difference in the **Ethernet address for the same IP address.**

Scenario 2 – In a rare case it can add one of the new values to the table but this will soon result in breaking the chain and the old ethernet address will be resolved soon. If not we will hit a roadblock as the router information is different. (**This does not happen in IPV4**)

**EX2.**

* From the screenshot attached below we can see the cache allocated to the MAC of the system.

**Answer – How much time ?**

This depends on the device that we are working on.

**MAC of our system – 20 mins and then the table refreshes. (my device Windows)**

This depends on many factors right down to the version of windows and caching policies.

**How to check this**

* We can use the below command and select the interface to check the caching policy .Text

  Description automatically generated