



COSC 328 – LAB 9

Introduction to Networks

2020 Winter Term 1

Deadline: Dec 6th, 2020 at 11:59 PM Pacific Time (Sharp). Delayed assignments will receive penalty as described in the course outline.

Introduction

This lab is optional.

There are two files in this folder. You can choose either the programming assignment or the Wireshark lab to receive the full mark. This lab will compensate at most 5% of your total grade. If you think you will receive a full mark, feel free to escape it.

Please note that completing both part does not qualify for more marks.

WireShark Lab

In this lab, we'll investigate the Ethernet protocol and the ARP protocol. Before beginning this lab, you'll probably want to review sections 6.4.1 (Link-layer addressing and ARP) and 6.4.2 (Ethernet) in the text . RFC 826 (<ftp://ftp.rfc-editor.org/in-notes/std/std37.txt>) contains the gory details of the ARP protocol, which is used by an IP device to determine the IP address of a remote interface whose Ethernet address is known.

1. Capturing and analyzing Ethernet frames

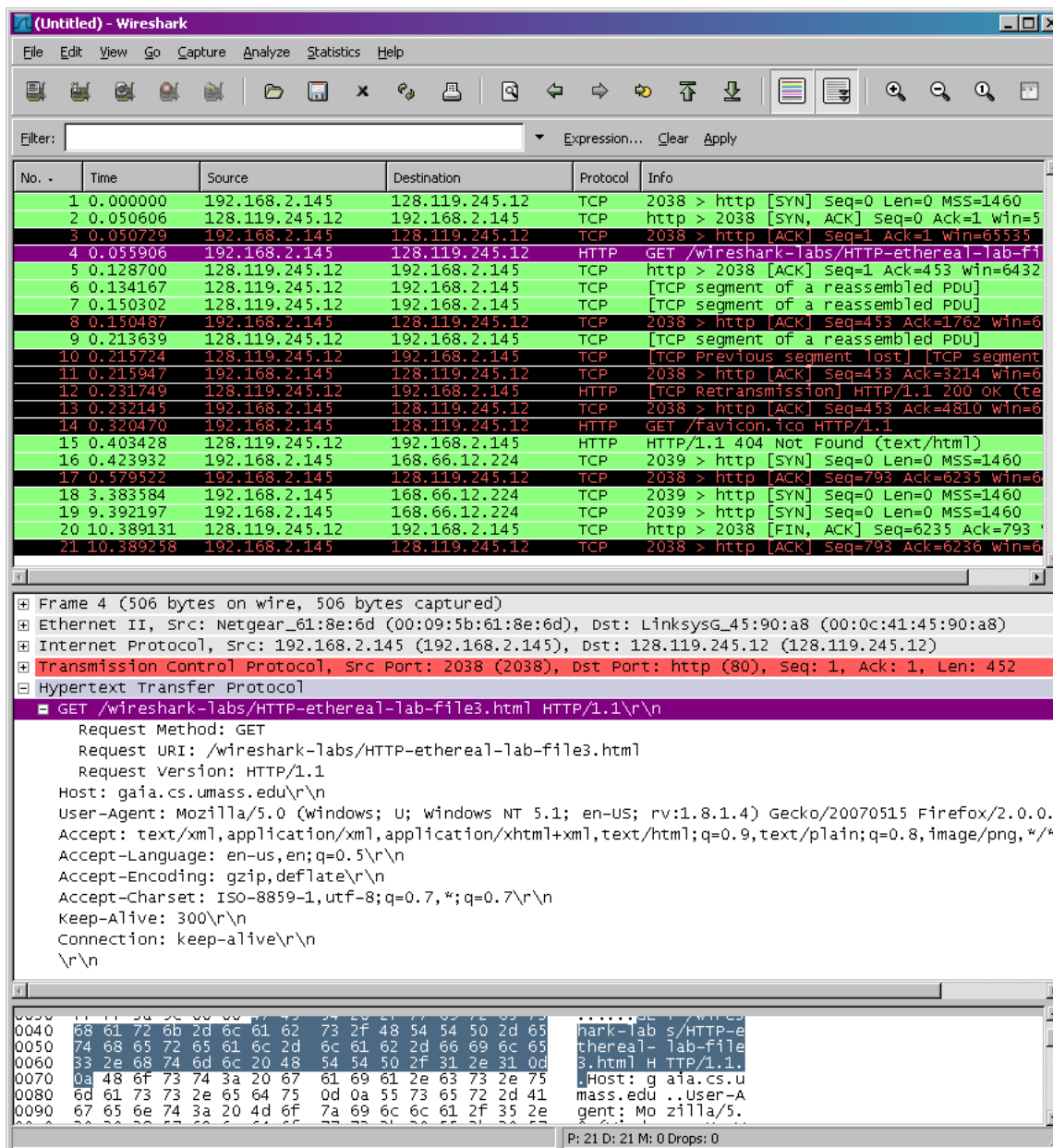
Let's begin by capturing a set of Ethernet frames to study. Do the following¹:

- First, make sure your browser's cache is empty. To do this under Mozilla Firefox V3, select *Tools->Clear Recent History* and check the box for Cache. For Internet Explorer, select *Tools->Internet Options->Delete Files*. Start up the Wireshark packet sniffer
- Enter the following URL into your browser
<http://gaia.cs.umass.edu/wireshark-labs/HTTP-ethereal-lab-file3.html>
Your browser should display the rather lengthy US Bill of Rights.

¹ If you are unable to run Wireshark live on a computer, you can download the zip file <http://gaia.cs.umass.edu/wireshark-labs/wireshark-traces.zip> and extract the file *ethernet--ethereal-trace-1*. The traces in this zip file were collected by Wireshark running on one of the author's computers, while performing the steps indicated in the Wireshark lab. Once you have downloaded the trace, you can load it into Wireshark and view the trace using the *File* pull down menu, choosing *Open*, and then selecting the *ethernet-ethereal-trace-1* trace file. You can then use this trace file to answer the questions below.

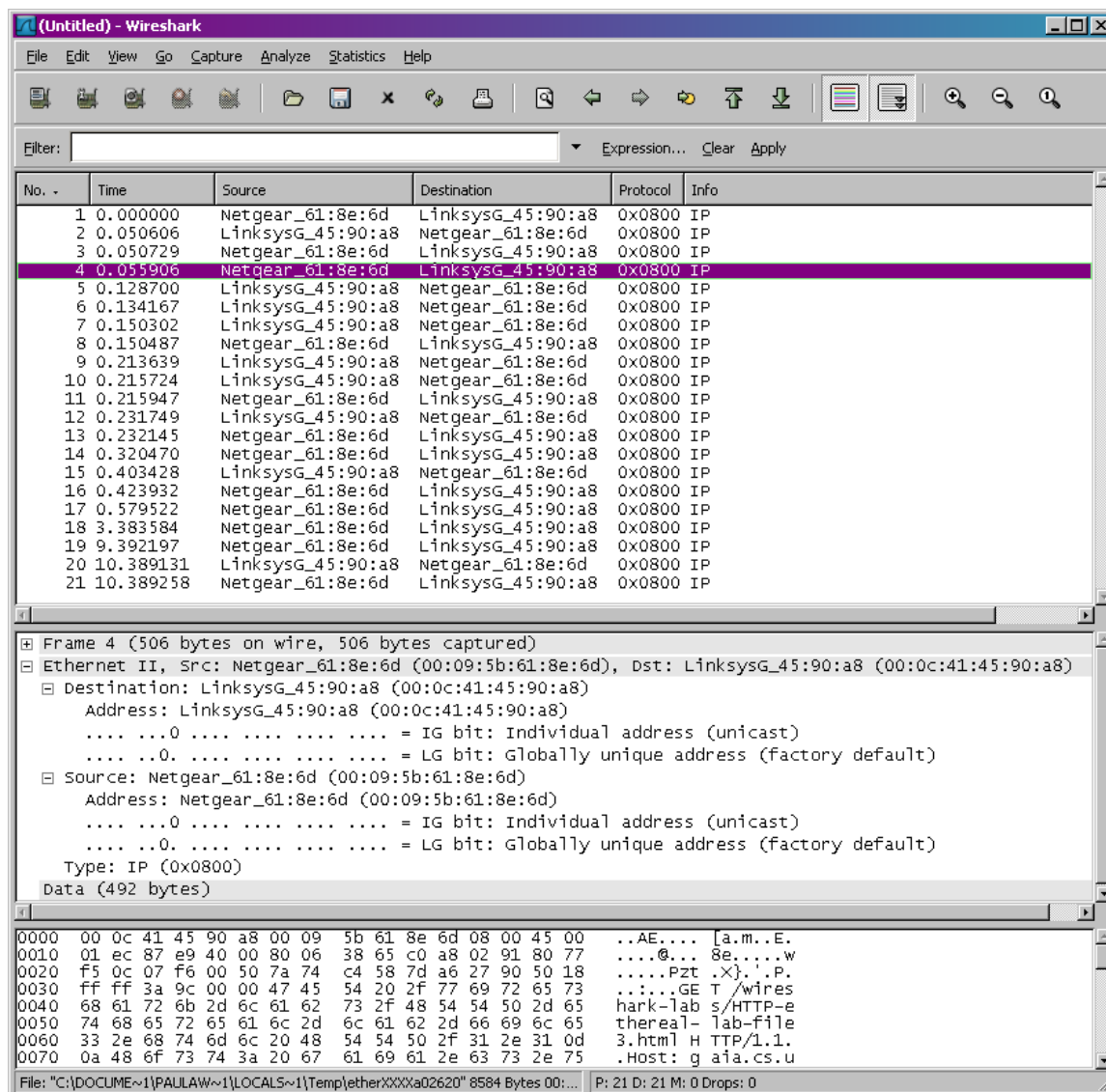


- Stop Wireshark packet capture. First, find the packet numbers (the leftmost column in the upper Wireshark window) of the HTTP GET message that was sent from your computer to gaia.cs.umass.edu, as well as the beginning of the HTTP response message sent to your computer by gaia.cs.umass.edu. You should see a screen that looks something like this (where packet 4 in the screen shot below contains the HTTP GET message)





- Since this lab is about Ethernet and ARP, we're not interested in IP or higher-layer protocols. So let's change Wireshark's "listing of captured packets" window so that it shows information only about protocols below IP. To have Wireshark do this, select *Analyze->Enabled Protocols*. Then uncheck the IP box and select *OK*. You should now see an Wireshark window that looks like:



In order to answer the following questions, you'll need to look into the packet details and packet contents windows (the middle and lower display windows in Wireshark).



Select the Ethernet frame containing the HTTP GET message. (Recall that the HTTP GET message is carried inside of a TCP segment, which is carried inside of an IP datagram, which is carried inside of an Ethernet frame; reread section 1.5.2 in the text if you find this encapsulation a bit confusing). Expand the Ethernet II information in the packet details window. Note that the contents of the Ethernet frame (header as well as payload) are displayed in the packet contents window.

Answer the following questions, based on the contents of the Ethernet frame containing the HTTP GET message. Whenever possible, when answering a question you should hand in a printout of the packet(s) within the trace that you used to answer the question asked. Annotate the printout² to explain your answer. To print a packet, use *File->Print*, choose *Selected packet only*, choose *Packet summary line*, and select the minimum amount of packet detail that you need to answer the question.

1. What is the 48-bit Ethernet address of your computer?
2. What is the 48-bit destination address in the Ethernet frame? Is this the Ethernet address of gaia.cs.umass.edu? (Hint: the answer is *no*). What device has this as its Ethernet address? [Note: this is an important question, and one that students sometimes get wrong. Re-read pages 468-469 in the text and make sure you understand the answer here.]
3. Give the hexadecimal value for the two-byte Frame type field. What upper layer protocol does this correspond to?
4. How many bytes from the very start of the Ethernet frame does the ASCII “G” in “GET” appear in the Ethernet frame?

Next, answer the following questions, based on the contents of the Ethernet frame containing the first byte of the HTTP response message.

5. What is the value of the Ethernet source address? Is this the address of your computer, or of gaia.cs.umass.edu (Hint: the answer is *no*). What device has this as its Ethernet address?
6. What is the destination address in the Ethernet frame? Is this the Ethernet address of your computer?
7. Give the hexadecimal value for the two-byte Frame type field. What upper layer protocol does this correspond to?
8. How many bytes from the very start of the Ethernet frame does the ASCII “O” in “OK” (i.e., the HTTP response code) appear in the Ethernet frame?

² What do we mean by “annotate”? If you hand in a paper copy, please highlight where in the printout you’ve found the answer and add some text (preferably with a colored pen) noting what you found in what you’ve highlighted. If you hand in an electronic copy, it would be great if you could also highlight and annotate.