



Lab 1: Data Link Layer

Yi-Chao Chen
yichao@sjtu.edu.cn

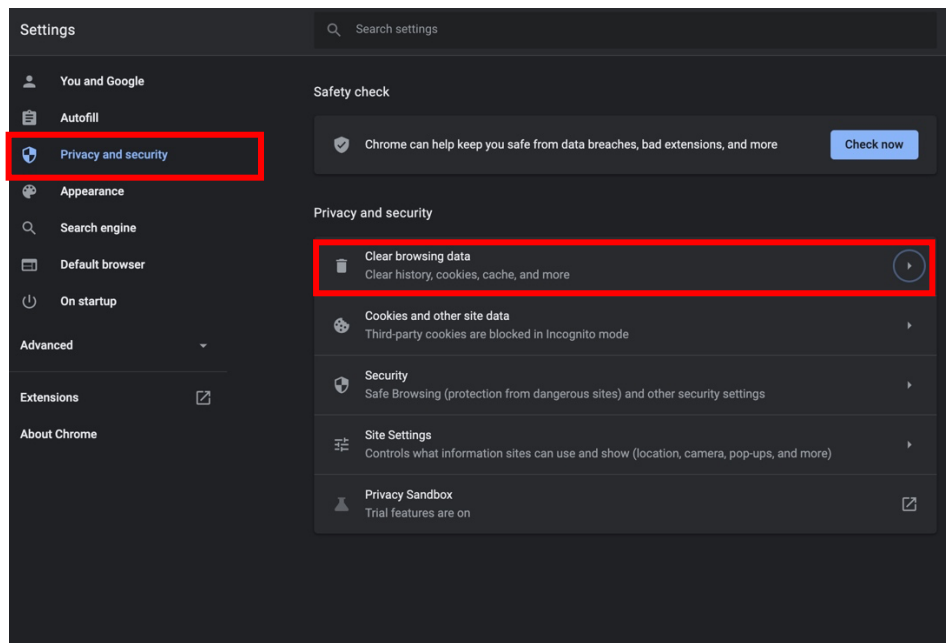
For any question, contact TA:
Haonan Wu
haonanwu@sjtu.edu.cn

In this homework, we'll investigate the Ethernet protocol. Before beginning this homework, you'll probably want to review Chapter 3 (Data Link Layer) and 4 (MAC Layer).

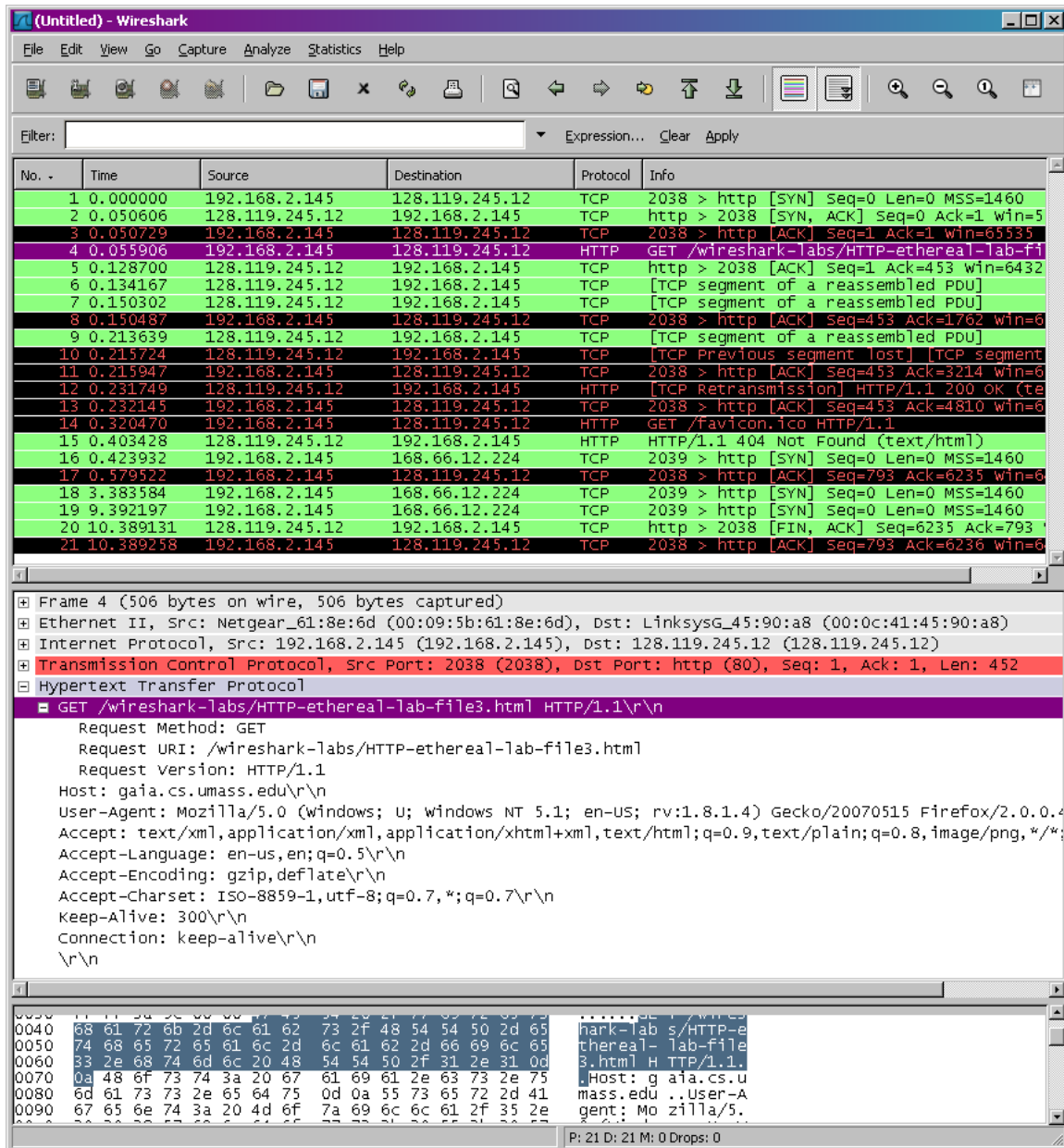
1. Capturing and analyzing Ethernet frames

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

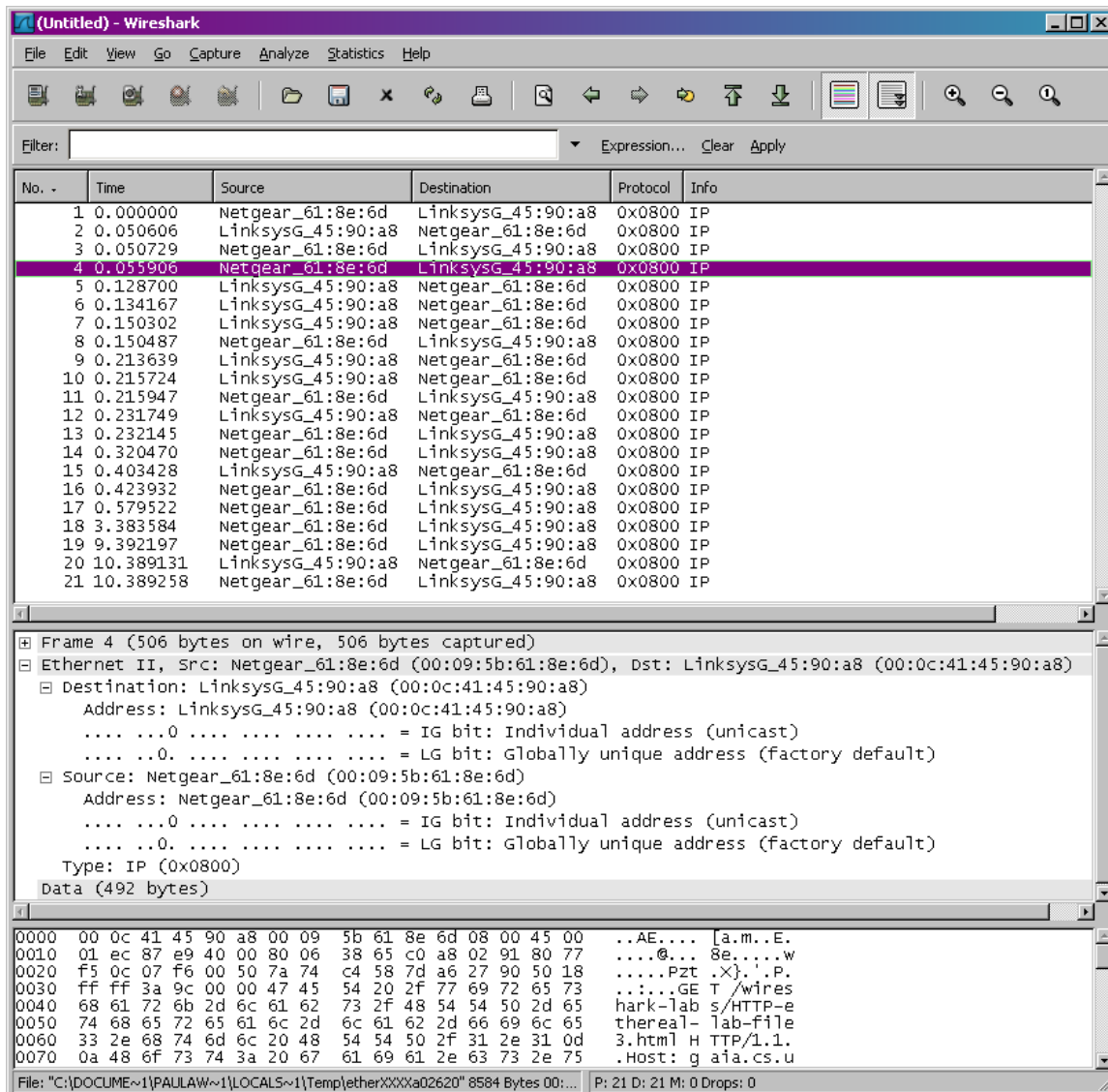
- First, make sure your browser's cache is empty. To do this under Google Chrome, select *Preferences->Privacy and Security->Clean Browsing Data* and check the box for "Cached images and files". For Internet Explorer, select *Tools->Internet Options->Delete Files*. Start up the Wireshark packet sniffer.



- 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.
- 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, 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 a Wireshark window that looks like:



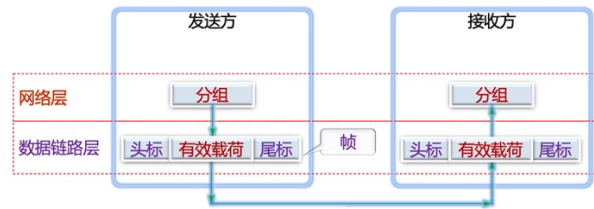
In order to answer the following questions, you'll need to look into the packet details and packet contents windows (the middle and lower display windows in Wireshark).

Select the Ethernet frame containing the HTTP GET message. (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. Recall our slides in Chapter 3 below).

成帧 (Framing)



➤ 分组 (packet) 与 帧(frame)的关系



3.1 数据链路层的设计问题

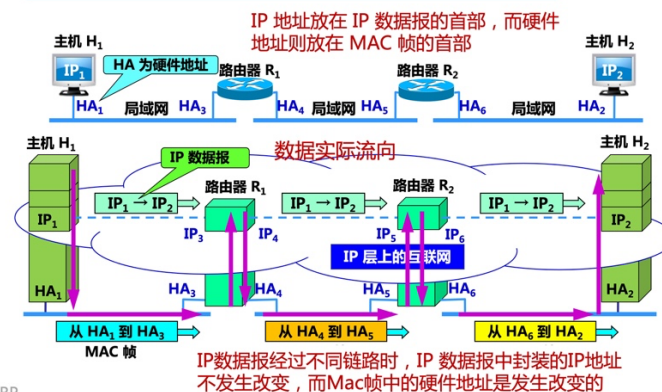
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Expand the Ethernet II information in the packet details window. Note that the contents of the Ethernet frame (header as well as payload) are displayed in the packet contents window.

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 printout 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. You may get better idea about of the question after we introduce ARP in Chapter 5 shown below.]
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?

IP 与 MAC地址



5.2.4 ARP

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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?