CS 315: Computer Networks Lab
Spring 2022-23, IIT Dharwad
Assignment-3
Wireshark Lab: HTTP
January 17, 2023

Lab Instructions

- Please leave your bags on the Iron shelf near the SP16 entrance.
- Login to the Ubuntu OS on your machine. The login credentials are as follows:
    - Username: user
    - Password: 123456
- Mark your attendance in the attendance sheet before leaving the lab.
- Handle the lab resources with utmost care.
- Please go through the following exercises in today's lab.
- It is recommended that you complete all the following exercises during the lab slot itself.
- If you face any difficulties, please feel free to seek help online or from your peers or TAs.
- After finishing all exercises, please carry your solutions with you (via email/pen drive) for future reference, and delete the files from the desktop.

Introduction

Having gotten our feet wet with the Wireshark packet sniffer in the introductory lab, we're now ready to use Wireshark to investigate protocols in operation. In this lab, we'll explore several aspects of the HTTP protocol: the basic GET/response interaction, HTTP message formats, retrieving large HTML files, retrieving HTML files with embedded objects, and HTTP authentication and security

Part-1: The Basic HTTP GET/response interaction

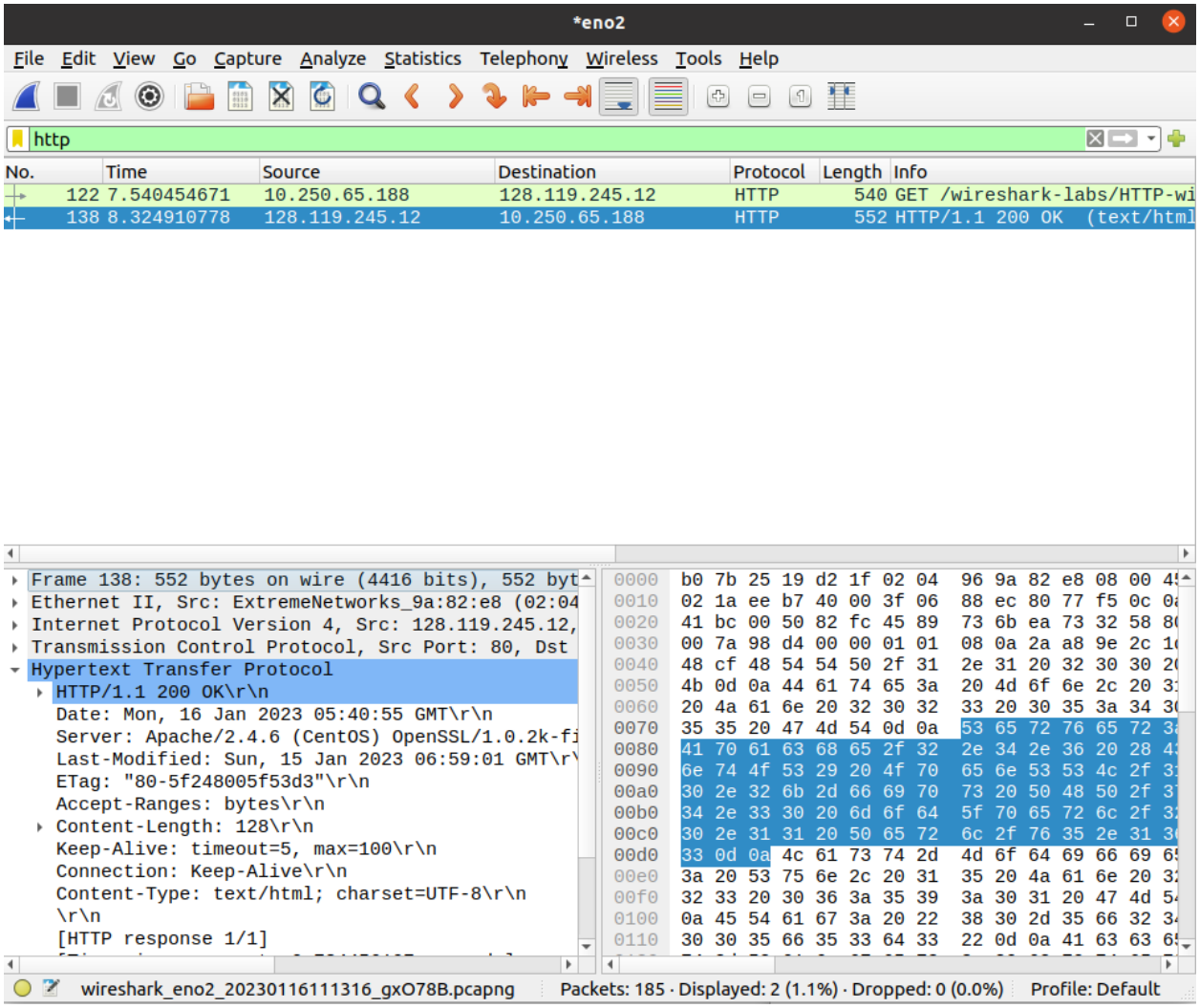
Let's begin our exploration of HTTP by downloading a very simple HTML file - one that is very short, and contains no embedded objects.

Do the following:

- Start up your web browser, and make sure your browser's cache is cleared.
- Start up the Wireshark packet sniffer, as described in the Introductory lab (but don't yet begin packet capture). Enter "http" (just the letters, not the quotation marks) in the display-filter-specification window, so that only captured HTTP messages will be displayed later in the packet-listing window. (We're only interested in the HTTP protocol here, and don't want to see the clutter of all captured packets)
- Wait a bit more than one minute (we'll see why shortly), and then begin Wireshark packet capture.

- Enter the following to your browser: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html Your browser should display the very simple, one-line HTML file.
- Stop Wireshark packet capture.

Your Wireshark window should look similar to the window shown below.



The example in above Figure shows in the packet-listing window that two HTTP messages were captured: the GET message (from your browser to the gaia.cs.umass.edu web server) and the response message from the server to your browser. The packet-contents window shows details of the selected message (in this case the HTTP OK message, which is highlighted in the packet-listing window). Recall that since the HTTP message was carried inside a TCP segment, which was carried inside an IP datagram, which was
carried within an Ethernet frame, Wireshark displays the Frame, Ethernet, IP, and TCP packet information as well. We want to minimize the amount of non-HTTP data displayed (we're interested in HTTP here, and will be investigating these other protocols is later labs), so make

sure the boxes at the far left of the Frame, Ethernet, IP and TCP information have a plus sign or a right-pointing triangle (which means there is hidden, undisplayed information), and the HTTP line has a minus sign or a down-pointing triangle (which means that all information about the HTTP message is displayed).

By looking at the information in the HTTP GET and response messages, answer the following questions.

1. Is your browser running HTTP version 1.0 or 1.1? What version of HTTP is the server running?
2. What languages (if any) does your browser indicate that it can accept to the server?
3. What is the IP address of your computer? Of the gaia.cs.umass.edu server?
4. What is the status code returned from the server to your browser?
5. When was the HTML file that you are retrieving last modified at the server?
6. How many bytes of content are being returned to your browser?
7. By inspecting the raw data in the packet content window, do you see any headers within the data that are not displayed in the packet-listing window? If so, name one.

Part-2: The HTTP CONDITIONAL GET/response interaction

Do the following:

- Start up your web browser, and make sure your browser's cache is cleared.
- Start up the Wireshark packet sniffer
- Enter the following URL into your browser http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html Your browser should display a very simple five-line HTML file.
- Quickly enter the same URL into your browser again (or simply select the refresh button on your browser)
- Stop Wireshark packet capture, and enter "http" in the display-filter-specification window, so that only captured HTTP messages will be displayed later in the packet-listing window.

Answer the following questions:

1. Inspect the contents of the first HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE" line in the HTTP GET?
2. Inspect the contents of the server response. Did the server explicitly return the contents of the file? How can you tell?
3. Now inspect the contents of the second HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE:" line in the HTTP GET? If so, what information follows the "IF-MODIFIED-SINCE:" header?
4. What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the contents of the file? Explain.

Part-3: Retrieving Long Documents

In our examples thus far, the documents retrieved have been simple and short HTML files. Let's next see what happens when we download a long HTML file.

Do the following:

- Start up your web browser, and make sure your browser's cache is cleared.
- Start up the Wireshark packet sniffer
- Enter the following URL into your browser http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file3.html Your browser should display the rather lengthy US Bill of Rights.
- Stop Wireshark packet capture, and enter "http" in the display-filter-specification window, so that only captured HTTP messages will be displayed.

In the packet-listing window, you should see your HTTP GET message, followed by a multiple-packet TCP response to your HTTP GET request. This multiple-packet response deserves a bit of explanation; the HTTP response message consists of a status line, followed by header lines, followed by a blank line, followed by the entity body. In the case of our HTTP GET, the entity body in the response is the entire requested HTML file.

Answer the following questions:

1. How many HTTP GET request messages did your browser send? Which packet number in the trace contains the GET message for the Bill or Rights?
2. Which packet number in the trace contains the status code and phrase associated with the response to the HTTP GET request?
3. What is the status code and phrase in the response?
4. How many data-containing TCP segments were needed to carry the single HTTP response and the text of the Bill of Rights?

Part-4: HTML Documents with Embedded Objects

Now that we've seen how Wireshark displays the captured packet traffic for large HTML files, we can look at what happens when your browser downloads a file with embedded objects, i.e., a file that includes other objects (in the example below, image files) that are stored on another server(s).

Do the following:

- Start up your web browser, and make sure your browser's cache is cleared.
- Start up the Wireshark packet sniffer.
- Enter the following URL into your browser http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file4.html Your browser should display a short HTML file with two images. These two images are referenced in the base HTML file. That is, the images themselves are not contained in the HTML; instead the URLs for the images are contained in the downloaded HTML file. As discussed in the textbook, your browser will have to retrieve these logos from the indicated web sites. Our publisher's logo is retrieved from the gaia.cs.umass.edu web

site. The image of the cover for our 5 th edition (one of our favorite covers) is stored at the caite.cs.umass.edu server. (These are two different web servers inside cs.umass.edu).

- Stop Wireshark packet capture, and enter "http" in the display-filter-specification window, so that only captured HTTP messages will be displayed.

Answer the following questions:

1. How many HTTP GET request messages did your browser send? To which Internet addresses were these GET requests sent?
2. Can you tell whether your browser downloaded the two images serially, or whether they were downloaded from the two websites in parallel? Explain.

Part-5: HTTP Authentication

Finally, let's try visiting a web site that is password-protected and examine the sequence of HTTP messages exchanged for such a site. The URL http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wireshark-file5.html is password protected. The **username** is "***wireshark-students***" (without the quotes), and the **password** is "***network***" (again, without the quotes). So let's access this "secure" password-protected site.

Do the following:

- Start up your web browser, and make sure your browser's cache is cleared.
- Start up the Wireshark packet sniffer
- Enter the following URL into your browser http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wireshark-file5.html Type the requested user name and password into the pop up box.
- Stop Wireshark packet capture, and enter "http" in the display-filter-specification window, so that only captured HTTP messages will be displayed later in the packet-listing window.

Answer the following questions:

1. What is the server's response (status code and phrase) in response to the initial HTTP GET message from your browser?
2. When your browser sends the HTTP GET message for the second time, what new field is included in the HTTP GET message?

The username (wireshark-students) and password (network) that you entered are encoded in the string of characters (d2lyZXNoYXJrLXNodWRlbnRzOm5ldHdvcms=) following the "Authorization: Basic" header in the client's HTTP GET message. While it may appear that your username and password are encrypted, they are simply encoded in a format known as Base64 format. The username and password are not encrypted! To see this, go to http://www.motobit.com/util/base64-decoder-encoder.asp and enter the base64-encoded string d2lyZXNoYXJrLXNodWRlbnRz and decode. You have translated from Base64 encoding to ASCII encoding, and thus should see your username! To view the password, enter the remainder of the string Om5ldHdvcms= and press decode.

Submission Details

- Write your answers in a single doc/tex file, and submit its PDF named after your IIT Dharwad roll number**,** which contains all answers (with screenshots, if necessary).