NTNU
The Norwegian University of
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Department of Telematics

TTM4100
Communication – Services and Networks

Wireshark Lab: TCP

The three Wireshark labs in this course are not mandatory, but highly recommended exercises which will help improve your understanding of relevant subjects. Any questions about the exercises can be sent to the same e-mail or be posted on the forum.

Deadline of submission: **N/A**

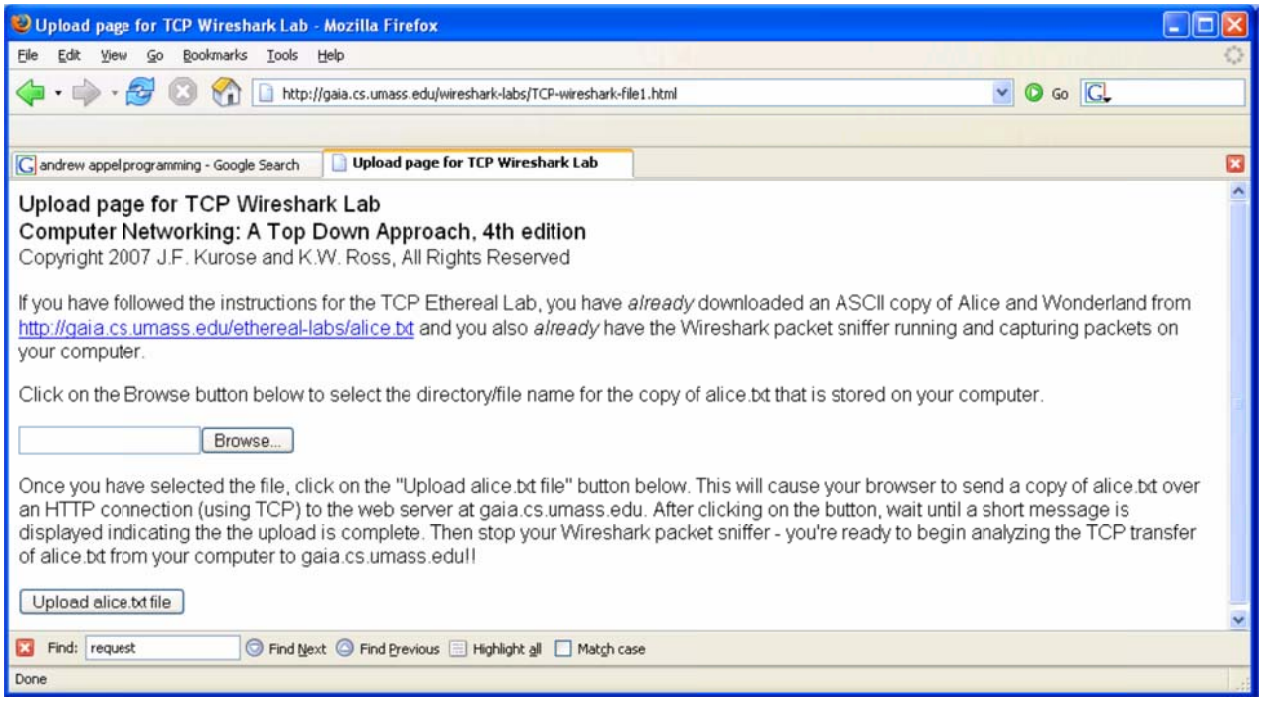
In this lab, we'll investigate the behavior of TCP in detail. We'll do so by analyzing a trace of the TCP segments sent and received in transferring a 150KB file (containing the text of Lewis Carrol's Alice's Adventures in Wonderland) from your computer to a remote server. We'll study TCP's use of sequence and acknowledgement numbers for providing reliable data transfer; we'll also briefly consider TCP connection setup and shutdown procedures.

Before beginning this lab, you'll probably want to review sections 3.5 and 3.7 in the textbook.

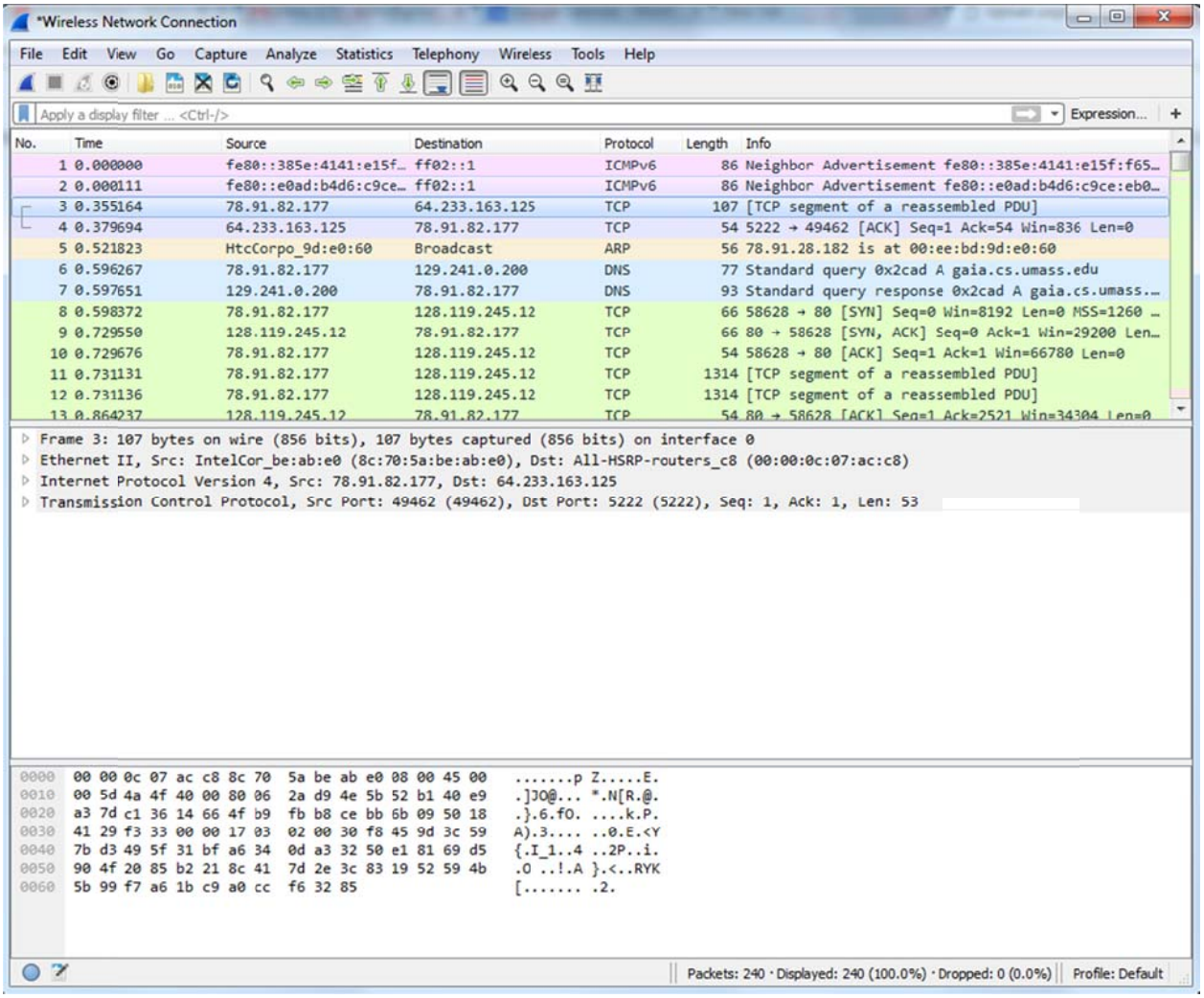
1. Capturing a bulk TCP transfer from your computer to a remote server

Before beginning our exploration of TCP, we'll need to use Wireshark to obtain a packet trace of the TCP transfer of a file from your computer to a remote server. You'll do so by accessing a web page that will allow you to enter the name of a file stored on your computer (which contains the ASCII text of Alice in Wonderland), and then transfer the file to a Web server using the HTTP POST method (see section 2.2.3 in the text book). We're using the POST method rather than the GET method as we'd like to transfer a large amount of data from your computer to another computer. Of course, we'll be running Wireshark during this time to obtain the trace of the TCP segments sent and received from your computer. Do the following:

- Start up your web browser. Go the http://gaia.cs.umass.edu/ethereal-labs/alice.txt and retrieve an ASCII copy of *Alice in Wonderland.* Store this file somewhere on your computer.
- Next go to http://gaia.cs.umass.edu/wireshark-labs/TCP-wireshark-file1.html.
- You should see a screen that looks like:



- Use the Browse button in this form to enter the name of the file (full path name) on your computer containing Alice in Wonderland (or do so manually). **Don't yet press the "Upload alice.txt file" button.**
- Now start up Wireshark and begin packet capture (Capture->Start) and then press OK on the Wireshark Packet Capture Options screen.
- Returning to your browser, press the "Upload alice.txt file" button to upload the file to the gaia.cs.umass.edu server. Once the file has been uploaded, a short congratulations message will be displayed in your browser window.
- Stop Wireshark packet capture. Your Wireshark window should look similar to the window shown below.



2. A first look at the captured trace

Before analyzing the behavior of the TCP connection in detail, let's take a high level view of the trace.

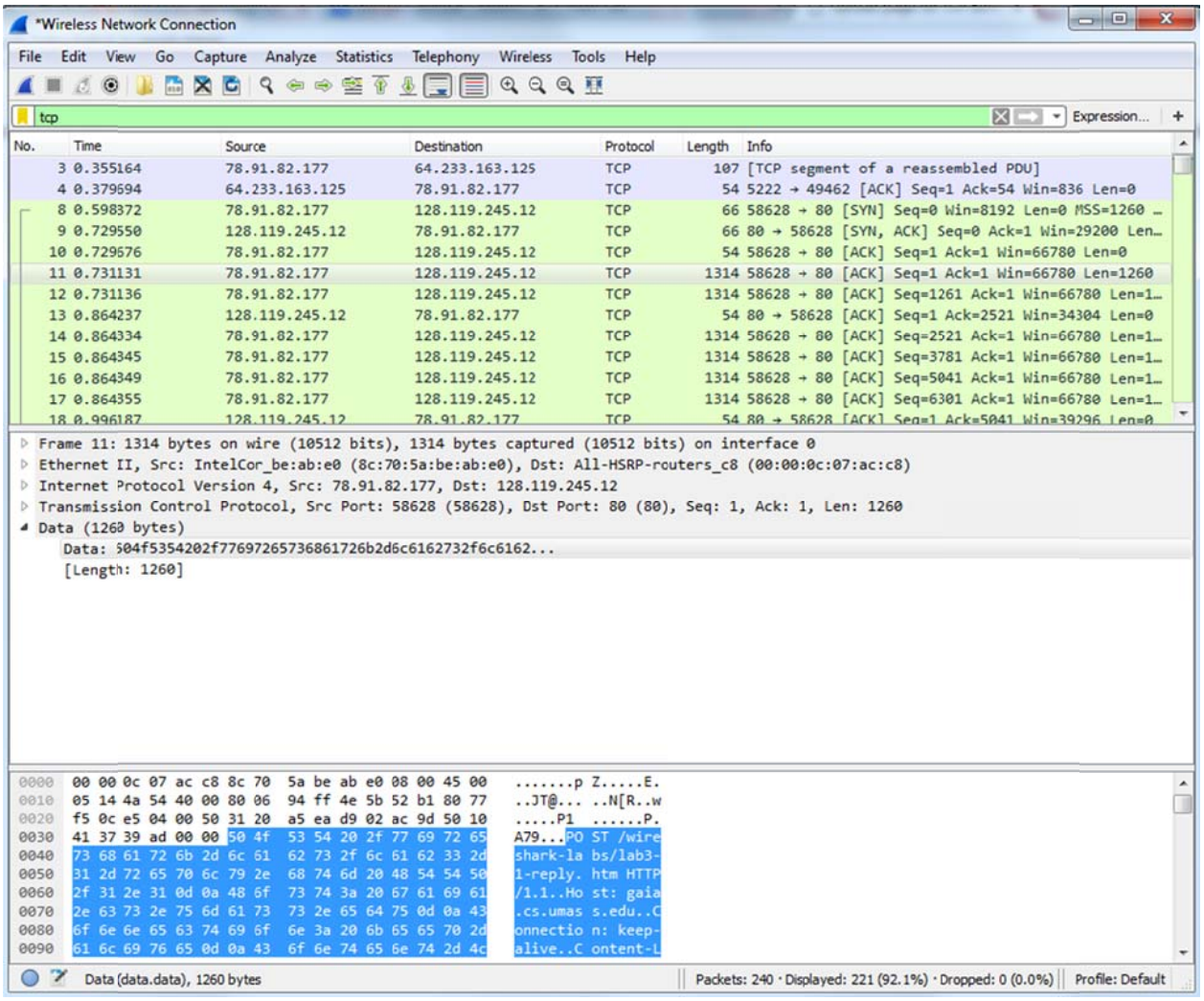
- First, filter the packets displayed in the Wireshark window by entering "tcp" (lowercase, no quotes, and don't forget to press return after entering!) into the display filter specification window towards the top of the Wireshark window.

What you should see is series of TCP and HTTP messages between your computer and gaia.cs.umass.edu. You should see the initial three-way handshake containing a SYN message. You should see an HTTP POST message and a series of "TCP Segment of reassembled PDU" messages being sent from your computer to gaia.cs.umass.edu. This is Wireshark's way of indicating that there are multiple TCP segments being used to carry a single HTTP message. You should also see TCP ACK segments being returned from gaia.cs.umass.edu to your computer.

Answer the following questions:

1. What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?
2. What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?

Since this lab is about TCP rather than HTTP, let's change Wireshark's "listing of captured packets" window so that it shows information about the TCP segments containing the HTTP messages, rather than about the HTTP messages. To have Wireshark do this, select Analyze->Enabled Protocols. Then uncheck the HTTP box and select OK. You should now see a Wireshark window that looks like the figure on the next page.



This is what we're looking for - a series of TCP segments sent between your computer and gaia.cs.umass.edu. We will use the packet trace that you have captured to study TCP behavior in the rest of this lab.

3. TCP basics

Answer the following questions for the TCP segments:

1. What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?
2. What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the ACKnowledgement field in the SYNACK segment? How did gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?
3. What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.
4. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST)?
5. What is the length of each of the first six TCP segments?
6. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?
7. How can you tell that the client initiates a shutdown procedure of the TCP connection? Draw a sequence diagram modeling the package flow from the moment your computer initiates the shutdown procedure until the final package is received from gaia.cs.umass.edu.