CSCI 4171 Networks and Communications
CSCI 6704 Advanced Topics in Networks
Fall 2024
Assignment No. 1
Date Given: Tuesday, September 10, 2024
Date Due: Monday, September 23, 2024, 11.59 PM on Brightspace

Welcome to your first assignment. The assignment has two exercises. The first exercise is on virtual circuit packet switching. The second is a discovery of TCP/IP encapsulation and layers using Wireshark.

Submission: One PDF file uploaded on Brightspace. Please see instructions at the end of this assignment.

Submission Deadline: Monday, September 23, 2024, 11.59 PM

Grace Time: Submissions will be accepted until 4.59 AM on Monday, September 24, 2024 without late penalty.

Late Penalty: Submissions received after the grace time will be subject to a 10% per day late penalty, for up to 5 days. For example, if you submit the assignment on Tuesday at 12 noon and your score is 8/10, it will be reduced to 7.2/10. Submissions past five days after the grace submission time will not be accepted. The submission portal will close on Sunday, September 29, 4.59 AM.

Dropping of Assignments: One out of six assignments can be dropped during the semester. No SDA submission required.

Exercise 1 <Virtual Circuit Packet Switching >

Consider the following network that uses virtual circuit packet switching. Multiple hosts (labeled A, B, etc.) are connected to switches. Each switch has four ports with port numbers labeled 1, 2, 3, and 4.
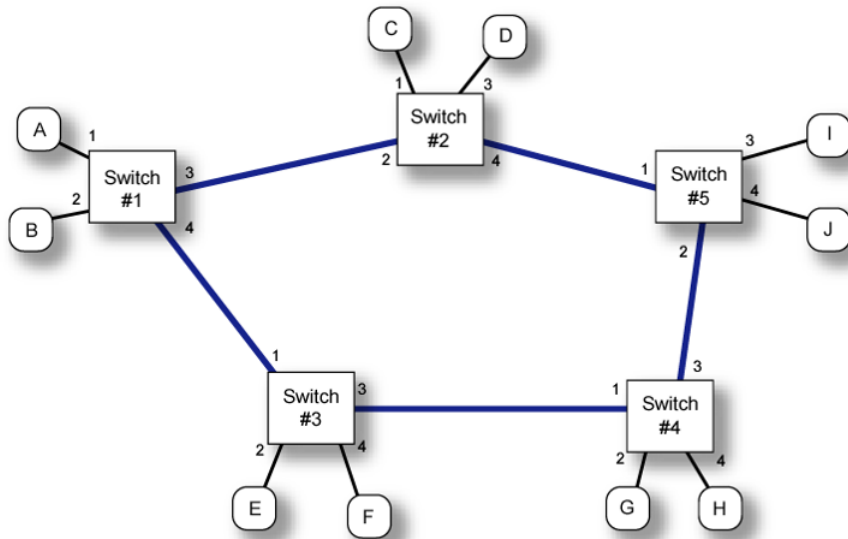

Figure source: https://www.grotto-networking.com/BBMPLS.html

The following virtual circuit paths need to be set up:
Host A to Host J via Switches #1, #2 and #5
Host B to Host H via Switches #1, #2 and #5
Host C to Host E via Switches #2, #1 and #3
Host D to Host H via Switches #2, #5 and #4
Host F to Host I via Switches #3, #4 and #5
Host E to Host B via Switches #3, #4, #5, #2 and #1
Host G to Host D via Switches #4, #5 and #2
Host H to Host C via Switches #4, #3, #1 and #2
Host I to Host F via Switches #5, #4 and #3
Host J to Host A via Switches #5, #2 and #1

Using appropriate virtual circuit identifiers, set up the virtual circuit paths and draw the virtual circuit tables in each of the switches #1 to #5 when all the paths are simultaneously active.

You must choose the virtual circuit identifier as follows. On any link in a particular direction, start with the number 10. Only if 10 cannot be used, use 20. If 10 and 20 cannot be used, use 30, and so on. _This will ensure that you will use a different number only if necessary._

**Exercise 2:** <TCP/IP Encapsulation Discovery using Wireshark>

As you would know from your previous course in networking, Wireshark is an excellent tool for packet capture and studying the components of different parts of a message. For this question, you will perform a simple packet capture using Wireshark to identify different headers.

a) If you don't have Wireshark installed on your machine, download Wireshark
https://www.wireshark.org/download.html
and understand its features, including how to set the display filters.

b) Clear your browser cache and open a browser window.

c) Start Wireshark capture.

d) Enter http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html in the browser window.
(This is an HTTP site from the book "Computer Networking: A Top-Down Approach" by Kurose and Ross. It contains a simple HTML file).

e) After a few seconds, close the browser window.

f) Stop Wireshark capture.

g) Set the display filter to HTTP.

h) **Select one HTTP message** and click on various parts of the message, namely, Application Layer, Transport layer, Network Layer and Data Link Layer, thus identifying the TCP segment, the IP datagram and the Ethernet header.

i) Examine the above and identify **all the header components (in decimal or Hex as appropriate)** for the TCP header, the IP header and the Ethernet header.

For the TCP Header, identify as many fields as you can using the figure shown below as a guide. Write their values from your Wireshark capture.
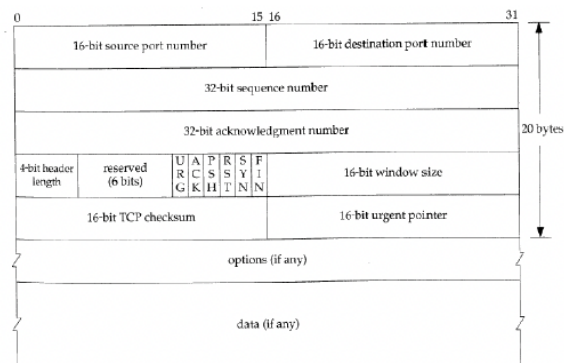

For the IP Header, identify as many fields as you can using the figure shown below as a guide. Write their values from your Wireshark capture.
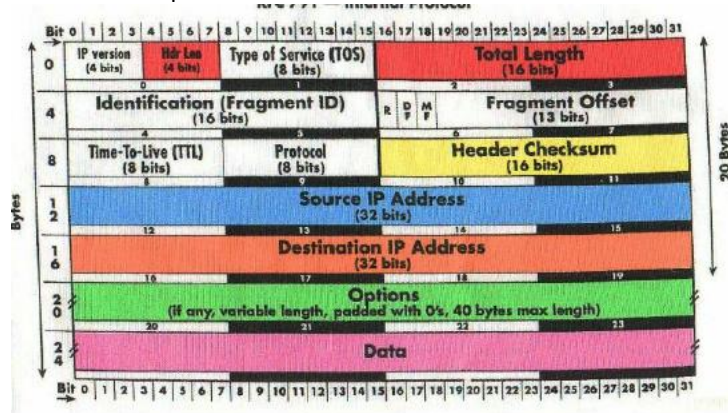
For the Ethernet header, identify as many fields as you can using either the IEEE 802.3 format (if you are connecting via a wired network) or the IEEE 802.11 format (if you are connecting via a wireless network) shown below as a guide. Note that there could be some differences in the formats depending upon which network standard/version that you use.
Write the values from your Wireshark capture.

IEEE 802.3 Standard Ethernet Frame
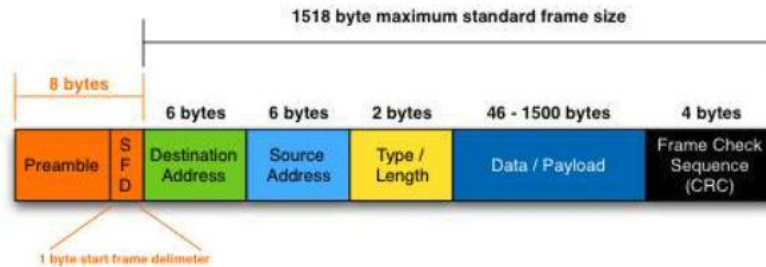
IEEE 802.11 Standard Frame Format
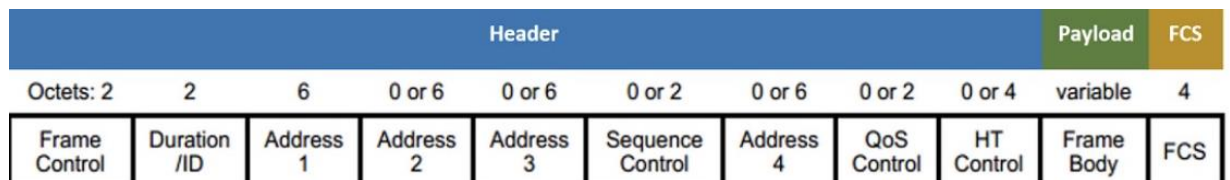
What you need to put in your answer to this question: A screen snapshot of the Wireshark capture and a listing of the values for each field that you can identify.

Short paragraph answer: Are you able to find the Data Link Trailer in the Ethernet frame capture in Wireshark? Why or why not? (Write a brief answer by looking up web resources).

What to submit: You need to submit one PDF file that contains the answers to all the questions. You can put your answers in a text document and convert it to PDF. If you write your answers in multiple documents, convert all your documents into PDF and then zip it and submit it. Make sure that your full name and banner ID appears on the top of the document.