

# **Assignment #2 for Computer Networks (CNT 4004) for Fall 2018**

**Due September 13, 2018 at the start of class**

This assignment primarily covers material from chapters 1 and 2 (thru chapter 2.6 only) of the textbook and from class lecture. Each problem is worth 10 points.

## **Problem #1**

- a) For assignment #1 you drew the five layer Internet protocol stack model used in our textbook. Redraw this figure and for each layer, describe its function in one sentence.
- b) Sketch a packet (i.e., show the headers and trailers) that would result from this five-layer model. Be sure to show all header and trailers that could be present (even if you know that they are not present in a “real” Internet packet).
- c) Give the definitions of protocol and interface we used in class.
- d) What are the five elements of a protocol according to Holzmann?
- e) Application layer protocols define four things. What are these four things?

## **Problem #2**

- a) Think about the train crash example given in class. Who should go to jail? That is, who was incompetent (or negligent at best) in this situation? What does this train crash example teach us with respect to protocol design?
- b) Again considering the train crash example, can you come-up with some other not-unreasonable scenario where a serious accident could occur? Describe the scenario and also describe your fix to the protocol to handle this scenario. Assume that the signalmen can communicate more than 1 bit of information between them.

## **Problem #3**

Do Problem P6 (page 71) from the text book

## **Problem #4**

- a) Does Internet delay vary by time of day? It is reasonable to believe that during day time (business hours) the delay will be higher than during night (non business hours). You are to use ping to determine if the cross-country (so, Florida to a west coast host) RTT varies as a function of time of day. For full credit, you need to show that your result (if, indeed, the average delay is found to be lower at night than day) is statistically significant. Please do not flood a host with tens of thousands of pings at a high rate, this is not necessary for this problem. Give a screenshot of the summary of any relevant collected data.

b) For the host you are pinging for (a) above, do a traceroute and identify how many routers there are between your host and the host you are pinging. Give a screenshot of the traceroute.

### **Problem #5**

Do problems P1 and P3 from the textbook (page 173 of the textbook).

### **Problem #6**

Do problem P4 from the textbook (page 173 of the textbook). Do not fail to think, there might be a trick here.

### **Problem #7**

Do problem P5 from the textbook (page 174 of the textbook).

### **Problem #8**

Peer-to-peer networking is a means of distributed file storage (so, no single centralized store of a given file). What is the latest “hot technology” that is also effectively peer-to-peer, but is not explicitly used for file storage, but storage of something else? What is it that is stored in multiple peers (and not centralized)? Hint: This is not in the textbook.

### **Problem #9**

Do problems P7 and P8 from the textbook (page 175 of the textbook). Don’t forget the single RTT<sub>0</sub> for a TCP connection. For P8(c) consider the case of pipelining (default mode for HTTP 1.1).

### **Problem #10**

Every student who has taken a Networks course has to be able to decode a packet from raw hex. This is laborious to do, but very educational. So, here below is a packet sniffed from an Ethernet network. Your job is to decode it and answer the below questions. You can find packet header formats on Wikipedia. You can find hex converters (to decimal and ASCII) online.

```
d4 a9 28 06 f0 43 50 7b 9d e4 db e1 08 00 45 00
03 2f 4b 9d 40 00 80 06 62 cc c0 a8 01 bb 83 f7
03 05 de 92 00 50 62 72 96 9e c8 61 7b 5f 50 18
01 00 c9 cf 00 00 47 45 54 20 2f 7e 6b 63 68 72
69 73 74 65 2f 63 68 72 69 73 74 65 6e 2e 68 74
6d 6c 20 48 54 54 50 2f 31 2e 31 0d 0a 48 6f 73
74 3a 20 77 77 77 2e 63 73 65 65 2e 75 73 66 2e
65 64 75 0d 0a 43 6f 6e 6e 65 63 74 69 6f 6e 3a
20 6b 65 65 70 2d 61 6c 69 76 65 0d 0a 43 61 63
68 65 2d 43 6f 6e 74 72 6f 6c 3a 20 6d 61 78 2d
61 67 65 3d 30 0d 0a 55 70 67 72 61 64 65 2d 49
6e 73 65 63 75 72 65 2d 52 65 71 75 65 73 74 73
3a 20 31 0d 0a 55 73 65 72 2d 41 67 65 6e 74 3a
20 4d 6f 7a 69 6c 6c 61 2f 35 2e 30 20 28 57 69
```

```

6e 64 6f 77 73 20 4e 54 20 31 30 2e 30 3b 20 57
69 6e 36 34 3b 20 78 36 34 29 20 41 70 70 6c 65
57 65 62 4b 69 74 2f 35 33 37 2e 33 36 20 28 4b
48 54 4d 4c 2c 20 6c 69 6b 65 20 47 65 63 6b 6f
29 20 43 68 72 6f 6d 65 2f 36 38 2e 30 2e 33 34
34 30 2e 31 30 36 20 53 61 66 61 72 69 2f 35 33
37 2e 33 36 0d 0a 41 63 63 65 70 74 3a 20 74 65
78 74 2f 68 74 6d 6c 2c 61 70 70 6c 69 63 61 74
69 6f 6e 2f 78 68 74 6d 6c 2b 78 6d 6c 2c 61 70
70 6c 69 63 61 74 69 6f 6e 2f 78 6d 6c 3b 71 3d
30 2e 39 2c 69 6d 61 67 65 2f 77 65 62 70 2c 69
6d 61 67 65 2f 61 70 6e 67 2c 2a 2f 2a 3b 71 3d
30 2e 38 0d 0a 41 63 63 65 70 74 2d 45 6e 63 6f
64 69 6e 67 3a 20 67 7a 69 70 2c 20 64 65 66 6c
61 74 65 0d 0a 41 63 63 65 70 74 2d 4c 61 6e 67
75 61 67 65 3a 20 65 6e 2d 55 53 2c 65 6e 3b 71
3d 30 2e 39 0d 0a 43 6f 6f 6b 69 65 3a 20 5f 5f
75 74 6d 61 3d 31 31 38 36 31 39 32 37 37 2e 31
37 34 32 37 37 36 38 33 30 2e 31 35 33 34 36 34
34 39 36 33 2e 31 35 33 34 36 34 34 39 36 33 2e
31 35 33 34 36 38 38 34 35 35 2e 32 3b 20 5f 5f
75 74 6d 7a 3d 31 31 38 36 31 39 32 37 37 2e 31
35 33 34 36 38 38 34 35 35 2e 32 2e 32 2e 75 74
6d 63 73 72 3d 63 73 65 65 2e 75 73 66 2e 65 64
75 7c 75 74 6d 63 63 6e 3d 28 72 65 66 65 72 72
61 6c 29 7c 75 74 6d 63 6d 64 3d 72 65 66 65 72
72 61 6c 7c 75 74 6d 63 63 74 3d 2f 7e 6b 63 68
72 69 73 74 65 2f 63 68 72 69 73 74 65 6e 2e 68
74 6d 6c 3b 20 5f 5f 75 74 6d 74 3d 31 3b 20 5f
5f 75 74 6d 74 5f 61 63 63 6f 75 6e 74 32 3d 31
3b 20 5f 5f 75 74 6d 62 3d 31 31 38 36 31 39 32
37 37 2e 34 2e 31 30 2e 31 35 33 34 36 38 38 34
35 35 0d 0a 49 66 2d 4e 6f 6e 65 2d 4d 61 74 63
68 3a 20 22 31 37 61 39 2d 35 37 33 35 34 61 35
33 39 30 31 33 65 22 0d 0a 49 66 2d 4d 6f 64 69
66 69 65 64 2d 53 69 6e 63 65 3a 20 4d 6f 6e 2c
20 31 33 20 41 75 67 20 32 30 31 38 20 31 37 3a
34 34 3a 32 39 20 47 4d 54 0d 0a 0d 0a

```

- What is the Ethernet destination and source address (in hex)?
- Identify the vendor of the equipment of the source?
- What is the protocol type (in the Ethernet header)?
- What version of IP is this?
- What are the IP destination and source addresses (give in proper dotted decimal notation)?
- Identify if the transport protocol is TCP or UDP.

- g) What are the transport protocol destination and source port numbers (in decimal)?
- h) What is the application protocol (be sure to give the version number)?
- i) What is the function being performed at the application layer (that is, what is the purpose of this packet)?
- j) What are the checksum values for all protocols that have a checksum in this packet? Note that a CRC is not a checksum.