CNT 5106C Computer Networks, Spring 2022
Instructor: Prof. Ahmed Helmy
Homework 1 – Part 2: Internet Architecture & Application Layer
Due Date: Feb 28, 2020 through Canvas

Instructions: Be precise and to the point. Many questions require answers using a sentence or two. Some questions will ask you to elaborate, use visual aids or graphs, or show traces/code. Use your own words and phrases, do not copy from any other source.

Q1 <6 points>. A. Application layer: What are the main network application architectures in the Internet? (mention 3)

   B. What are the processes are needed to support all the above architectures? Explain which process is used in which architecture and how.

Q2. <13 points> What are the advantages and disadvantages of:

   A. Hierarchical network architectures (mention 3 advantages and 2 disadvantages)

   B. Protocol layering (mention at least 2 advantages and 2 disadvantages)

   C. Stateless protocols (mention at least 2 advantages and 2 disadvantages)

Q3. <6 points> A. How were the original Internet requirements met through its design? (mention 4)

   B. What are the two main requirements that you see missing from the original design that are much needed today?

Q4. <6 points> In slide 1-71 of chapter 1 discussed in class, explain the probability of '0.0004' when 35 users are active.

Q5. <4 points> A. What is a DDoS attack?

   B. why is it harder to control than a DoS attack?

Q6. <4 points> What is the first Internet worm, and how did it harm the Internet? [hint: Watch video link posted on canvas]

Q7. <5 points> A. Why is UDP preferred over TCP for IP-telephony/VoIP (like Skype)?

   B. Why would Skype sometimes use TCP? Give two reasons.

Q8. <5 points> Would an application that needs congestion control ever use UDP? Give two examples to support your argument.

Q9. <6 points> How do web caches/proxy servers help Internet performance? Explain and list 3 of its benefits from the user and network perspectives. [hint: explain using your understanding of elementary queueing theory and delays, and use graphs as needed]

Q10. <7 points> Use '*traceroute*' and '*ping*' commands/tools to measure and analyze delays in the Internet:

    A. Use *traceroute* to measure delays between your location and an overseas location (e.g., www.eurecom.fr). Show the trace and annotate it showing the transoceanic link.
    B. Identify machines/routers along the way with:
    1. less than1ms delay, 2. 2–10ms delay, 3. 11–100ms delay, more than 100ms delay

    then *ping* those machines for 15seconds each and analyze their delays

    C. Identify the locations of the machines and reason about the differences in delays

[hints: look at the traceroute example in the lecture/book and perform something similar. *traceroute* is called *tracert* on windows. On some machines you need to be super user (sudo) to run traceroute. You may run the commands from your machine or from a UF machine (e.g., storm.cise.ufl.edu), so try and see what works for you.]

Q11. <7 points> Visit the wireshark website at wireshark.org, read the user's manual (https://www.wireshark.org/docs/wsug_html_chunked/), then answer these questions:
    A. What is wireshark?

    B. What are some of intended purposes? (mention four)

    C. What are two unintended purposes?

[hints: install wireshark and start using it to prepare for future hwks. Read intro posted on canvas.]