CS 204: Computer Network

Assignment – 1

Date: 8th Feb. 2021

Submission Instructions:

- **Answer all the questions and submit the answers in scanned PDF copy or any PDF document.**
- **Answers should be clear and legible, unclear answers will not be acceptable.**
- **Last date for Submission: 22nd Feb. 2021, 11:59 PM**

1. In the context of Network Layer, what is Logical address and Physical address in computer networks? Why a mapping from logical address to physical address and vice versa is required? Explain the protocols which perform it.

2. Two IITs located in different cities wish to have a jam session over a communications network. Find the maximum possible distance between the IITs if they are to interact in real-time, in the sense of experiencing the same Propagation delay in hearing each other as if they were 10 meters apart. The speed of sound is approximately 330 meters/second. Assume that the network transmits the sound at the speed of light in cable, 2.3×10^8 meters/second.

3. In the 1950s, standard containers were developed for the transportation of goods. These standard containers could fit on a train car, on a truck, or in specially designed container ships. The standard size of the containers makes it possible to load and unload them much more quickly than using non-standard containers of different sizes. Draw an analogy to packet switching based communications networks. In your answer identify what might constitute a container and speculate on the advantages that may come from standard-size information containers.

4. Suppose that an interactive video game is accessed over a communication network. What requirements are imposed on the network if the network is connection-oriented? What if the network is connectionless?

5. Explain why it is useful for application layer programs to have a "well-known" TCP port number?

6. Suppose end system **A** wants to send a large file to end system **B**. At a very high level, describe how end system **A** creates packets from the file. When one of these packets arrives to a router, what information in the packet does the router use to determine the link onto which the packet is forwarded?

7. Consider a router buffer preceding an outbound link. In this problem, you will **use Little's formula**, a famous formula from queuing theory. Let **N** denote the average number of packets in the buffer plus the packet being transmitted. Let **a** denote the rate of packets arriving at the link. Let **d** denote the average total delay (i.e., the queuing delay plus the transmission delay) experienced by a packet. Little's formula is **N = a.d**). Suppose that on average, the buffer contains 10 packets, and the average packet queuing delay is 10 msec. The link's transmission rate is 100 packets/sec. Using Little's formula, what is the average packet arrival rate, assuming there is no packet loss?

8. A process on host 1 has been assigned port p, and a process on host 2 has been assigned port q. Is it possible for there to be two or more TCP connections between these two ports at the same time? Explain.