CS3640 Written Assignment-1

Due: Feb 16, 2021 midnight
Submit as a PDF on ICON

Part-A (based on the paper, *End-To-End Arguments in System Design* [Saltzer 1984])

A1. Summarize the end-to-end argument in your own words (copying the definition verbatim from the paper earns no points). **5 points**

A2. Give a real world example where the end-to-end principle works well (other than the design of the core Internet), and a counter example where it caused a problem. **20 points**

A3. In the description of *careful file transfer* (section 2.1 of the paper), the authors list five threats to the transaction. Then, they go on to explain why a communication system that provides a reliable data transmission is neither necessary nor sufficient. Imagine that you are allowed to play god, and completely eliminate one or more of these five threats. Which of these threats need to be eliminated in order to make reliable communication network a good design choice? Explain your answer. **20 points**

Part-B (covering Kurose-Ross chapter 1 and lecture notes)

B1. We learnt the packet transmission delay between a pair of networking elements is L/R, where L is the length of the packet in bits and R is the transmission rate of the link connecting the two elements. Find the delay in (i) sending the same packet of length L over a network path consisting of N identical links, each with the transmission rate R, (ii) sending P such packets back-to-back over the same N links. **15 points**

B2. You are responsible for quickly and economically transferring 200 terabytes of data from Iowa City, IA to a cloud provider in Mountain View, CA (~2000 miles). Your network provides an average end-to-end throughput of 100 Mbps. Compare and contrast the following two methods: (i) transmit data over the aforementioned network, or (ii) ship the disks using FedEx overnight delivery. List advantages and disadvantages of both methods. **20 points**

B3. Perform a *traceroute* from your home/university to a destination within the continental U.S. at three different times of the day. Report (i) the average round-trip delay, (ii) number of routers in the path, (iii) number of ISPs in the path. Do any of these vary over time? Repeat the above steps for a destination outside of the continental U.S. **20 points**

B4 (bonus question). Skype allows an Internet connected computer to place a call to an ordinary telephone. Describe the networking element needed to make this happen. **10 points**

Note on bonus question: points earned in B4 can make up for any points lost in other questions but cannot take your score beyond 100.