Homework 1

CS341 Introduction to Computer Networks, KAIST
(2023 Fall)

Due: 11:59 PM (KST), September 21, 2023

INSTRUCTIONS TO STUDENTS:

- Any collaboration or assistance of any kind is strictly prohibited; all work must be your own.
- Your submission *will surely* be compared with the submissions for your peers for plagiarism detection. Any academic dishonesty will be directly reported to the university.
- Hint: in general, shorter answers are better than longer answers. Spend more time thinking and less time writing.
- Word limit: Your answers should be within the word limit when it is specified in each question. We will *not* read beyond the word limit when grading.

1. The Road to Your Peers (30 points)

For this homework question, pick any torrent file (`.torrent`) of your choice and start downloading it with any torrent client of your choice on your machine inside the KAIST network.[1]

1. Use `tcpdump` to capture all torrent packets coming to your computer. You may need to filter out unrelated packets. Write down the command you used. Also, list the IP addresses (up to 20) of other torrent clients sending packets to you.
2. Use `tcpdump` to capture all torrent packets leaving your computer. You may need to filter out unrelated packets. Write down the command you used. Also, list the IP addresses (up to 20) of other torrent clients receiving packets from you.
3. Pick five IP addresses from the two lists and use `traceroute` to map out the routes from your machine at KAIST to them. Show how routes diverge at different points with your own illustration. Please draw a diagram of the routes with the observed IP addresses (please do not attach scanned images of your hand-written drawings). You may need to re-try this with different IP addresses until you find routes going to different places.

2. Getting IP Addresses (30 points)

1. Use a machine that is connected to `Welcome_KAIST`. Find out the IP address of your machine for this connection. What is the IP address seen by a Netflix server? Explain how you find it out.
2. Use a machine that is connected through a mobile hotspot. Find out the IP address of your machine for this connection. What is the IP address seen by a Netflix server? Explain how you find it out.
3. Use `dig` for resolving `netflix.com` and find the TTL value "set" for this domain.

[1] Make sure that you are not violating any law or KAIST policy when downloading the torrent file.

4. If your host machine receives multiple IP addresses for Netflix, which one would be picked and used by the browser? Explain the process.

5. Try resolving `netflix.com` multiple times and observe whether the set of IPs changes over time. Explain your observation. Enumerate all IPs you see in the time window of 5 minutes.

3. Closer to You (30 points)

CDN service providers want their clients to get service from the servers closer to them. The problem is that CDN servers are located in different networks in different geographic locations.

1. Name one application-layer solution that assigns a closer CDN server to a client.

2. Name one network-layer solution that assigns a closer CDN server to a client.

3. Which one offers a closer server to the client? Define your notion of "distance" and then discuss. (in less than 80 words)

4. Suppose you own a start-up CDN service. Which approach would you take and why? (in less than 80 words)

4. Academic Integrity (10 points)

(Yes or No) I have read and understood the KAIST SoC Honor Code.

Submission

- Please upload your answer sheet on Gradescope (via KLMS).
- Please map the problem numbers with the pages of your submission.