

CS408 – Computer Networks – Spring 2024 - HW 1 – Due March 11, Monday 2023, 23:59

Please submit SUCourse before due. No late submissions

Everyone must submit his/her own work! Plagiarized homework will be graded as minus 100 and will be reported to the Dean's office according to university regulations.

BE AWARE OF ALL TYPE OF UNIT CONVERSIONS. BE CAREFUL ABOUT THE ARITHMETIC!!!!

Q1) 45 pts

Conduct a network analysis to investigate the connectivity between your computer and Stanford University (stanford.edu). Answer the following questions:

- Use the **ping** command to record the basic connectivity values to Stanford at two different hours of the day (one at noon and one at midnight). What is the output of the command, Find the average of the round-trip delays at each of the two hours. Did you observe any difference? What does it indicate about the network connectivity? Explain.
- Perform a **Traceroute** to Stanford at two different hours of the day (one at noon and one at midnight) to determine the network path to Stanford University from your computer. What is the output of the command, and what does it tell you about the network topology and potential bottlenecks (if there is any) at two different times of the day? Explain.
- Find the number of routers in the path at each of the times. Did the paths change during any of the hours? Explain.

Add screenshots of command results in your report – at least 2 ping and 2 traceroute screenshots, one at noon and one at midnight. Don't forget to add your location info where you conducted the test - e.g. Sabanci Campus, home etc.

Run ping and traceroute commands in **terminal mode of your computer**, don't use some web services.

Q2) 45 pts

- Calculate the air distance (or bird fly distance) from your location to Stanford University (You may ask to Google). If this is the distance of fiber optic cable, what would be the propagation delay?
- Calculate approximate fiber optic cable distance from Istanbul to Stanford. Assume that your ping packages followed the path :

Istanbul – Marmaris (Use land distance)

Marmaris – GoonHilly Downs, UK (through SeaMeWe-3 submarine cable
<https://www.submarinecablemap.com/submarine-cable/seamewe-3> You may use Google map Measure Distance for multiple points. The total length of cable is 39.000 km but you only need the length between Marmaris and UK)

UK – Bellport, NY, USA (through Yellow submarine cable
<https://www.submarinecablemap.com/submarine-cable/yellow>)

NY, USA – San Francisco (You may ask to Google)

What would be the propagation delay of this distance? What is RTT?

- c) In Q1-a you found an average RTT value. Is it different than the calculated RTT in Q2-b?
What could be possible reasons?

Q3) 10 pts

Assume that you are sailing in the Mediterranean sea and your ship is located north of Crete Island (See sample figure below). Since you need Internet connection for your freelance work, you bought Starlink Internet service.

Use the following Web site to see live locations of all Starlink satellites and zoom to the area shown in the sample screenshot below. As you see at any moment the satellites move:

<https://satellitemap.space/>

Assume that you want to send a 1MB file to someone in Bilişim Vadisi, Gebze. As you see from the sample screen below, your message will go up first, then it will be transferred to the closest satellite, and finally it will go down to Gebze ground station.

Orbital height of each satellite is stated on its name.

You may use Google map “Measure Distance” command to calculate approximate distances among satellites.

Task: At any time take a screenshot of the satellites and draw lines to connect closest ones with each other (See example below). Measure approximate distances between satellites and calculate total distance between source and destination.

Calculate and report approximate time to transfer the file from your ship to Gebze. Show the steps to calculate transmission time and propagation time.

Assumption-1: Speed of light 200.000 km/s

Assumption-2: You will use the same path for the whole file transfer

Assumption-3 The bandwidth is 50 Mbit/s (symmetric)

Assumption-4: Ignore processing and queuing times.

Sample topology (make your own):

