CS 315: Computer Networks Lab
Spring 2022-23, IIT Dharwad

Mid-semester Exam
February 25, 2023
9:30 AM AM to 10:30 AM

Instruction

1. Login to the Ubuntu OS on your machine using the following credentials:
    a. Username: user
    b. Password: 123456
2. Use the provided `.pcapng` file (captured while accessing www.iitdh.ac.in) to solve Part-1, and the Python Socket API docs to solve Part 2.
3. Save all your Part-1 answers in a text file named `<your_roll-number>_client.txt`, while replacing `<your_roll-number>` with your IIT Dharwad roll number.
4. Save your Part-2 files as `<your_roll-number>_client.py` and `<your_roll-number>_server.py`.
5. Copy above three files into an archive named after your roll number, i.e. `<your_roll-number>_server.zip` and place it in the `/home/user/Documents` folder.
6. At the end of your exam, ensure that the `/home/user/Documents` folder contains only one zip file, which is your final submission created as per the above instructions.

Part-1

1. [1 mark] What are the different protocols you observe in the application layer of the protocol stack?
2. Answer the following based on the pcap file.
    a. [1 mark] What is the total amount of data being received for the first five http requests in the pcap file for accessing www.iitdh.ac.in?
    b. [2 marks] How many HTTP GET requests do you observe till frame number 357? List down the GET requests(with frame number).
3. [3 marks] Create a <Source IP, Destination IP, Type of Query, No. of Answers, Source port, Destination Port> table by exploring the first 5 DNS queries and their corresponding responses.
4. List out the following for the HTTP GET request made at the frame number 44::
    a. [2 marks] The total number of TCP segments being received with the total payload value.
    b. List the following:
        i. [1 mark] Source port
        ii. [1 mark] Destination port
        iii. [1 mark] segment length
        iv. [1 mark] Sequence number
        v. [1 mark] Next sequence number
        vi. [1 mark] Acknowledgment number
        vii. [1 mark] Header length
    c. [2 marks] What is the RTT value of the first data-carrying TCP segment? Explain how you have obtained it with proper calculation.

5. List out the following for the UDP protocol at the frame number 26:
    a. [1 mark] What is the length of UDP payload for frame number 26.
    b. [1 mark] What is the largest possible source port number?
    c. [1 mark] What is the protocol number for UDP? Give your answer in both hexadecimal and decimal notation.
    d. [1 mark] Determine the length (in bytes) of each of the UDP header fields.

Part-2

[15 marks] Create a socket programming-based client-server application in Python.

- Each client chooses its username, and communicates the same to the server.
- Each client should be able to gracefully terminate its connection by sending the reserved keyword "QUIT" to the server.
- Whenever a client joins/leaves the server, the server sends the list of all online clients (i.e. usernames) to each online client.