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

Mid-semester Exam
February 25, 2023
11 AM AM to 12 Noon

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 and nslookup to mit.edu) 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>*`.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 transport layer of the protocol stack?
2. Answer the following based on the pcap file.
   a. [1 mark] What is the total number of lines of data being received for the first five http requests made for accessing www.iitdh.ac.in?
   b. [2 marks] How many HTTP OK responses do you observe till frame number 693? List down the corresponding frame numbers.
3. Answer the following based on the NS type DNS queries in the pcap file:
   a. [1 mark] To what IP address is the NS query message sent. 10.250.200.3
   b. [1 mark] How many answers are there for the NS query response. 0
   c. [1 mark] What are the source port, destination port, transaction ID for the NS query message. Source: 36514 Dest: 53
4. List out the following for the HTTP GET request made at the frame number 51:
   a. [2 marks] The total number of TCP segments being received with the total payload value. 45, 119442
   b. List out the following:
      i. [1 mark] Source port 46594
      ii. [1 mark] Destination port 80
      iii. [1 mark] segment length 343
      iv. [1 mark] Sequence number raw: 3041048245 relative:1
      v. [1 mark] Next sequence number 344 (rel)
      vi. [1 mark] Acknowledgment number raw:2042725314 rel:1
      vii. [1 mark] Header length 32 bytes

c. [2 marks] What is the RTT value of the second data-carrying TCP segment? Explain how you have obtained it with proper calculation. 0.000018795 = 0.702741158 - 0.702722363

5. List out the following for the UDP protocol at the frame number 4:
   a. [1 mark] What is the length of UDP payload? 12
   b. [1 mark] What is the largest possible source port number? 2^16-1
   c. [1 mark] What is the protocol number for UDP? Give your answer in both hexadecimal and decimal notation. 17 Hexa(11)
   d. [1 mark] Determine the length (in bytes) of each of the UDP header fields. 2bytes each total header = 8bytes.

Part-2

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

- Calculation is restricted to only two operands and one arithmetic operator, i.e. +, -, /, and *.
- Each client can send an expression of the form "operand operator operand" to the server, and the server returns the final value to the client.
- Each client should be able to gracefully terminate its connection by sending the reserved keyword "QUIT" to the server.