Part A: Network Programming

Rationale:

Asynchronous communication allows datagrams can be send to server at any time despite the statue of the server. Today, different types of internet protocols are used around the world, some of them are using synchronous communication while the others are using asynchronous communication. In this report, it will be focus on whether the User Datagram Protocol is an asynchronous communication or not. The hypothesis is that the UDP is an asynchronous communication and to test this theory, a client will send multiply datagrams to the server. If the datagrams get queued up, then it will prove the UDP is asynchronous communication.

Method:

To test whether the UDP is asynchronous or not, a program is wrote to help. This program has two components, the server and the client. The client's goal is to send datagrams to the socket and the server will receive the datagrams from the other side of the socket. However just sending and receiving datagram will not be enough to prove that UDP is asynchronous, so to show more clearly whether UDP is asynchronous or not, client will send the datagram with a small delay between each sends and server will received datagram at much slower pace. This force the server to have more datagrams in the socket than it can handles and if the datagrams queues up, it can prove that UDP is an asynchronous. To help to see whether datagrams queues up or not, all datagrams are contains a number that increments by one when a datagrams is send. This way, if the datagram last received by the server and datagram last send by the client are different, then it can prove the UDP is asynchronous.

Result:

The following screenshots shows the output of client's terminal and server's terminal at different time intervals. A two second delay is added between each datagram send and an eight second delay is added between each datagram receive. As the screenshots shown, the client and server both work at different pace due to the different datagram number. In the first screenshot, the server just received datagram #4 while the client is already sending the datagram #16. This proves that the client and server are both work concurrently. Screenshots also show that the server receives the datagrams in the order that they was sent. Since the server and client work at different pace, the only way for the datagrams to appear in the same order that they are sent is to put them in the queue.

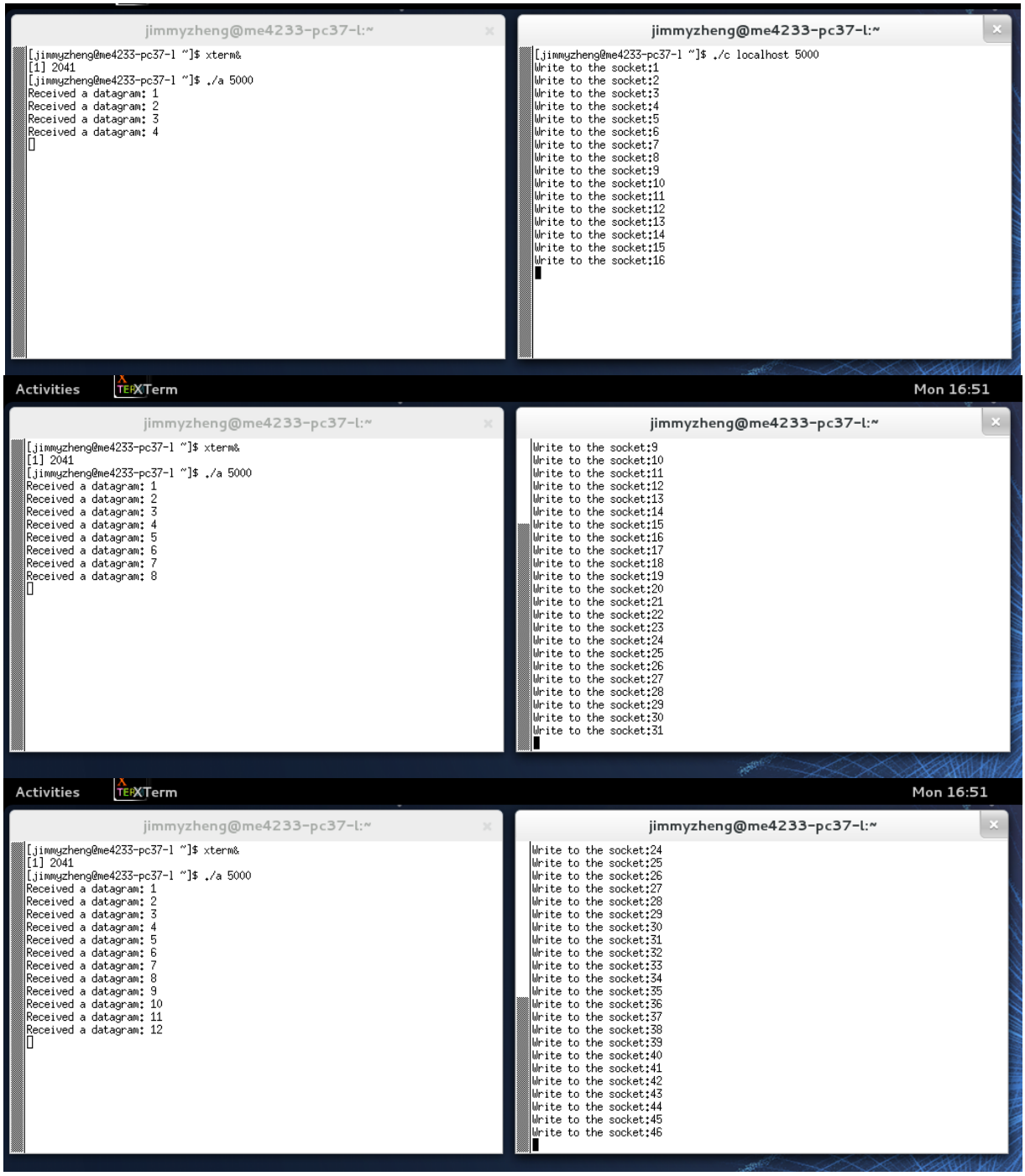

Figure 1: screenshot of the server's terminal and client's terminal at 30sec, 60 sec, and 90 sec.

On the left side is the server's terminal and client's terminal is on the right.

Analysis:

As showed in the screenshots, the datagrams are queued up on the server's side and client send the datagrams concurrently. This proves that the UDP is an asynchronous communication.