

Programming Assignment #3

Issued 10/16/2018 - Due 10/31/2018

Program 1. TCP Socket Programming [40 points]

Write a simple Java client-server application to demonstrate socket programming for the TCP. Your program should perform the following:

- A client reads the server's name and the port's number from its standard input (keyboard) and connects to the specified server.
- A client reads an integer from its standard input (keyboard) and sends the number out its socket to the server.
- The server reads the integer number from its connection socket.
- The server calculates the factorial of the received number.
- The server sends the obtained result out its connection socket to the client.
- The client reads the result from its socket and prints the line on its standard output (monitor).

For this program, you will make a **JFrame** for the Client subject to the program requirements. Below is a screen shot of what the client may look like.

The screenshot shows a client application window with a standard Windows-style title bar (minimize, maximize, close buttons). The window contains three main sections:

- Connection Section:** Labeled "Ip Address" and "Port". The "Ip Address" field contains "io.uwplatt.edu" and the "Port" field contains "9876". Below these fields is a "Connect" button.
- Send Section:** Labeled "Send to server:". Below the label is a text input field containing the number "5". Below the input field is a "Send" button.
- Output Section:** Labeled "Output:". Below the label is a large text area containing the number "120".

Figure 1. A screen shot of what client may look like

Part 2. [60 points]

Host **A** and **B** are communicating over a TCP connection, and Host **B** has already received from **A** all bytes up through byte 126. Suppose Host **A** then sends two segments to Host **B** back-to-back. The first and second segments contain 70 and 50 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host **B** sends an acknowledgement whenever it receives a segment from Host **A**.

- a) In the second segment sent from Host **A** to **B**, what are the sequence number, source port number, and destination port number?

- b) If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?

- c) If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, what is the acknowledgment number?

- d) Suppose the two segments sent by **A** arrive in order at **B**. The first acknowledgement is lost and the second acknowledgement arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgements sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgement that you add, provide the acknowledgement number.

