CSCI-7645: Practice Problem Set 5

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1. Create a FIFO based client-server application that does the following. The client, when started, randomly generates 10 numbers of type `double`, all of which are between `0` and `1`. It then sends a request to the server, where the request consists of an array with the above 10 double precision floating point numbers. When the server receives a request, it creates a new thread to prepare a response and to send it to the client. In this case, the response is the average of the 10 numbers sent by the client. Once the response has been sent, the thread exits. Once a client receives a response, it prints out the 10 numbers it had sent and the response it received, and then exits. The server exits on CTRL+C.

   The client and server should be run as follows.

   In shell 1:

   ```
   ./server
   ```

   In shell 2:

   ```
   seq 1 4 | xargs -P 0 -n 1 ./client
   ```

   The last command above runs four instances of the client, with as many of them running in parallel as possible (see `https://man7.org/linux/man-pages/man1/xargs.1.html`).

2. Solve the above problem using a POSIX message queue instead of a FIFO.

3. Implement a POSIX message queue with a writer process and a reader process. The writer writes messages to the message queue, where each message represents a `Person` with a `firstName` (20 bytes) and a `lastName` (20 bytes). The reader reads all the messages in the message queue and displays them to screen.

   (a) Set the message priorities such that they are read in FIFO order.

   (b) Set the message priorities such that they are read in LIFO order.

   (c) Set the maximum number of messages in the message queue to 10. What happens if the writer process tries to write 100 messages to the message queue? What happens if the reader is run 10 times?