UNX511 Lab 10: Semaphores with Shared Memory

Due: Sunday, August 10, 2025 (11:59pm)

Three processes are going to communicate with each other through shared memory. The memory is allocated as follows:

```
struct Memory {
   int packet_no;
   unsigned short srcClientNo;
   unsigned short destClientNo;
   char message[BUF_LEN];
};
```

Each client is numbered 1, 2, and 3. Each client will read from the shared memory looking for a message for itself. If the destClientNo matches the client's number, it will print out the message and then send a message to another client.

For example, if client 2 receives a message from client 1, the message could read as:
Client 2 has received a message from client 1:
This is message 29 from client 1

Client 2 will then send a message to either client 1 or 3. For example, if client 2 sends a message to client3, the message could read as:
Client 3 has received a message from client 2:
This is message 28 from client 2

Since three clients will be accessing shared memory, some sort of synchronization mechanism is required.

Code has been given for clients 1, 2 and 3, plus its Makefile. A start.sh has also been provided to start all processes. They can be found at:
start.sh,
client.h,
client1.cpp,
client2.cpp,
client3.cpp,
Makefile.

This code contains everything except synchronization. It is your task to implement a synchronization mechanism for these three clients, such that only one accesses shared memory at a time. Clients 1 and 2 should wait for client 3 to start up. You will need to modify client.h, client1.cpp, client2.cpp and client3.cpp.

NB: Please insert a sleep of 1 second in the for-next loop for each client, so we can see communication between them.

Assignment Submission:

- Complete all steps, Add all output-screenshot and explanations (if required) to a MS-Word file.
- Add the following declaration at the top of MSWORD file and source code

```
/*********************************************************************************
* UNX511-Lab10
* I declare that this lab is my own work in accordance with Seneca Academic Policy.
* No part of this assignment has been copied manually or electronically from any other source
* (including web sites) or distributed to other students.
*
* Name: _____ Student ID: _____ Date: _____
*
*
*********************************************************************************/
```

- Please answer the following two declarations:
    - D1) On a scale from 1 to 5, **How much did you use generative AI to complete this assignment?**
        - where:
        - **1** means you did not use generative AI at all
        - **2** means you used it very minimally
        - **3** means you used it moderately
        - **4** means you used it significantly
        - **5** means you relied on it almost entirely
        - **Your answer :**
    - D2) On a scale from 1 to 5, **How confident are you in your understanding of the generative AI support you utilized in this assignment, and in your ability to explain it if questioned?**
        - where:
        - **1** means "Not confident at all – I do not understand the generative AI support I used and cannot explain it."
        - **2** means "Slightly confident – I understand a little, but I have many uncertainties."
        - **3** means "Moderately confident – I understand the majority of the support, though some parts are unclear."
        - **4** means "Very confident – I understand most of the AI support well and can explain it with minor gaps."
        - **5** means "Extremely confident – I fully understand the generative AI support I used and can clearly explain or justify it if asked."
        - **Your answer :**

- Please submit the Source code (zip all .c, .h, and makeFiles)

Important Note:

- **LATE SUBMISSIONS for labs**. There is a deduction of 10% for Late assignment submissions, and after three days it will grade of zero (0).
- This labs should be submitted along with a video-recording which contains a detailed walkthrough of solution. Without recording, the assignment can get a maximum of 1/3 of the total.
    - Note: In case you are running out of time to record the video, you can submit the assignment (source code + screenshots) by the deadline and submit the video within 24 hours after the deadline.