

Assignment #2

Java Synchronization

Problem Definition

It is required to simulate a limited number of devices connected to a router's Wi-Fi using Java threading and semaphore. Routers can be designed to limit the number of open connections. For example, a Router may wish to have only N connections at any point in time. As soon as N connections are made, the Router will not accept other incoming connections until an existing connection is released.



The following rules should be applied:

- The Wi-Fi number of connected devices is initially empty.
- If a client is logged in (print a message that a client has logged in) and if it can be served (means that it can reach the internet), then the client should perform the following activities:
 - ◆ Connect
 - ◆ Perform online activity
 - ◆ Log out

→ Note: these actions will be represented by printed messages, such that there is a random waiting time between the printed messages when a client connects, do some online activities and logged out.

→ If a client arrives and all connections are occupied, it must wait until one of the currently available clients finish his service and leave.

→ After a client finishes his service, he leaves and one of the waiting clients (if exist) will connect to the internet.

Solution Design:

You program must contain the following classes:

1. **Router Class:** that contains a list of connections and methods to occupy a connection and release a connection.
2. **Semaphore Class:** as given the synchronization lab.
3. **Device Class:** represent different devices (threads) that can be connected to the router; each device has its own name (i.e. C1) and type (i.e. mobile, pc, tablet...) and it may perform three activities: connect, perform online activity and disconnect/logout
4. **Network Class:** this class contains the main method in which the user is asked for the following inputs:
 - **N:** max number of connections a router can accept
 - **TC:** total number of devices that wish to connect).
 - **TC lines** that contain name of each device, and its type

Submissions that do not contain these classes will be graded Zero

Sample Run:

You will print the output logs in a file, which simulates the execution order of the devices threads and the printed messages of each device

NOTE THAT: This is just an example not the only scenario that can be applied.

Sample Input

What is the number of WI-FI Connections?

2

What is the number of devices Clients want to connect?

4

C1 mobile

C2 tablet

C3 pc

C4 pc

Sample Output

- C1 (mobile)arrived
- C2 (tablet)arrived
- Connection 1: C1 Occupied
- Connection 2: C2 Occupied
- C4 (pc) arrived and waiting
- C3 (pc)arrived and waiting
- Connection 1: C1 login
- Connection 1: C1 performs online activity
- Connection 2: C2 login
- Connection 2: C2 performs online activity
- Connection 1: C1 Logged out
- Connection 1: C4 Occupied
- Connection 1: C4 log in
- Connection 1: C4 performs online activity
- Connection 2: C2 Logged out
- Connection 2: C3 Occupied

Submission instructions:

1. The submission deadline date is 16th August on Google Classroom.
2. The assignment is submitted in a group of maximum **3** students.
 - a. Students from G1 and G2 can form groups from both G1 or G2 students
 - b. Students from G3 MUST form groups from G3 Students only
3. The submitted file name should be GroupNumber_ID1_ID2_ID3_A2