

# CSCI 202: Object-Oriented Programming

Lab 3 - Due Thursday March 7, 2024 at 11:59pm

## Resources:

- GNU/Linux server IP address: [198.100.146.58](#)

## Shared account with multiple threads (Lab3\_1)

In this part you will be working with a program that creates multiple thread that deposit or withdraw money from a shared account. The current program allows multiple threads to access the shared account at the same time. This is not thread safe and can cause unexpected results. Your task will be to fix the program by making it thread safe.

Download and unzip [Lab3\\_1.zip](#) from canvas onto your local computer. Then open up the unzipped project with IntelliJ.

The program creates an account with an initial balance of 0. Next, it creates 200 threads: 100 of which each deposit 1 into the account, and 100 of which each withdraw 1 from the account.

Run the program multiple times. Some of these program executions might result in an actual account balance not matching the expected account balance of zero. This is because the program is not yet thread safe.

## Your Task:

Edit Account.java and modify the method `deposit()` and `withdraw()` to make them thread safe. These methods are for adding and removing money from the account balance respectively.

Only one thread is allowed to be executing code in either `deposit()` or `withdraw()` at any given time. A thread in `withdraw()` cannot proceed if it tries to withdraw more than the current balance. In this case, place the thread in the waiting state by calling `wait()`. When the thread wakes up, it must one again check if it can proceed by testing if there is enough money in the account to withdraw. Calling `wait()` might throw an `InterruptedException`. To account for this, either handle the exception in `withdraw()` or declare it to be thrown in the declaration of `withdraw()`. When a thread in `deposit()` finishes its task, it must notify any waiting threads that are in `withdraw()` to wake up by calling `notifyAll()`.

When you are done, zip up your project in a file called [Lab3\\_1.zip](#) and upload this .zip file to Canvas (click on [Assignments](#) and go to [Lab 3](#)).