

Programming Lab 1: The Pthreads Library

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Problem 1.1. Implement a simple concurrent system to simulate ATM-Customers interaction with the Pthreads Library.

In this concurrent system, we assume that the ATM has unlimited supply of cash and unlimited storage for storing cash. Suppose our concurrent system has 5 customers and 3 ATM cash-filling officers, where each ATM cash-filling officer can supply cash to the ATM at the rate of **FILL=50** bahts an hour (**sleep(1)** in the skeleton file is used to simulate this time period) and each customer withdraws exactly **WITHDRAW=70** bahts from the ATM at a random point in time. Let us simulate this concurrent system by assuming that each ATM cash-filling officer fills **FILL_FREQUENCY=5** times a day.

Complete the skeleton file with appropriate synchronization primitives. Which signal operation should we use in this concurrent system **pthread_cond_signal()** or **pthread_cond_broadcast()**? Justify your design decision.

Problem 1.2. Implement a concurrent system to simulate the Producers-Consumers Problem using the Pthreads Library.

The program should take two parameters: the number of producers and the number of consumers. In this simulation, each producer produces one item at a time and places the item into a shared FIFO queue of size **QUEUE_SIZE=5** whereas each consumer takes one item at a time from the shared FIFO queue and performs computation on it. Assume that the total number of items the producers and the consumers can produce and consume is restricted to **MAX_PRODUCED=30**.

Complete the skeleton file with appropriate synchronization primitives. Which signal operation should we use in this concurrent system **pthread_cond_signal()** or **pthread_cond_broadcast()**? Justify your design decision.