

CS 5334 Spring 2016
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In-class Activity
February 4

Names _____

Producer-Consumer using Pthreads Condition Variables

Please work in teams of three to answer the questions below about the Pthreads producer-consumer code provided on the course website. You may want to modify the code to answer some of the questions. You may find it useful to refer to information in the LLNL Pthreads tutorial or in Pthreads man pages.

1. Explain why the tests on `fifo->full` and `fifo->empty` are inside `while` loop conditions rather than `if` statement conditions. Describe a scenario of how the code could fail if `if` statements were used. You may assume multiple consumers and producers for your scenario.

2. Assume just one producer and one consumer. Would the code still be guaranteed to work correctly if just the condition variables were used and the associated mutex were not locked? If so, argue why it is still correct. If not, give an example where it fails.

3. Assume just one producer and one consumer. Would the code still work correctly if just one condition variable were used, rather than two – that is, both producer and consumer wait on and signal the same condition variable? If so, argue why it is still correct. If not, give an example where it fails.

4. Now assume more than one producer and/or consumer – for example, one producer and two consumers.

a. Would the code still work correctly if just one condition variable were used, rather than two. If so, argue why it is still correct. If not, give an example where it fails.

b. As in part a, assume one condition variable is used, rather than two. Also change the code to use `pthread_cond_broadcast()` instead of `pthread_cond_signal()` in both the producer and consumer routines. Now will the code work correctly? If so, argue why it is correct. If not, give an example illustrating how it can fail. Even if it is correct, is it a good solution?