

(10 points) In the pthread condition variable, a thread calling wait on the condition variable must do so with a mutex held. Explain one problem that would occur if the thread were to allow calls to wait without requiring a mutex to be held.

If the thread were to allow calls to wait without requiring a mutex to be held, then threads can simultaneously call to wait. For instance, a thread that calls wait on the condition variable will be pulled out of the critical section by said function while the other threads remain in it. The function then blocks the calling thread until the condition is met/signaled. With the mutex held, only one thread can call wait on the condition variable at a time. Without it, multiple threads can call it simultaneously, meaning they enter the queue at the same time. Therefore, if another thread makes that condition true, both threads would be woken up at the same time (in theory). This will be problematic for any code that requires one thread to wait/wake at a given time since it causes interruptions in the statuses of threads.