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CSCE 313

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5 March 2013

Homework 2

1. **What are asynchronous, deferred, and disabled cancellation in pthreads? What makes them different?**Asynchronous cancellation can occur at any time, and is often used to cancel threads immediately. Deferred cancellation will be delivered when the thread reaches it the next function that is classified as a cancellation point. Disabled cancellation will be queued by the thread until it returns to enabled cancellation.
2. **What is the role of the *contentionscope* for pthreads? How does it affect the execution of pthreads?**  
   *contentionscope* is the scope of a *pthread* as either user-level or kernel-level; it can be changed after a *pthread* is created to change its scope. The execution will change depending on the contention scope in several ways. First, there is a limit on the number of available kernel threads, so it may not be possible to change a pthread to *PTHREAD\_SCOPE\_SYSTEM* if the number of kernel threads is already full.
3. **usleep() C++-style snippit**

// wait thread

pthread\_mutex\_lock(&m);

while (timer > 0)

pthread\_cond\_wait(&c, &m);

pthread\_mutex\_unlock(&m);

// timer thread

pthread\_mutex\_lock(&m);

while (timer > 0)

timer --;

pthread\_cond\_signal(&c);

pthread\_mutex\_unlock(&m);

1. **The *execve* system call**
   1. What happens to the file descriptors of open files?  
      Normally, the file descriptors remain open across an *execve()* call.
   2. How can this behavior be controlled?  
      Using the flag *FD\_CLOEXEC* will cause the file descriptors to close across an *execve()* call.
2. **Ten processes share a critical section implemented by using a semaphore *x*. Nine of these process use the code P(x); <critical section>; V(x). However, one process erroneously uses the code V(x); <critical section; P(x). What is the maximum number of processes that can be in the critical section at one time?**  
   Given the problem, at most three threads can enter the critical section at one time. Assume it is the erroneous process’s turn and *x* *= 1*: the erroneous function calls V(*x*), and *x = 2.* Now, two more processes will come along and get to enter as *x = 1* and then *x = 0*.
3. **SafeAccount Java Class:**public class SafeAccount {

// members

private static int balance;

private static final int N;

private final Semaphore lock = new Semaphore(100, true);

// methods

public SafeAccount(int \_n) {

N = \_n;

}

// do not credit if balance exceeds n

public void credit(int \_amount) {

lock.acquire();

/\* critical section \*/

if (balance < N) balance += \_amount;

/\* /critical section \*/

lock.release();

}

// hold debits until acct is large enough to permit

public void debit(int \_amount) {

lock.acquire();

/\* critical section \*/

if (balance >= \_amount) balance -= \_amount;

/\* /critical section \*/

lock.release();

}

}