OntarioTech UNIVERSITY

TUTORIAL #5: POSIX Threads

Faculty of Engineering and Applied Science
Operating Systems SOFE-3950U

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Conceptual Questions

1. **Read the pthread documentation and explain the following three functions: pthread_create, pthread_join, pthread_exit.**

   pthread_create
   Used to create a new thread. It returns a 0 if successful, otherwise the error number.

   pthread_join
   Suspends the calling thread until the target thread is finished executing. It returns a 0 if successful, otherwise the error number.

   pthread_exit
   Terminates the calling thread. Has no return value.

2. **Explain how the memory of threads work in comparison to processes, do threads share the same memory, can threads access the memory of other threads?**
   The primary difference is that threads within the same process run in a shared memory space, while processes run in separate memory spaces. Threads are not independent of one another like processes are, and as a result threads share with other threads their code section, data section, and OS resources (like open files and signals).

3. **Name the differences between multithreading and multiprocessing (multiple processes). What are the advantages and disadvantages of each?**
   Multithreading
   Refers to the ability of a processor to execute multiple threads concurrently, where each thread runs a process.

Advantages	Disadvantages
- Improved performance - Simplified coding of remote procedure calls - Simultaneous access to multiple applications	- Difficulty of writing code - Difficulty of debugging - Difficulty of testing

   Multiprocessing
   Refers to the ability of a system to run multiple processors concurrently, where each processor can run one or more threads.

Advantages	Disadvantages
- More reliable systems - High Throughput - More economic systems	- Increased expense - Complicated OS Required - Large Main memory required

4. **Provide an explanation of mutual exclusion, what is a critical section?**
   Mutual exclusion is also known as Mutex. The critical section can be defined as a period for which the thread of execution accesses the shared resource.

5. **Research the functions used to perform mutual exclusion with pthreads and explain the purpose of each function.**
   - pthread_mutex_init: Initialize a mutex
   - pthread_mutex_lock: Lock a mutex
   - pthread_mutex_unlock: Unlock a mutex
   - pthread_mutex_lock: Lock a mutex
   - pthread_mutex_trylock: Lock with a non blocking mutex