

Chapter 4: Threads



(slides selected by R. Doemer, 01/07/09)



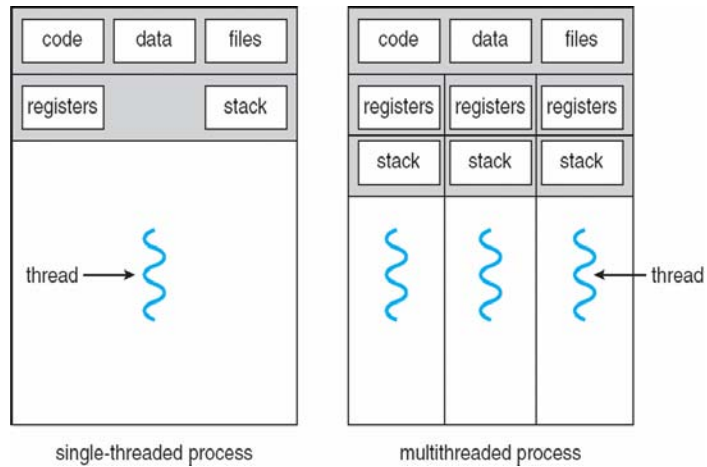
Chapter 4: Threads

- Overview
- Multithreading Models
- Thread Libraries
- Threading Issues
- Operating System Examples
- Windows XP Threads
- Linux Threads





Single and Multithreaded Processes



Benefits

- Responsiveness
- Resource Sharing
- Economy
- Scalability



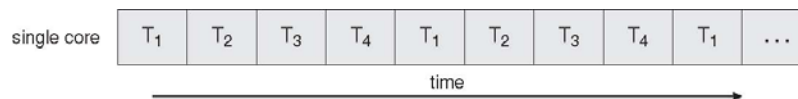


Multicore Programming

- Multicore systems putting pressure on programmers, challenges include
 - **Dividing activities**
 - **Balance**
 - **Data splitting**
 - **Data dependency**
 - **Testing and debugging**

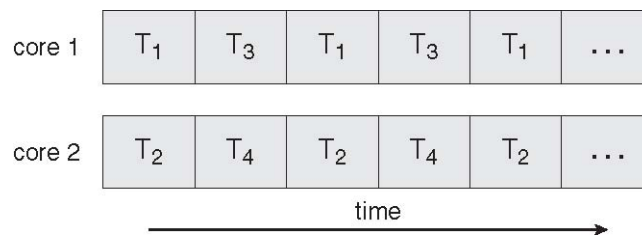


Concurrent Execution on a Single-core System





Parallel Execution on a Multicore System



User Threads

- Thread management done by user-level threads library
- Three primary thread libraries:
 - POSIX [Pthreads](#)
 - Win32 threads
 - Java threads





Kernel Threads

- Supported by the Kernel
- Examples
 - Windows XP/2000
 - Solaris
 - Linux
 - Tru64 UNIX
 - Mac OS X



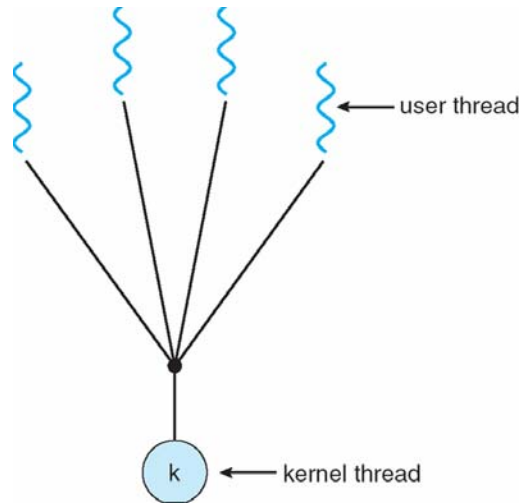
Multithreading Models

- Many-to-One
- One-to-One
- Many-to-Many

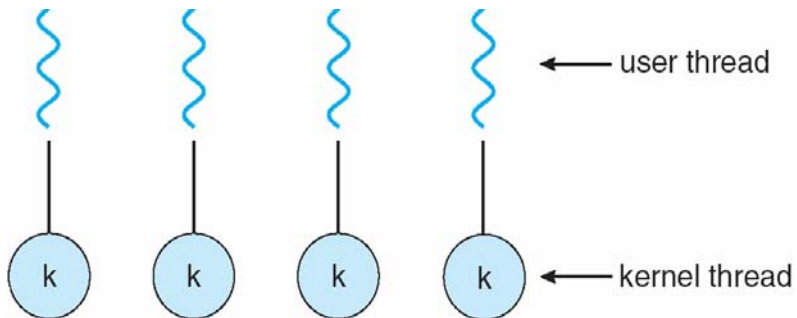




Many-to-One Model

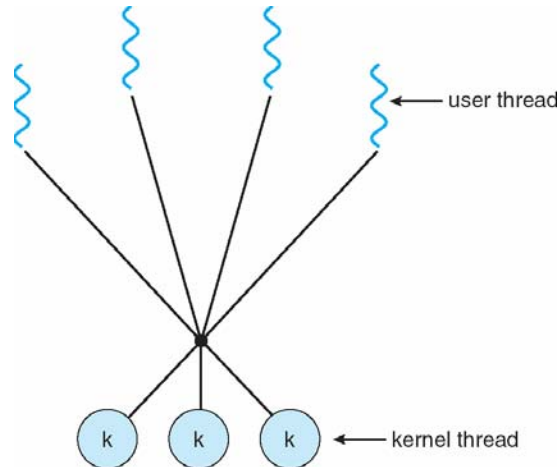


One-to-one Model





Many-to-Many Model



Threading Issues

- Semantics of **fork()** and **exec()** system calls
- Thread cancellation of target thread
 - Asynchronous or deferred
- Signal handling
- Thread pools
- Thread-specific data
- Scheduler activations



End of Chapter 4

