Introduction to Threads

→ It is a smallest unit of a process that can be scheduled & executed by CPU.

- Multithreading :- The ability of a CPU to execute multiple threads concurrently.

Types of Threads :-

User level Threads :-

→ Managed by user level libraries.
→ Faster Context switching.
→ No kernel support needed.
→ Example Posix Threads (P Threads)

Kernel level Threads

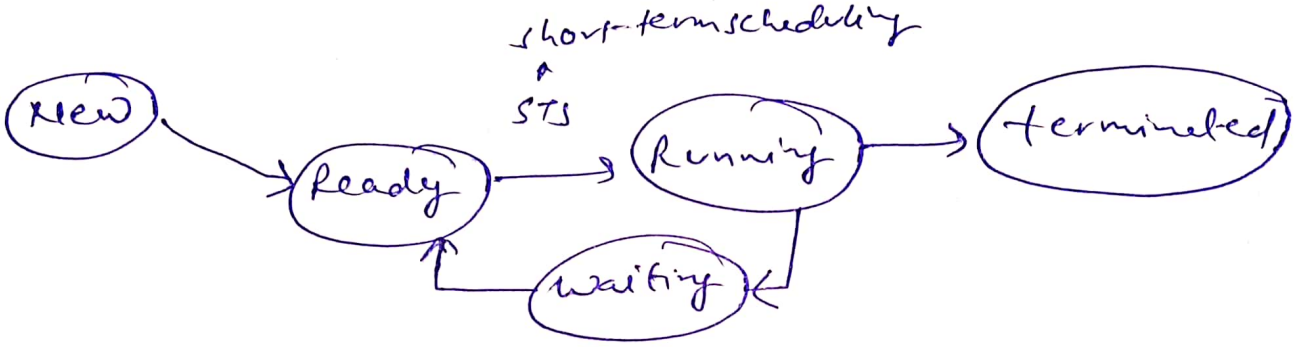
→ Managed by operating system.
→ Slower Contextswitch
→ full kernel support.
→ Example :- Windows Threads, LINUX Kernel Threads

Benefits of using Threads

- Concurrency : Multiple Threads can execute simultaneously improving the overall speed of applications
- Resource Sharing : Thread within the same process share resource such as memory & file handles.
- Responsiveness : Applications remain responsive by delegating long running task to separate Threads.
- Scalability : Efficiently utilize Multi-Core Processors to perform Parallel Computations.

Threads life cycle :-

- New :- The Thread is created but not yet started.
- Runnable :- The Thread is ready to run and waiting (Ready) for CPU time.
- Running :- The Thread is currently executing
- Blocked/waiting :- The Thread is waiting for a resource or event.
- Terminated :- The Thread has finish execution.



Thread Management

Thread Creation

- Methods : Using Thread libraries (eg. Pthread_create in POSIX) or language constructs e.g. Thread class in Java).
- Attributes :- setting Thread attributes like stack size, Priority, & scheduling Policy.

Thread Synchronization

- Mutexes :- Ensure Mutual exclussion to prevent race conditions.
- semaphores : Control access to resources.
- Monitors :- High level synchronization construct.

Thread scheduling:-

- Preemptive scheduling:- The OS decides when to switch Threads
- Cooperative scheduling:- Threads voluntarily yield control.

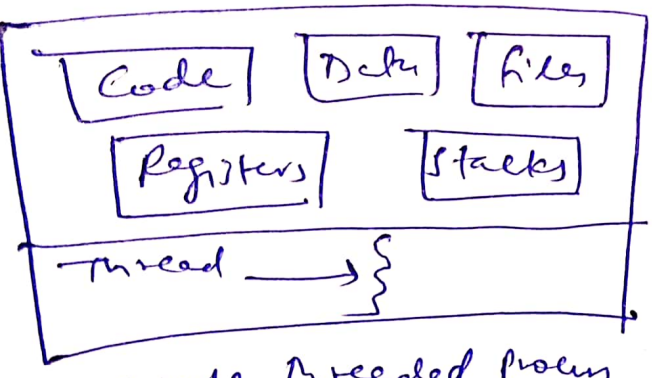
Threads:

→ It is a basic unit of CPU Utilization.

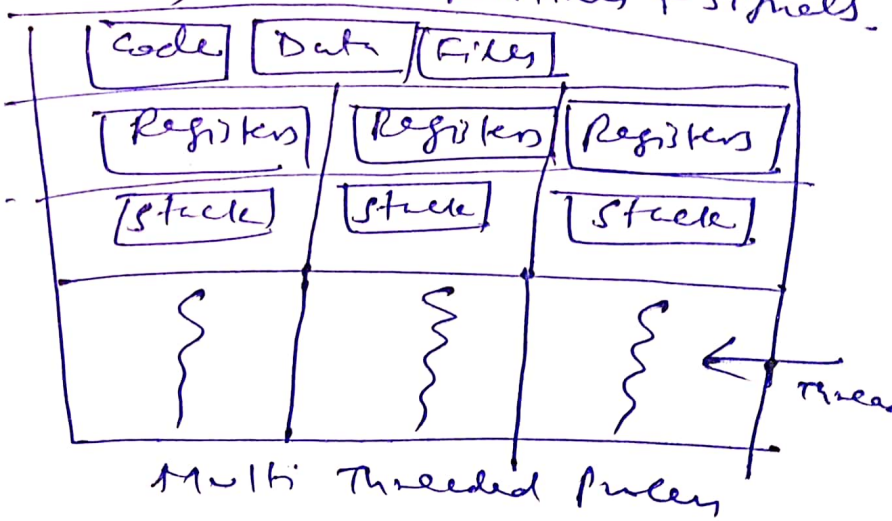
It Comprises

- A Thread ID
- program counter
- A register set
- A stack

It shares with other threads belonging to the same Process its ~~Code Section~~ Code section, data section, other operating system resources, such as open files & signals.



Single Threaded Process



Multi Threaded Process