CS35L – Winter 2019

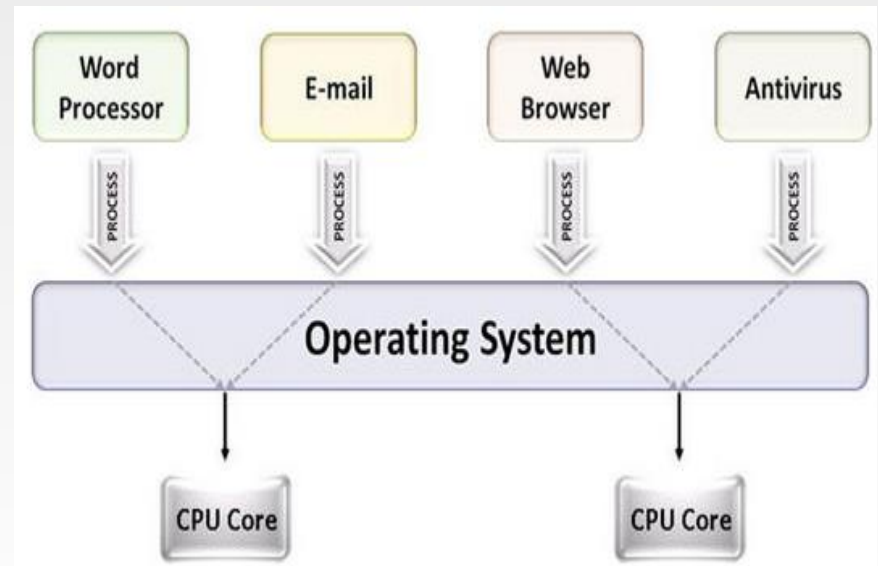| Slide set:	6.1
Slide topics:	Multithreaded Performance
Assignment:	6

Multiprocessing

- The use of multiple CPUs/cores to run multiple tasks simultaneously

Uniprocessing system
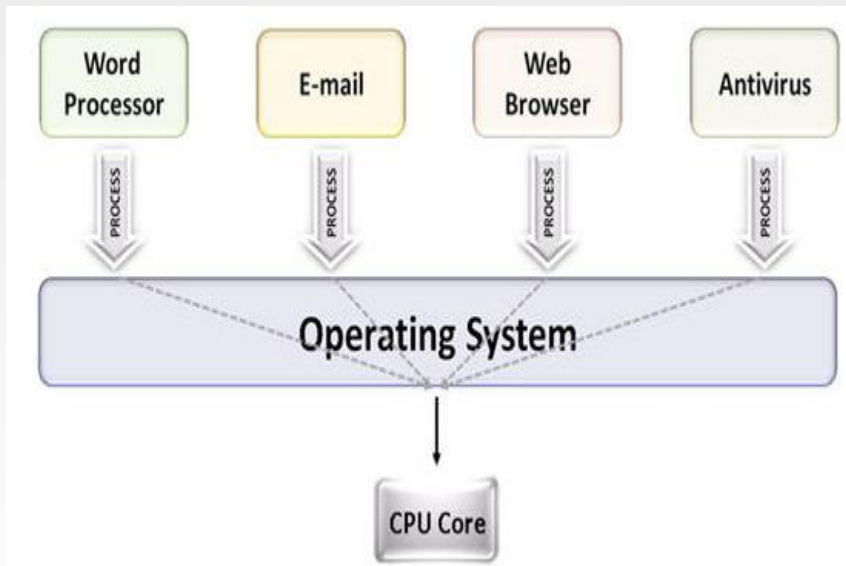
**Multiprocessing system**

Parallelism

- Executing several computations simultaneously to gain performance
- Different forms of parallelism
  - **Multitasking**
    - Several processes are scheduled alternately or possibly simultaneously on a multiprocessing system
  - **Multithreading**
    - Same job is broken logically into pieces (threads) which may be executed simultaneously on a multiprocessing system

What is a thread?

- A flow of instructions, path of execution within a process
- The smallest unit of processing scheduled by OS
- A process consists of at least one thread
- Multiple threads can be run on:
  - **A uniprocessor (time-sharing)**
    - Processor switches between different threads
    - Parallelism is an illusion
  - **A multiprocessor**
    - Multiple processors or cores run the threads at the same time
    - True parallelism

Multitasking vs. Multithreading
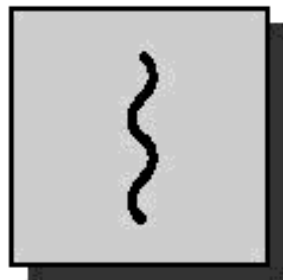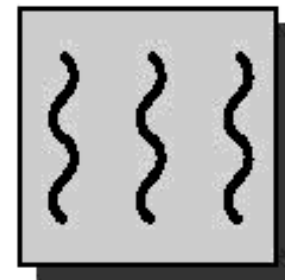
Multitasking
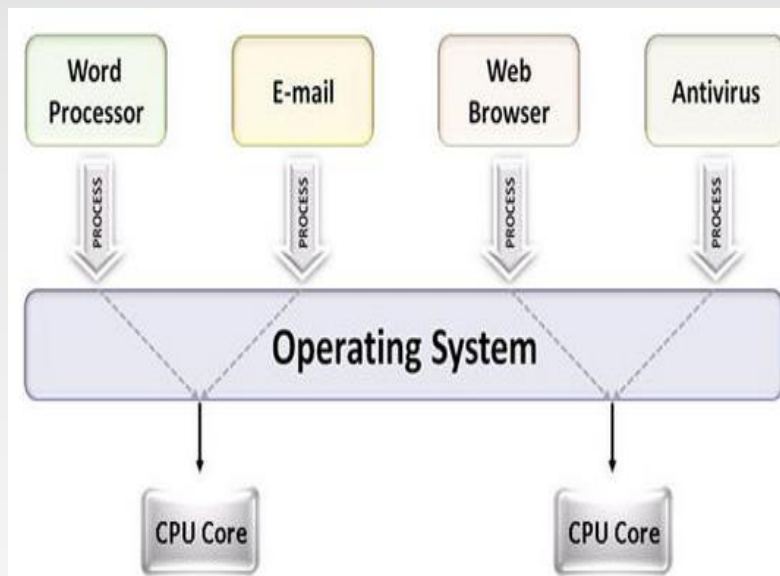
Multithreading
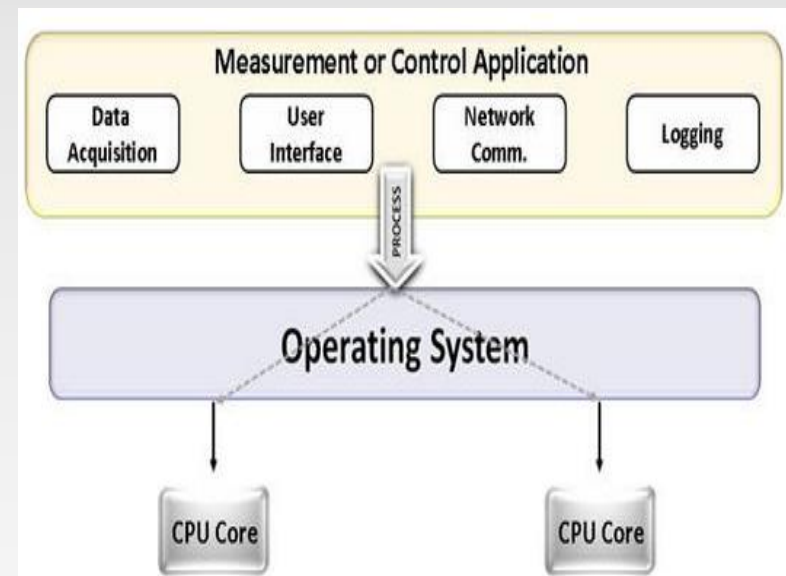
Multitasking is sharing of computing resources(CPU, memory, devices, etc.) among processes

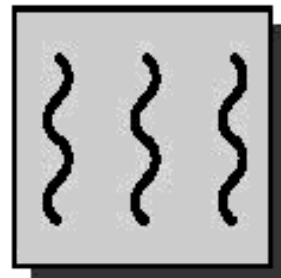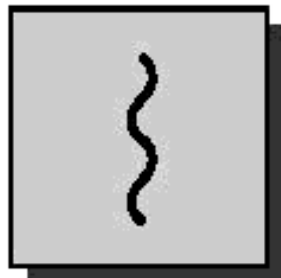Multithreading is sharing of computing resources among threads of a single process.
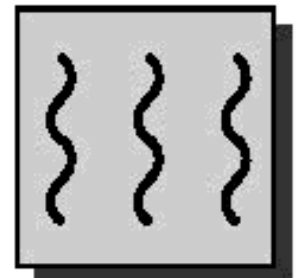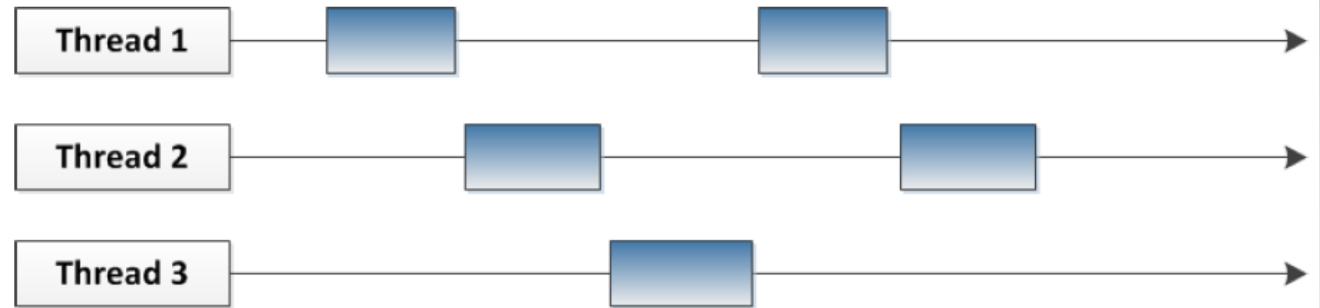
one process
one thread

one process
multiple threads

multiple processes
one thread per process
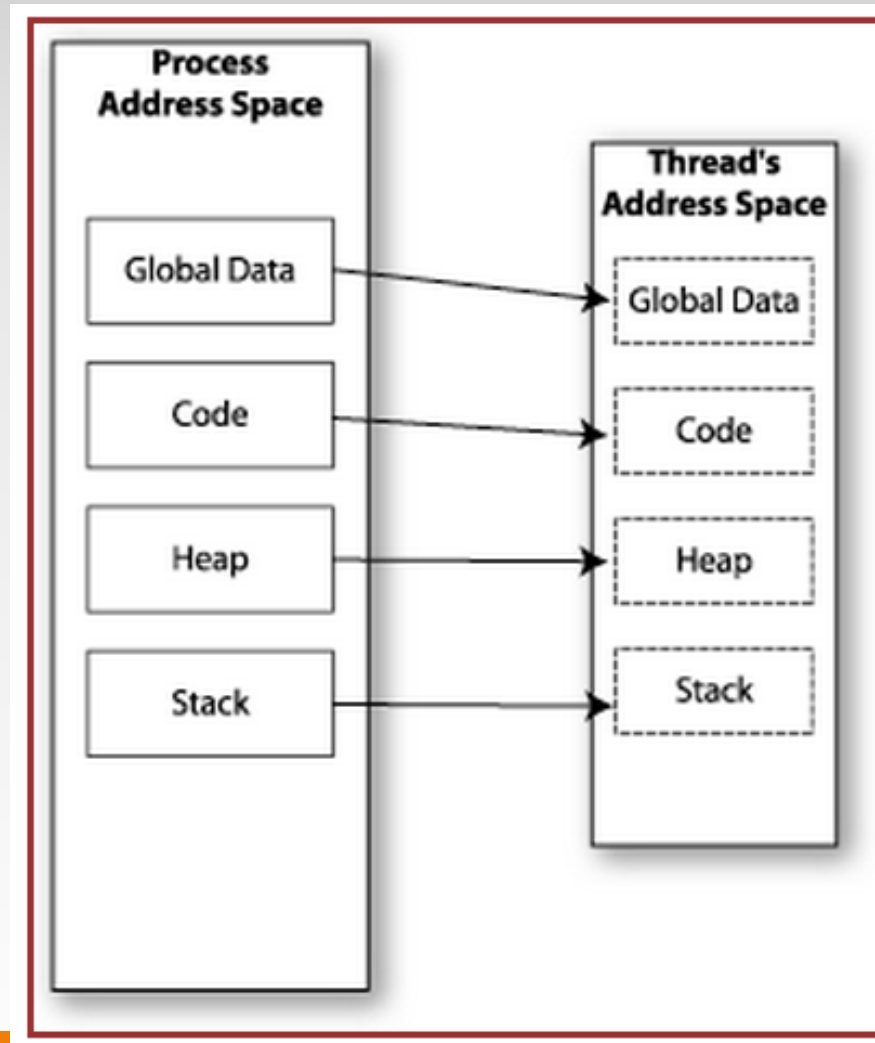
multiple processes
multiple threads per process

Multiple threads sharing a single CPU
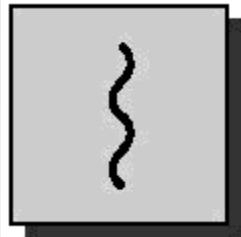
Thread 1			
Thread 2			
Thread 3			

Multiple threads on multiple CPUs

Thread 1	
Thread 2	
Thread 3	

Memory Layout: Single-Threaded Program

Memory Layout: Multithreaded Program