Ex5 - Threading

COP4600

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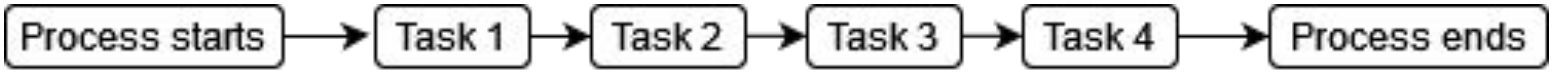
Threads

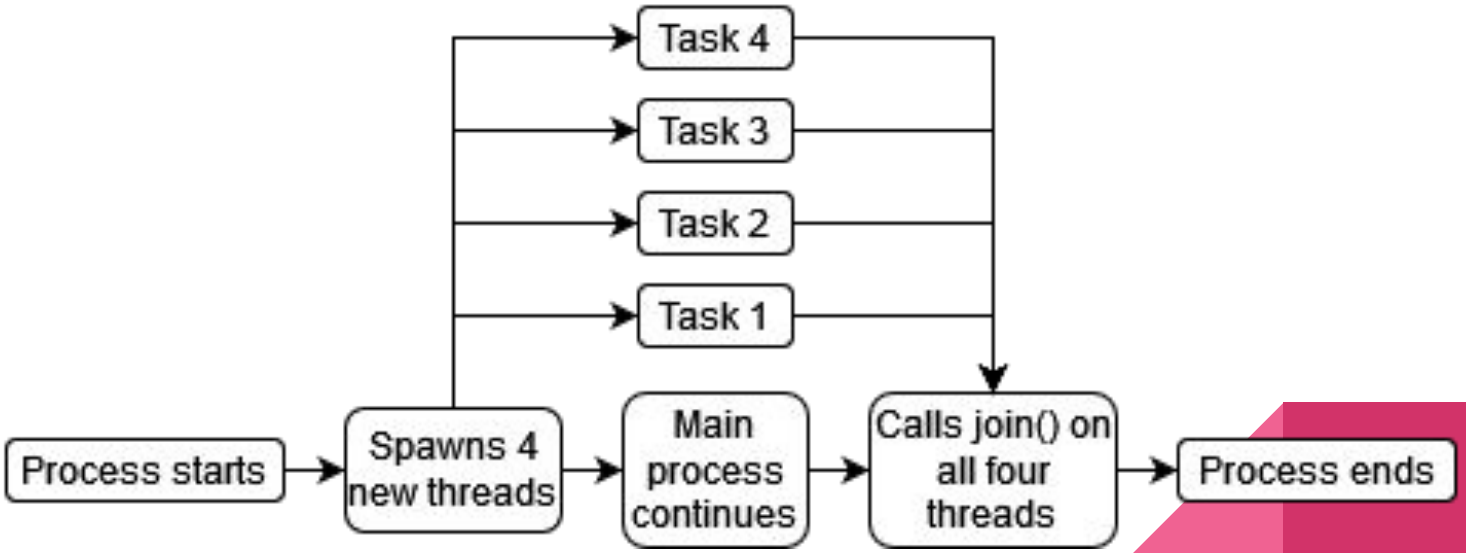
- Threads or ‘execution threads’ are a component of a process that are self-contained programmed instructions.
- Process can (and often will) spawn multiple threads to run in parallel to improve performance.
- On multi-core systems, threads can run on different CPU cores to be processed at the same time.
- Threads are **not** different processes of in themselves, so threads do have access to shared memory within a given program.

Threads (cont.)

- Threads are very useful but can be complicated and dangerous to program with, since it can be difficult to predict when a given thread will finish compared to other threads.
- “Thread safety” refers to programs that have consistently predictable behavior despite being multi-threaded.
- This can be achieved by:
  - Having individual threads never access the same memory.
  - Synchronization methods (ex: mutexes, atomic locking, etc.)

Threads (cont.)





Threading in C++

- C++ threading is usually done with std::thread
- C++ threads are objects, meaning you can store them in any common object containers. Vectors, stacks, queues….
- They usually take in a function as a parameter, along with any parameters you would provide to that function.
  - std::thread thread1(func, 5, 3);
  - This will create a thread called thread1 which will run function func(int num1, int num2), and pass in 5 and 3 as the parameters to that function.

Threading in C++ (cont.)

- You can halt your process until a specific thread completes execution by using threadName.join()
- This does not mean that a given thread will complete before any others.
- If you spawn two threads and call thread1.join() before thread2.join(), thread1 will **not** necessarily always complete first.
- In this exercise, you will be spawning 10 threads that you intentionally want to be randomly completed out of order.
- You can compile your program with:
  g++ <your solution name>.cpp -o ex5.out -pthread -std=c++11
- (Go look at pdf.)