Distributed Applications – Session 4

Lecturer Mouhsen Ibrahim

Contents

Threads

- A thread is currently the smallest unit of execution, it is part of a process and shares the process’s code and global variables.
- Multiple threads can be created in a single process to do different tasks.
- Advantages:

➔ Can improve performance and use multiple processing units if available.

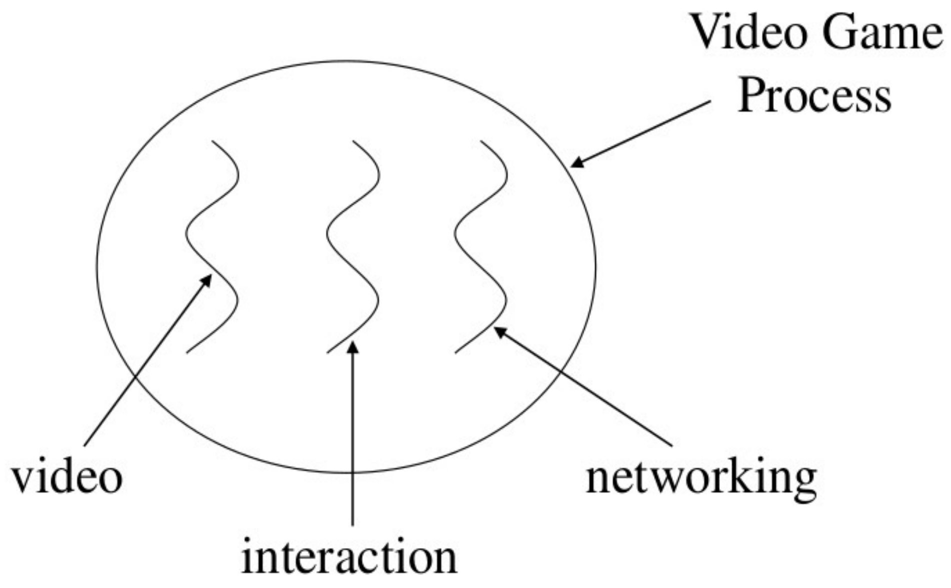
➔ Threads can share resources together.

Threads

- **Disadvantages**

➔ **Threads can lead to deadlocks.**

➔ **Overhead of switching between threads.**



Java Threads

- Threads in Java can be created using two methods

➢ Extending the Thread class

✓ It must implement the run() method.

✓ The thread ends when run() returns.

✓ Call start() method to get the thread ready for running.

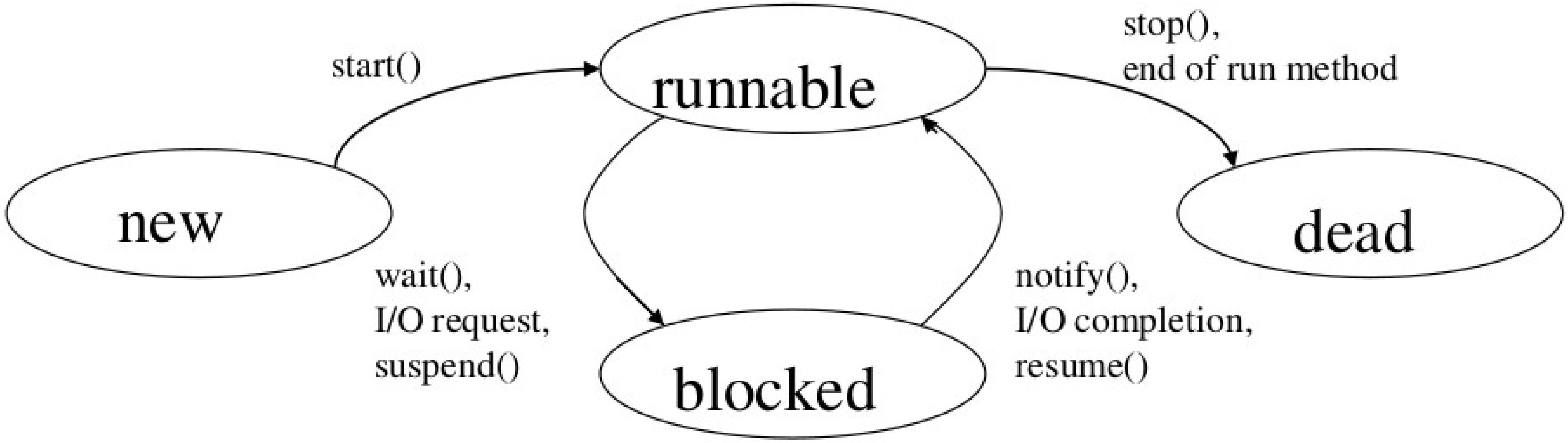
Java Threads

- ➢ Implements the Runnable interface.
- ✓ Implement the run() method.
- ✓ Use the Runnable object as an argument to the Thread class.
- • Using Runnable allows you to extend other classes as well, because in Java you can only extend from one class.
- • To call thread methods here we must use Thread.currentThread() to get an object of a Thread class.

Java Thread methods

- start() method to mark thread as ready for execution.
- join() wait for a thread to finish.
- getName() to return the name of a thread.
- setPriority() 0 to 10 (MIN_PRIORITY to MAX_PRIORITY) 5 is default NORMAL_PRIORITY.
- yield() causes current thread to stop running to allow other threads to run.
- sleep(msec) stop execution for some time

Java Thread States



Exercise 1

- Create a Java Thread that prints numbers from n1 to n2 and then stop.
- Create a main program to create 4 threads and pass different numbers to them then make sure all threads finish before the main thread prints “done”.
- Change the number of threads to 8 rather than 4.

Synchronization

- When multiple threads need to write to a shared resource (memory location, database, file …), they must be synchronized to prevent race conditions.
- Write operations are not atomic so the order of these writes is very important for the end result.
- Java uses the synchronized block with monitor objects allow only a single thread to execute a critical section.
- When used in static methods we can use class object MyClass.class as a monitor.

Exercise 2

- Create a counter class with a synchronized add method.
- Create a thread class that calls add method of its counter attribute.
- Create two threads with the same counter object.
- Create two threads with two different counter objects.

Good Luck