BITS Pilani
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CS F213 - Object Oriented Programming

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Consultation: Fridays 4 – 5 p.m.

https://github.com/JenniferRanjani/Object-Oriented-Programming-with-Java

Multi-threads

Thread 1

- Statement 1 : T11
- Statement 2 : T21
  - sleep
- Statement 3 : T31
- Statement 4 : T41

Thread 2

- Statement 1 : T12
- Statement 2 : T22
- Statement 3 : T32

Race Condition

- In multi-threaded environment, **when more than one thread try to access a shared resource** (modify, write) at the same time.

- Since multiple threads try to race each other to finish executing a method thus the name **race condition**.

- It is safe if **multiple threads are** trying to read a shared resource as long as they are not trying to change it.

Inter-thread Communication

- Synchronized blocks unconditionally blocks all the other threads from asynchronous access

- More subtle level of control can be achieved through interprocess communication

- Multithreading is used to replace polling. Polling is implemented by a loop that is used to check a condition repeatedly. Once the condition is true, appropriate action is taken. This wastes CPU time.
  - Eg. Producer / Consumer problem

IPC methods

- wait() – tells the calling thread to give up the monitor and go to sleep until some other thread enters the same monitor and calls notify() or notifyAll().
- notify() – wakes up a thread that called wait() on the same object.
- notifyAll() – wakes up all the threads waiting on the same object.

Difference between the sleep and yield methods

- Similarity
  - Both are static methods and operate on the current thread
  - Both get CPU back from the thread to thread scheduler
  - Both relinquish CPU from current thread, but does not release any lock held by the thread.
  - If the locks are to be released along with the CPU, then use wait() method.

- Difference
  - Sleep is more reliable because when yield is used there is a possibility of same thread getting the CPU
  - It is advisable to use Thread.sleep(1) instead of yield.

Deadlock

Figure - 1

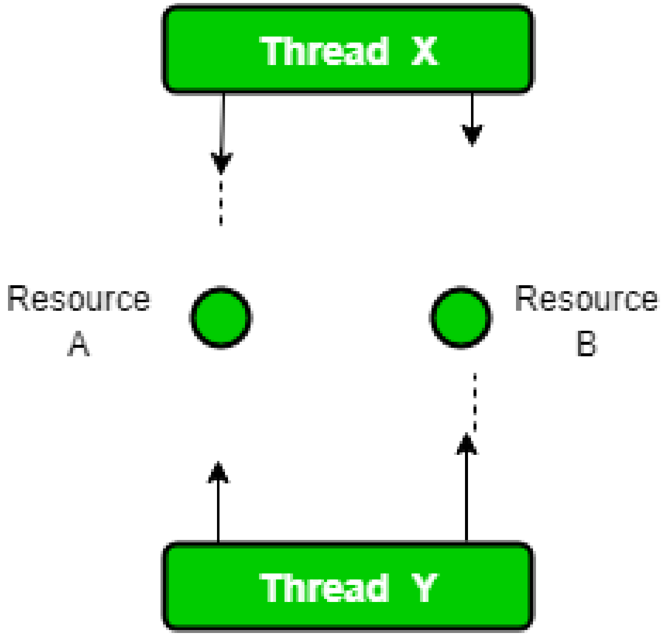
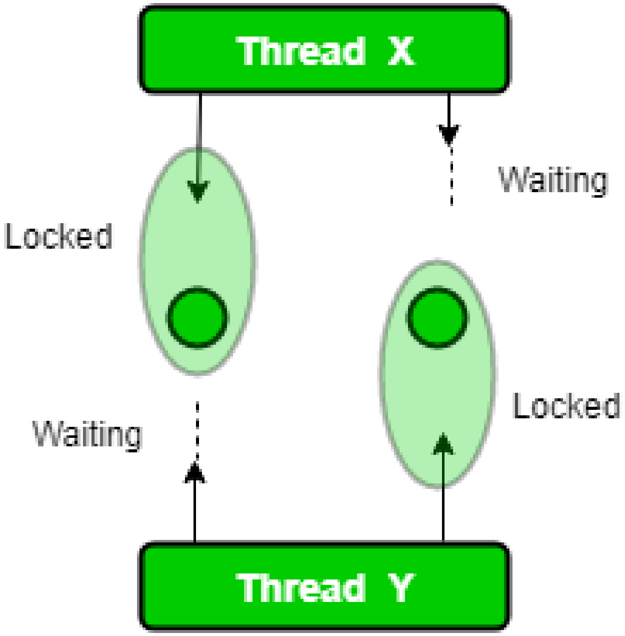


Figure - 2



Suspend, Resume, Stop

- suspend(), resume(), stop() – are used to pause, restart and terminate a thread
- But, they are deprecated because they can sometimes cause serious failures.
- wait() and notify() methods can be used to suspend and resume thread using a Boolean flag