Java Multithreading

Presented by

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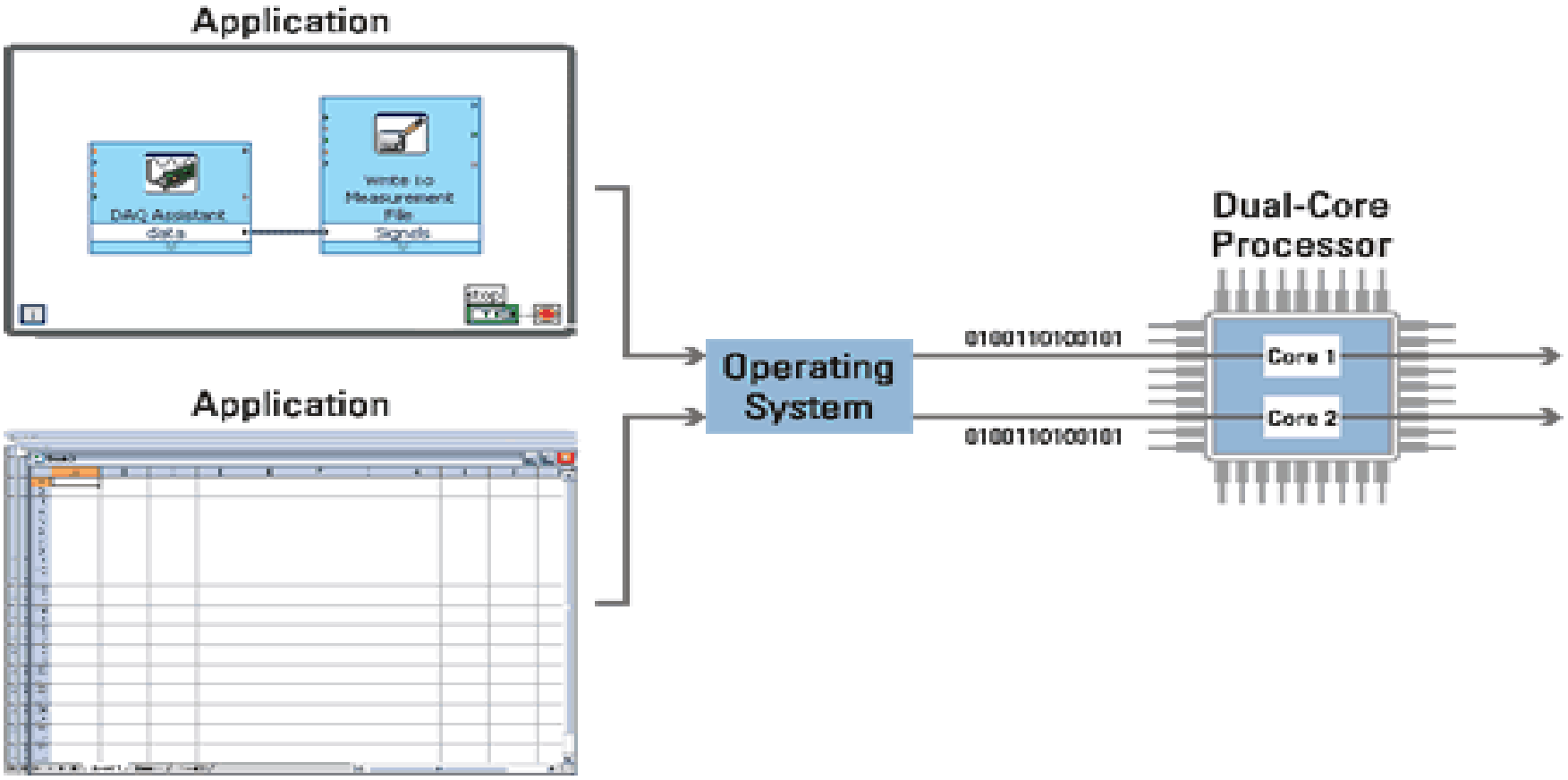
Multitasking

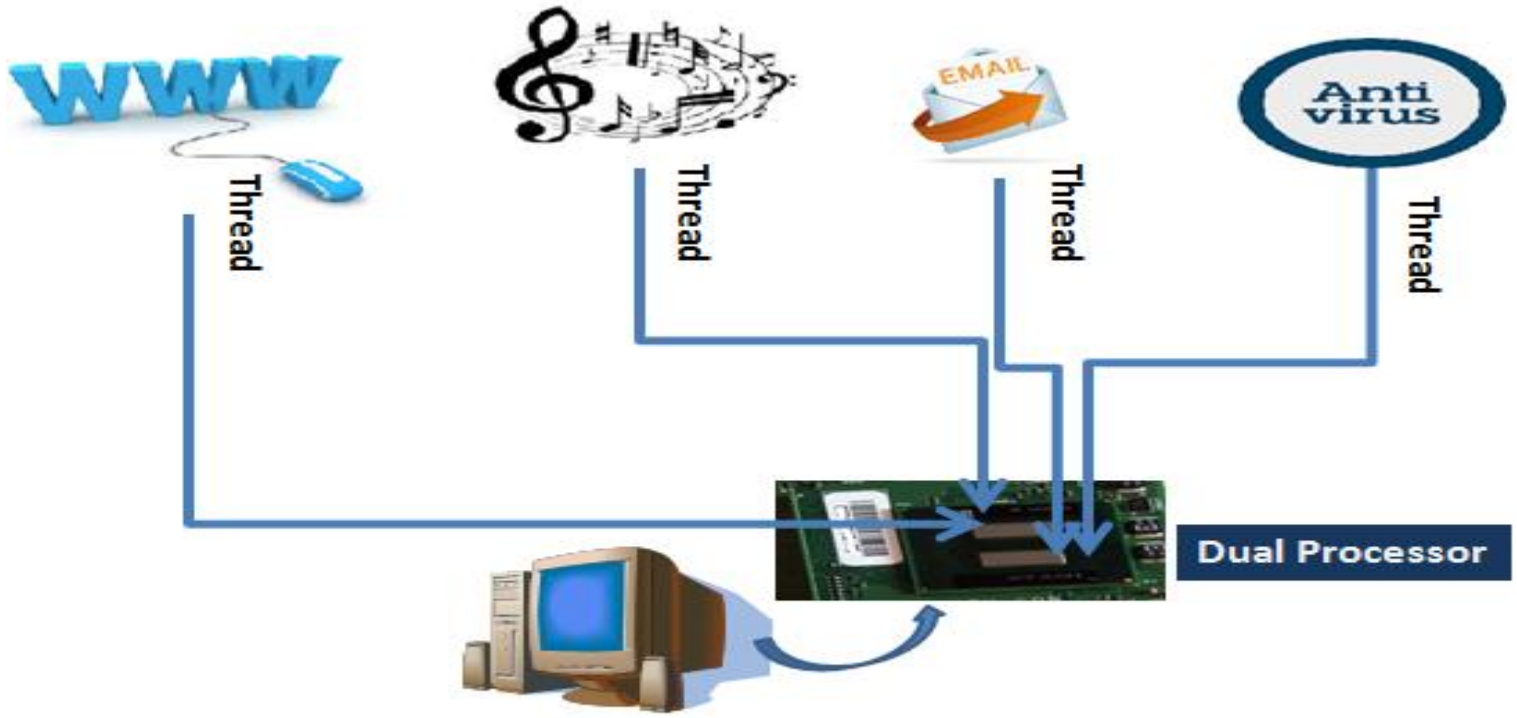
Executing multiple programs simultaneously.

1. Process based **2. Thread based**

Multitasking Applications



Multitasking Applications



Multithreading On a Dual Processor Desktop System

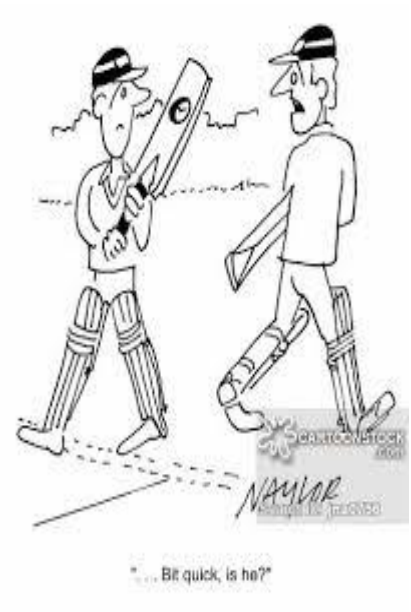
Note: Multithreading can also be possible on single processor systems

Multitasking

1

2

3



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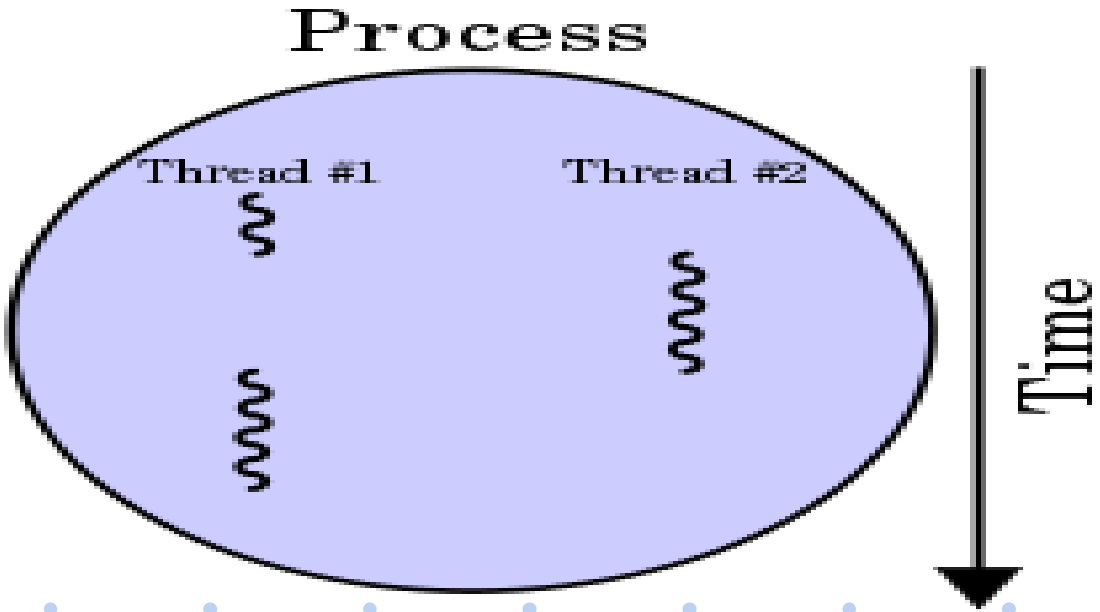
Multi Threading

Thread

The smallest unit of processing

Ex: Few lines of code – computing 3 account's interest



Multi Tasking vs Multi Threading

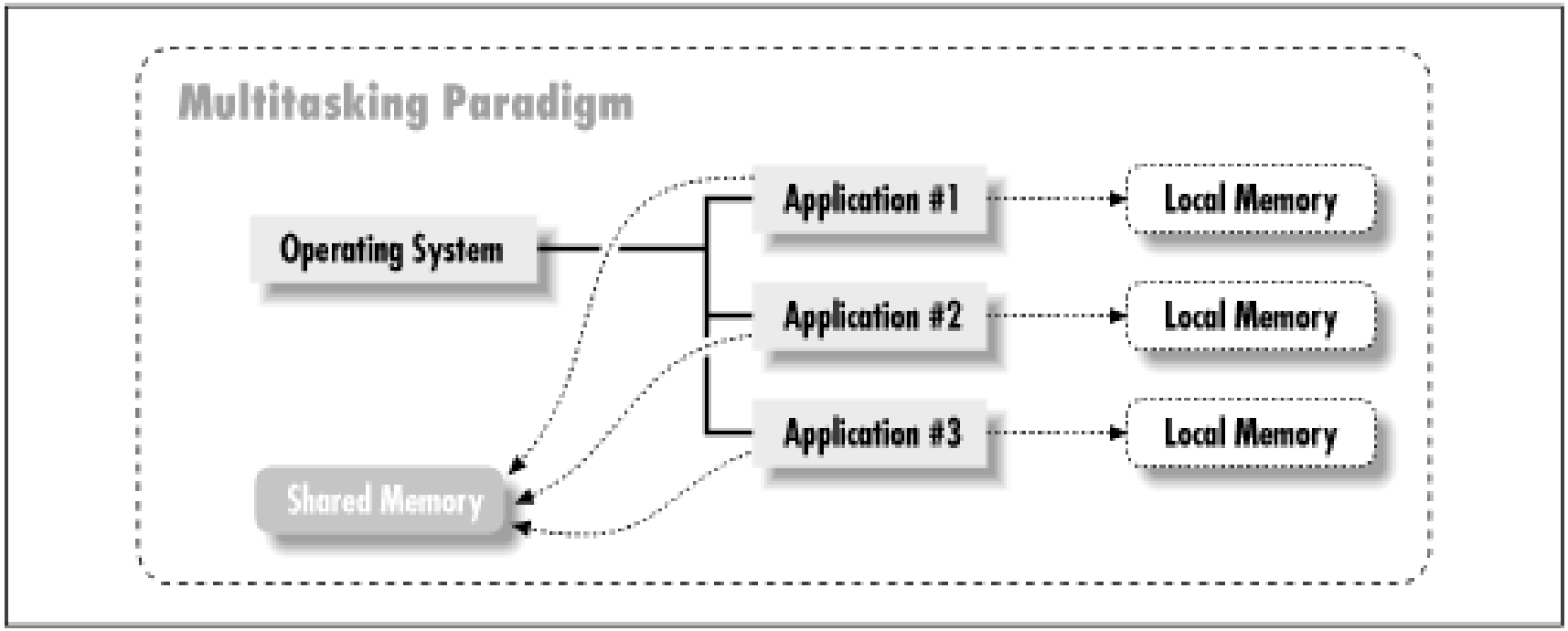
Multitasking and Multithreading

- Multitasking:
  - refers to a computer's ability to perform multiple jobs concurrently
  - more than one program are running concurrently, e.g., UNIX
- Multithreading:
  - A thread is a single sequence of execution within a program
  - refers to multiple threads of control within a single program
  - each program can run multiple threads of control within it, e.g., Web Browser

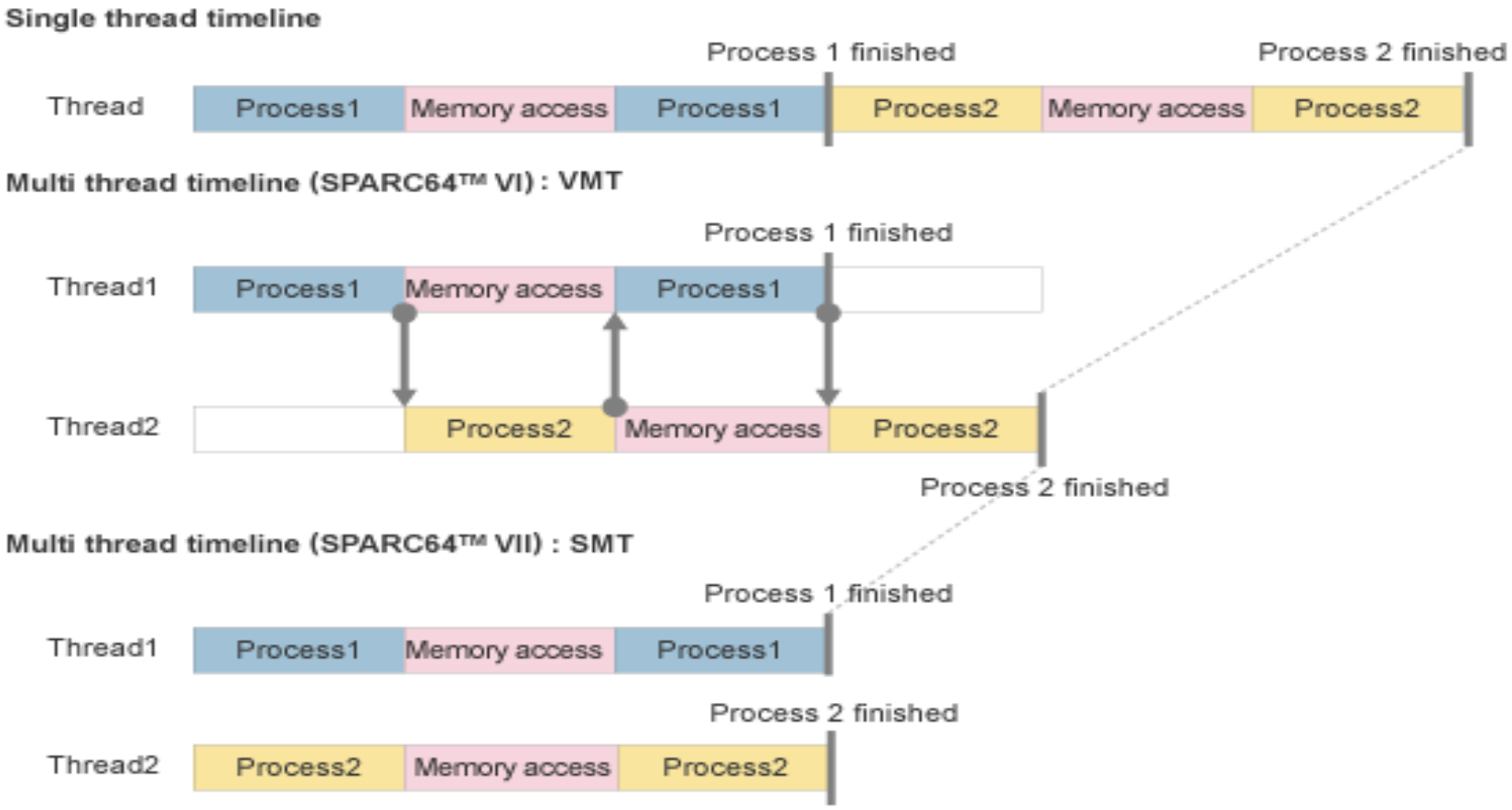
2

Multitasking Environment

Data within processes is seperated; separate stack for local variables and data area for objects



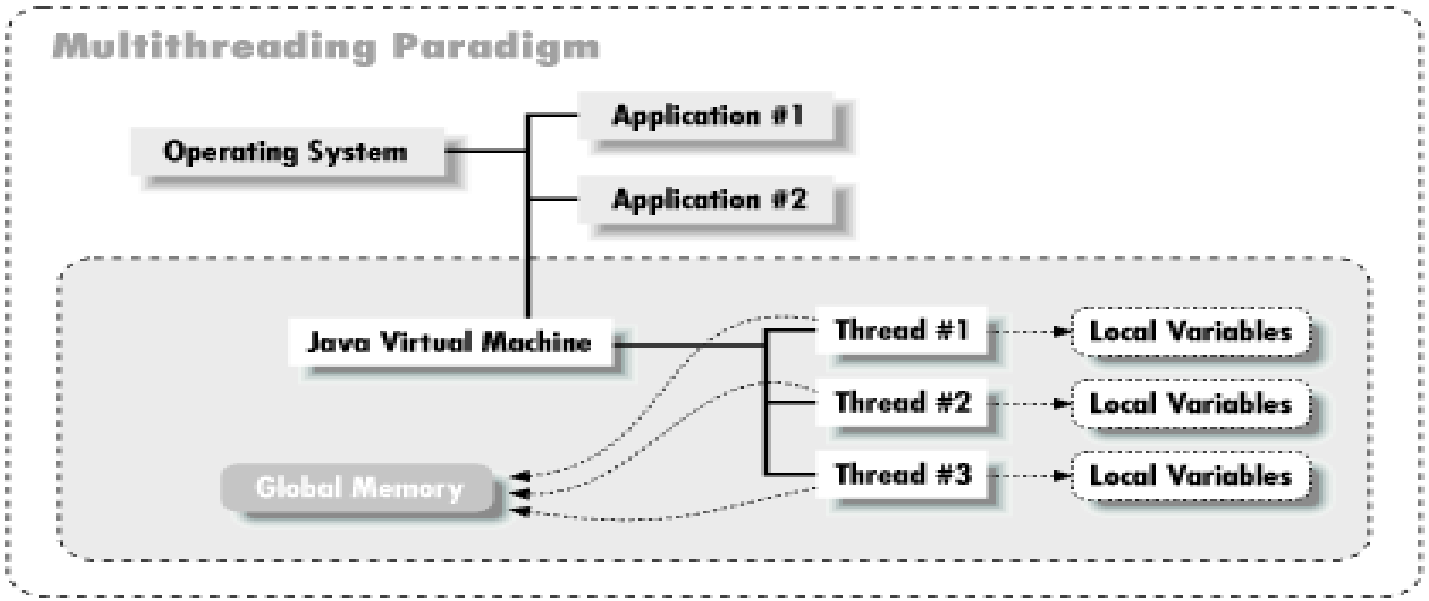
Multitasking with Threads



Multitasking with Threads

Thread - similar to process

Multiple thread running within a single instance of JVM – similar to multiple processes within an OS



Thread Life Cycle

Implementing Threads

Threads are developed by :

First, by subclassingthe **Thread** class

Second, by implementing the **Runnable** interface

Override the public void run() method

Place the functionality in the run()method

How a thread starts?

public void start()

- Creates a new thread. The thread will be in runnablestate

public void run()

- The new thread begins its life

Thread Life Cycle

```
public class BytePrinter extends Thread {
        public void run() {
                for (intbnum= -128; bnum< 128; bnum++) {
                        System.out.println(bnum);
                }
        }
}
```

Multithreading Issues

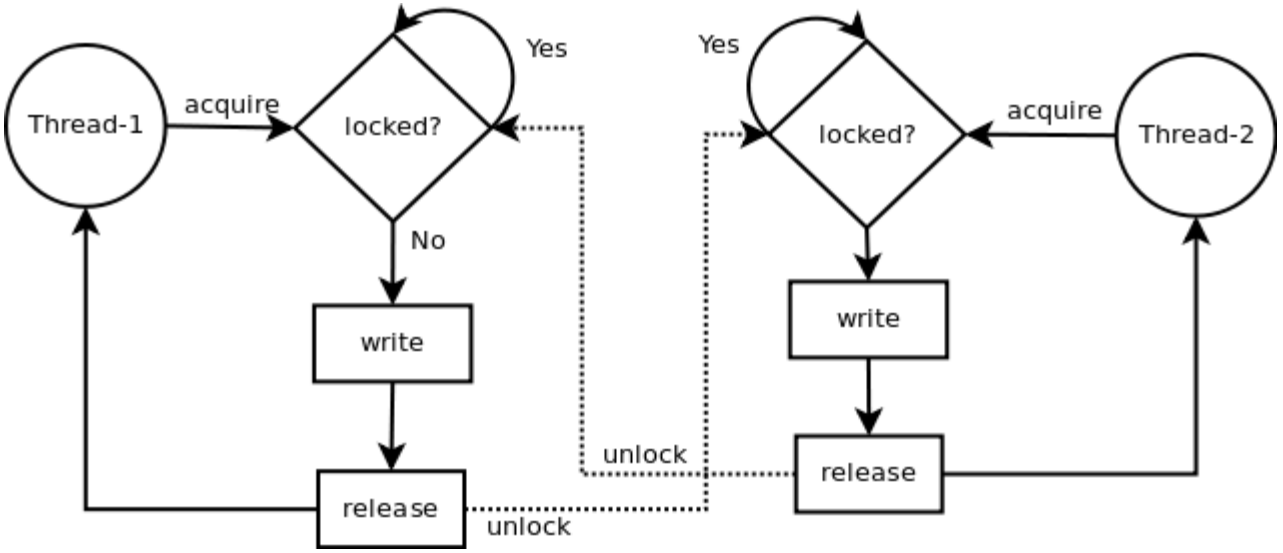
- A single-threaded program performs one task at a time
- With multithreading ,two or more threads may coexist and possibly try to use the same resource simultaneously.
- Colliding over a resource must be prevented
- Because many threads may try to access the same resource, which may yield undesirable result

Solution - Synchronization

Thread Synchronization

- **Placing a lock on a resource when one thread is utilizing it.**

- **The first thread that accesses a resource locks it**
- **Other threads can not access that resource until it is unlocked.**



Thread Synchronization

- **Methods can be declared as synchronized.**

- **Only one thread at a time can call a synchronized**
- **method of a particular object.**

- **Every thread object has a lock / monitor.**

- **The object that has synchronizedmethod, is locked**

- **No other synchronized methods of that object is called until the first thread completes and releases the lock**

Thread Synchronization Example

```
public class Shared // used by UserThread class methods
        public synchronized int get() {
                forI(int taskNo=1;taskNo<=5;taskNo++) {
                        // code goes here
                }
        }

        public synchronized  void put() {
                for(int taskNo=1;taskNo<=5;taskNo++) {
                        // code goes here
                }
        }

}
```

Thread Synchronization Example

```
public class MainSynch {
        public static void  main(String args[]) {
                UserThread ut1 = new UserThread();
                UserThread ut2 = new UserThread();
                ut1.start();
                ut2.start();
        }
}
```

Interthread Communication

Allowing “synchronized threads” to communicate with each other. implemented by following methods of Object class:

wait() – Makes the thread to halt until it is notified

notify() - Wakes up a single thread that is waiting on this object

notifyAll() - Wakes up all threads that are waiting on this object


return
THANK
YOU
alt
control