

## EXPERIMENT 2

Aim Write a program to demonstrate multithread application

Theory: Multithreading is a JAVA feature that allows concurrent execution of two or more parts of a program for maximum utilization of CPU. Each part of such program is called a thread so threads are light-weight process within a process.

Multithreading application execute two or more threads run concurrently hence, it is also known as concurrency in Java. Each thread runs parallel to each other. Multiple threads don't allocate separate memory area, hence they save memory also, context switching between threads, takes less time.

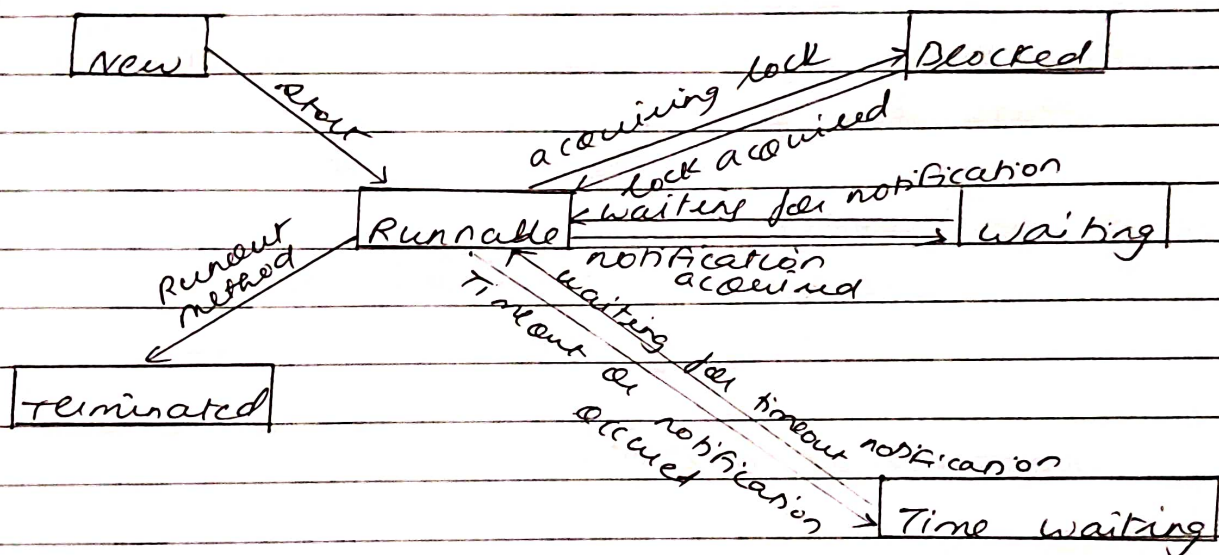
Importance of multithreading

- 1) Multithreading improves throughput so that many concurrent computation operations and also requests within single process
- 2) Simultaneous and fully symmetric use of multiple processors for computation and also improve server responsiveness
- 3) Large or complex requests or slow clients never block other requests for service

4) Less memory consumption

5) Synchronization of thread provides enhanced process to process communication sharing large amount of data through separate threads of execution

### State diagram



#### 1) New Thread

This is the state the thread is in after the thread instance has been created, but the `start()` method has not been invoked on the thread.

#### 2) Runnable State

This is the state a thread is in when it's eligible to run, but the scheduler has not selected it to be the running thread.



A thread first enters the runnable state when the `start()` method is invoked, but a thread can also return to the runnable state after either running or coming back from a blocked, waiting or sleeping state.

### 3) Running State

- This is the state a thread is in when the thread scheduler selects it to be the currently executing process.
- The component of JVM that decides the order in which threads will be executed is termed as the thread scheduler.
- The order in which runnable threads are chosen to run is not guaranteed.

### 4) Blocked State

- This is the state a thread is in when it's not eligible to run.
- sleeping / timed waiting state
  - A thread may be sleeping because the thread's run code tells it to sleep for some period of time.

### 5) Terminated state

- A thread is considered dead when its `run()` method completes.
- It may still be a viable thread object, but it is no longer a separate thread of execution.

→ Once thread is dead, it can never be brought back to life.

### Command related to thread

- 1) start: start a thread by calling its run method
- 2) run: Entry point for a thread
- 3) sleep: suspend a thread for period of time
- 4) join: wait for a thread to terminate
- 5) isAlive: Determine if a thread is still running
- 6) getpriority: obtain thread's priority
- 7) getName: obtain thread's name

Conclusion: Thus, we have studied and demonstrated the concept of multithreading and its states successfully.

## Multi-threading

multithreads.java

class two implements Runnable

```
{  
    public void run()  
    {  
  
        for(int j=0;j<5;j++)  
            System.out.println("Second:" +j);  
    }  
}
```

class three implements Runnable

```
{  
    public void run()  
    {  
        // this is third task  
        for(int k=0;k<5;k++)  
            System.out.println("Third:" +k);  
    }  
}
```

class multithreads

```
{  
    public static void main (String args[])  
    {  
        two t = new two();  
        three tt = new three();  
        Thread th = new Thread(t);  
        Thread th2 = new Thread(tt);  
  
        th.start();  
        th2.start();  
  
        //first task  
        for(int i=0;i<5;i++)  
            System.out.println("First:" +i);  
    }  
}
```

C:\Windows\System32\cmd.exe

```
C:\Users\User\Desktop\sem8-exps-anish\DC\exp2>javac multithreads.java
```

```
C:\Users\User\Desktop\sem8-exps-anish\DC\exp2>java multithreads
```

First:0

Third:0

Third:1

Second:0

Third:2

First:1

First:2

Third:3

Second:1

Third:4

First:3

Second:2

First:4

Second:3

Second:4

```
C:\Users\User\Desktop\sem8-exps-anish\DC\exp2>
```

cmd C:\Windows\System32\cmd.exe

```
Third:2
First:1
First:2
Third:3
Second:1
Third:4
First:3
Second:2
First:4
Second:3
Second:4
```

C:\Users\User\Desktop\sem8-exps-anish\DC\exp2>java multithreads

```
First:0
Third:0
Third:1
Third:2
Third:3
Third:4
Second:0
First:1
Second:1
First:2
Second:2
Second:3
First:3
Second:4
First:4
```