

Java Threads

```
import java.lang.Thread;
```

Threading

The ability to have more than one program working at what seems like the same time.

Thread States

- new
- runnable
- blocked
- dead

Thread Methods

- start()
- sleep()
- yield()
- run()
- wait()
- notify()
- notifyAll()
- setPriority()

Extending Thread

```
class TickTock extends Thread {  
  
    public void run() {  
        //programming statements go here.  
    }  
}  
  
public class ClockTest {  
  
    public static void main(String[] args) {  
  
        TickTock clock = new TickTock();  
  
        clock.start();  
  
        while(true){  
        }  
  
    }  
}
```

Implementing Runnable

```
class TickTock implements Runnable {  
  
    public void run() {  
        //programming statements go here.  
    }  
  
}  
  
public class ClockTest {  
  
    public static void main(String[] args) {  
  
        Thread clock = new Thread(new TickTock());  
  
        clock.start();  
  
        while(true){  
        }  
  
    }  
  
}
```

Blocking

- `sleep()`
- synchronized methods
- deadlock – `stop()`, `suspend()`, `resume()`, `destroy()`
- I/O
- `wait()`

sleeping Thread

```
public class Sleepy {  
  
    public static void main(String[] args) {  
  
        System.out.println("I'm waiting");  
  
        try {  
            Thread.currentThread().sleep(5000);  
        }  
  
        catch (InterruptedException e) {  
            System.out.println("Work up by some other process.");  
        }  
  
        System.out.println("All done waiting for X seconds.");  
    }  
}
```


synchronized

- race condition
- atomic operations
- object locks
- Synchronized methods
- Synchronized blocks of code

Unsynchronized Transactions, Non-atomic operations

Thread 1

- Load accounts [to] CPU register
- Add amount(store results in CPU register
- Loose CPU due to interruption

Thread 2

- Load accounts [to] CPU register
- Add amount(store results in CPU register
- Loose CPU due to interruption

Thread 1 → Move the result back to accounts [to]

Thread 2 → Move the result back to accounts [to]

Thread Communication

- PipedInputStream
- PipedOutputStream
- PipedReader
- PipedWriter

Misc. Thread Things

- Thread Groups
- Daemons
- Swing Threads
 - Most components are not thread safe.

Programming Assignment