City University

SE 409,410: Advanced Enterprise Java and Laboratory

Lecture 6

Thread in java

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Multitasking and Multithread

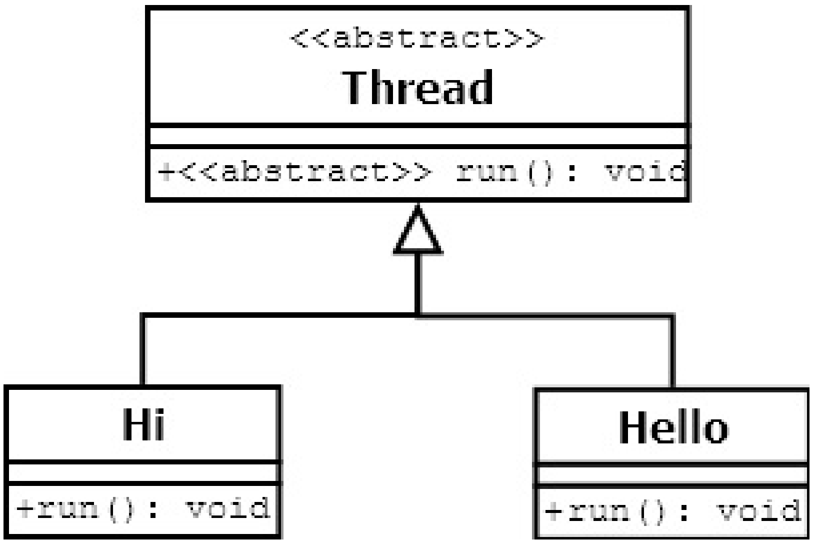
- In computing, multitasking is a concept of performing multiple tasks (also known as processes) over a certain period of time by executing them concurrently, e.g. OS.
- A thread is a single sequence of execution within a program.
- Multithreading referes to multiple threads of control within single program.
- An executing instance of a program is called a process. Processes has their own address space and Thread share the address spcace of process.
- There are two ways to create a thread:

> *By extending Thread class*
>
> *By implementing Runnable interface.*

- Both cases implements run method.
- **Class without Thread**

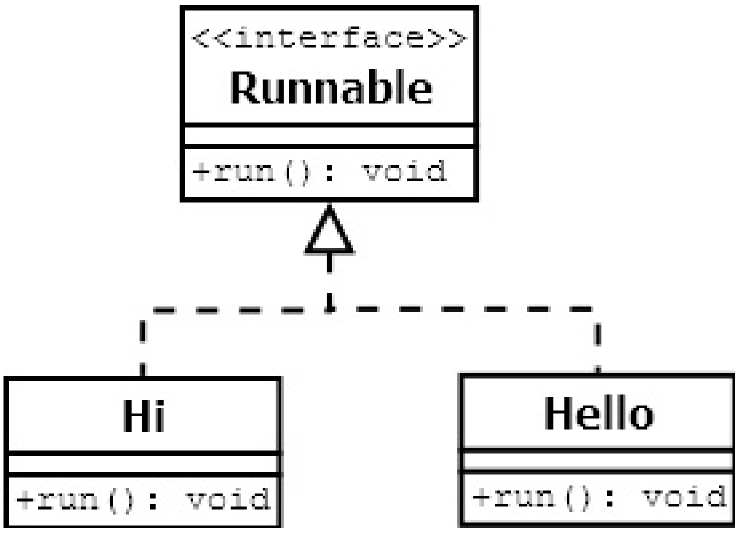
```java
class Hi {
    public void show() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hi");
        }
    }
}
class Hello {
    public void show() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hello");
        }
    }
}
public class App3 {
    public static void main(String[] args) {
        Hi obj1 = new Hi();
        Hello obj2 = new Hello();
        obj1.show();
        obj2.show();
    }
}
```

- **Class with Thread**



```
class Hi extends Thread{
    public void run() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hi");
            try{Thread.sleep(1000);}catch(Exception e){}
        }
    }
}
class Hello extends Thread{
    public void run() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hello");
            try{Thread.sleep(2000);}catch(Exception e){}
        }
    }
}
public class App3 {
    public static void main(String[] args) {
        Hi obj1 = new Hi();
        Hello obj2 = new Hello();
        obj1.start();
        obj2.start();
    }
}
```

- **Thread implements Runnable interface**



```
class Hi implements Runnable{
    public void run() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hi");
            try{Thread.sleep(2000);}catch(Exception e){}
        }
    }
}
class Hello implements Runnable{
    public void run() {
        for (int i = 0; i <= 5; i++) {
            System.out.println("Hello");
            try{Thread.sleep(500);}catch(Exception e){}
        }
    }
}
public class App3 {
    public static void main(String[] args) {
        Hi obj1 = new Hi();
        Hello obj2 = new Hello();
        Thread t1 = new Thread(obj1);
        Thread t2 = new Thread(obj2);
        t1.start();
        t2.start();
    }
}
```

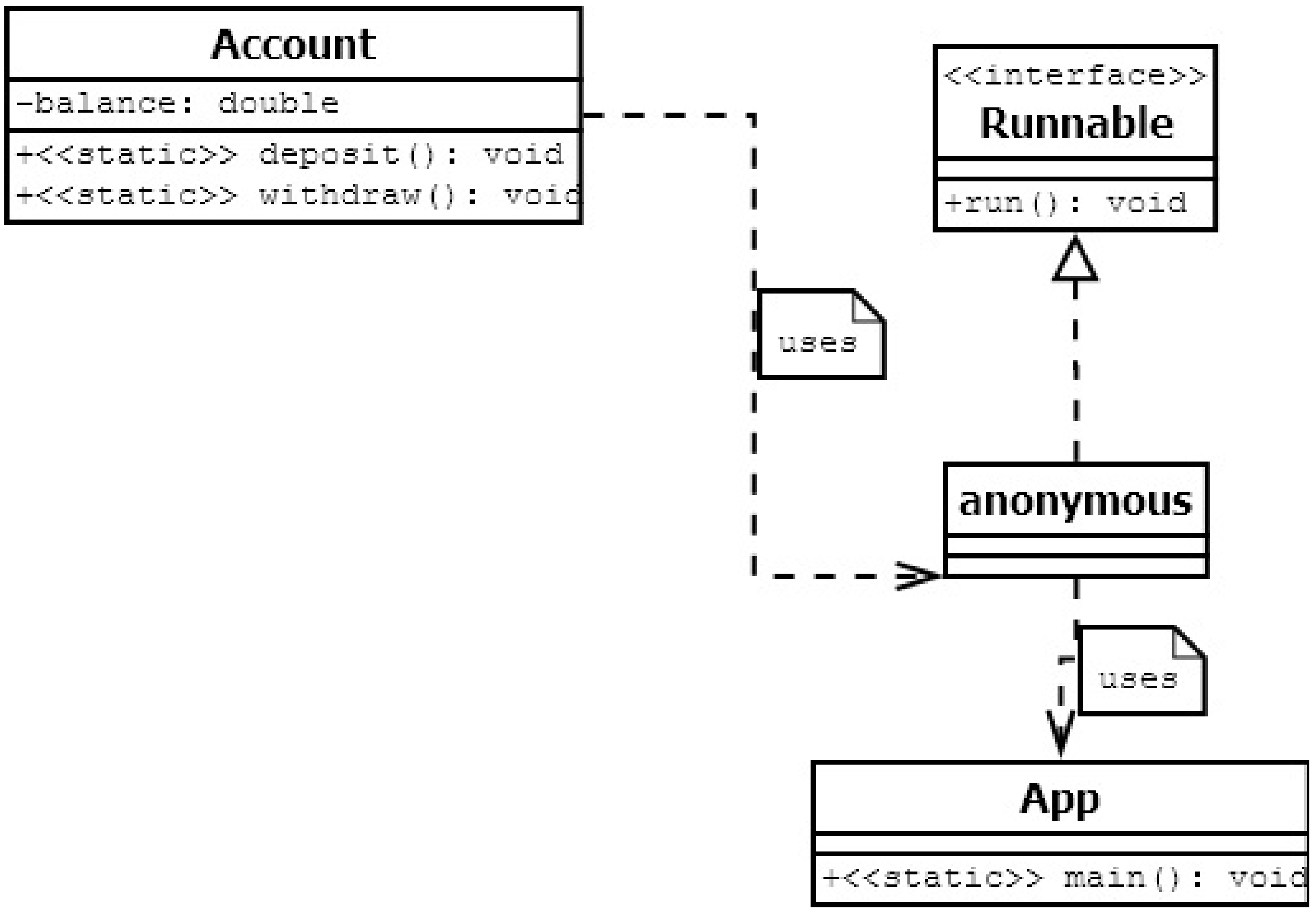
- ## More Example

```
//extends Thread Class---way1
class Myclass1 extends Thread {
    @Override
    public void run() {
        for (int i = 0; i < 10; i++) {
            System.out.println(Thread.currentThread().getI
d()+" Value " + i);
        }
        try {
            Thread.sleep(2000);
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    }
}
//Implements Runnable interface--way2
class Myclass2 implements Runnable {
    @Override
    public void run() {
        for (int i = 0; i < 5; i++) {
            System.out.println(Thread.currentThread().getI
d()+" Value " + i);
        }
    }
}

class App {
    public static void main(String args[]) {
        //way1 test
        //Myclass1 c1 = new Myclass1();
        //c1.start();
        //Myclass1 c2 = new Myclass1();
        //c2.start();

        //way2 test
        Thread t1 = new Thread(new Myclass2());
        Thread t2 = new Thread(new Myclass2());
        t1.start();
        t2.start();
    }
}
```

- **Creating an anonymous thread by implementing the Runnable interface.**

```
public class App2 {
    public static void main(String[] args) {
        Thread t1 = new Thread(new Runnable() {
            @Override
            public void run() {
                for (int i = 0; i < 10; i++) {
                    System.out.println(Thread.currentThrea
d().getId() + " Value " + i);
                }
                try {
                    Thread.sleep(2000);
                } catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        });
        t1.start();
    }
}
```

- **Join and Synchronized(For Thread Safety)**



```
class Account {
    private static double balance;
    public static synchronized void deposit() {
        balance = balance + 5;
    }
    public static synchronized void withdraw() {
        balance = balance - 1;
    }
    public static double getBalance() {
        return balance;
    }
}
public class App4 {
    public static void main(String[] args) {
        Thread t1 = new Thread(new Runnable() {
            @Override
            public void run() {
                for (int i = 1; i <= 100; i++) {
                    Account.deposit();
                }
            }
        });
        Thread t2 = new Thread(new Runnable() {
            @Override
            public void run() {
                for (int i = 1; i <= 100; i++) {
                    Account.withdraw();
                }
            }
        });
        t1.start();
        t2.start();
        try {
            t1.join();
            t2.join();
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
        System.out.println(Account.getBalance());
    }
}
```