





Day 11

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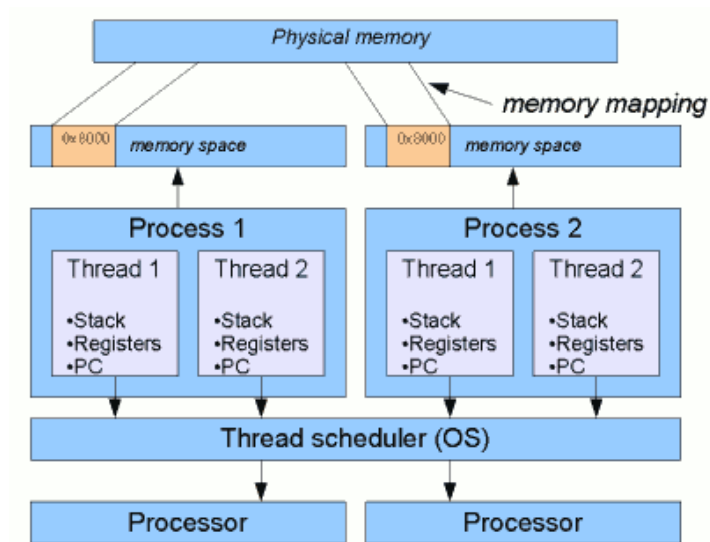
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Thread

- Minute process
- A sub process
- Part of a big process
- Operation Research
 - Shortest path
 - how to multi threaded programming
 - Critical path
 - Parallel processing
- Multi tasking
- By default run in a single thread
- Parallel thread - need to be spanned
- 1991 - SMS Released Thread API
- Thread become old
 - Can be done by
 - Extending Thread
 - Implementing Thread

- 2005 - SMS - Released executor framework (New Way)
 - Became platform independent
 - Threads are CPU hungry
 - Need to know how to control a thread

How thread works ?



- All program by default run un single thread
- Run in main thread
- Name
- Priority - 1 - 10
- Group
- Thread wait in a area called semaphore
- Child thread start after main execution or intrusion
-

```
Thread t = Thread.currentThread();
// used to capture the current thread (main thread)
t.setName("hello");
// used to set the thread name
t.setPriority(10);
// used to set the priority of an thread (1-10)
```

```

Thread t = new Thread(new MyThread());
// create new thread instance
t.start();
// starting the thread

// work of the thread
class MyThread implements Runnable {
    @Override
    public void run() {
        System.out.println("Child thread called")
    }
}

```

```

Thread.sleep(30000);
// used to pause the thread

```

Executor framework

```

ExecutorService es = Executors.newFixedThreadPool(1);
es.execute(new MyThreadWork());
es.shutdown();

```

Single Thread Demo

```

package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class ThreadIntro {
    ThreadIntro() {
        // Thread t2 = new Thread(new MyThreadWork());
        // t2.start();
        ExecutorService es = Executors.newFixedThreadPool(1);
        es.execute(new MyThreadWork());
        es.shutdown();
    }

    public static void main(String[] args) throws InterruptedException {
        new ThreadIntro();
        Thread t = Thread.currentThread();
        System.out.println(t);
        for (int i = 0; i < 5; i++) {
            System.out.println(i);
            Thread.sleep(1000);
        }
    }
}

```

```
class MyThreadWork implements Runnable{

    @Override
    public void run() {
        System.out.println("Child thread called");
    }
}
```

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Multi Thread

- Java by default single threaded
- Railway reservation counter is a example

Two Thread One Object

- Two thread two task

```
package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class TwoThreadOneObj {
    public static void main(String[] args) {
        ExecutorService es = Executors.newFixedThreadPool(2);
        ReservationCounter central = new ReservationCounter();
        es.execute(() -> {
            Thread.currentThread().setName("ramu");
            central.bookTicket(1000);
            central.giveChange();
        });

        es.execute(() -> {
            Thread.currentThread().setName("somu");
            central.bookTicket(500);
            central.giveChange();
        });

        es.shutdown();
    }
}

class ReservationCounter {
    int amt;

    public void bookTicket(int amount) {
        this.amt = amount;
    }
}
```

```

        Thread t = Thread.currentThread();
        String name = t.getName();
        System.out.println("Ticket booked for...." + name + "....amt is...." + this.amt);
        //System.out.println("Amount brought by "+name+" is..: "+amt);
    }

    public void giveChange() {
        Thread t = Thread.currentThread();
        String name = t.getName();
        System.out.println("Change being given to....." + name + " and the amount is..." + (amt - 100));
    }
}

```

- Method Lock
 - Optimistic Lock
 - Pessimistic Loc
- Object Lock
 - Locking whole object

```

package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class TwoThreadOneObjLock {
    public static void main(String[] args) {
        ExecutorService es=Executors.newFixedThreadPool(2);
        ReservationCounter2 central=new ReservationCounter2();
        es.execute()->{
            Thread.currentThread().setName("ramu");
            // object lock
            synchronized(central) {
                central.bookTicket(1000);
                central.giveChange();}
        });

        es.execute()->{
            Thread.currentThread().setName("somu");
            // object lock
            synchronized(central) {
                central.bookTicket(500);
                central.giveChange();}
        });

        es.shutdown();
    }
}

class ReservationCounter2 {
    int amt;
    public void bookTicket(int amount) {
        this.amt=amount;
        Thread t=Thread.currentThread();
        String name=t.getName();
    }
}

```

```


        System.out.println("Ticket booked for...:"+name+"....amt is...:"+this.amt);
        //try {Thread.sleep(10000);}catch(Exception e) {}
        //System.out.println("Amount brought by "+name+" is..: "+amt);
    }

    public void giveChange() {
        Thread t=Thread.currentThread();
        String name=t.getName();
        System.out.println("Change being given to.....:"+name+" and the amount is..."+(amt-100));
    }
}

```

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Two Thread One Object

- Two thread one task
- Producer / Consumer
- Inter thread communication
-

```

package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class SingleObjectTwoThreadsOneTask {
    public static void main(String[] args) {
        Gun bofors=new Gun();
        ExecutorService es= Executors.newFixedThreadPool(2);
        es.execute(()->{
            Thread.currentThread().setName("filler");
            for(int i=0;i<5;i++) {
                bofors.fill();
            }
        });

        es.execute(()->{
            Thread.currentThread().setName("shooter");
            for(int i=0;i<5;i++) {
                bofors.shoot();
            }
        });
        es.shutdown();
    }
}

class Gun{
    boolean flag;
}

```

```

synchronized public void fill() {
    if(flag) {
        try {
            //Thread.sleep(5000);
            wait();
        } catch (Exception e) {

        }

    }
    System.out.println("fill the gun.....");
    flag=true;
    notify();
}

synchronized public void shoot() {
    if(!flag) {
        try {
            //Thread.sleep(5000);
            wait();
        } catch (Exception e) {


        }

    }
    System.out.println("shoot the gun.....");
    flag=false;
    notify();//it will notify the waiting filler thread inside the monitor
}
}

```

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Deadlock

- Circular dependency

```

package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class DeadLockDemo {
    public static void main(String[] args) {
        Crane crane = new Crane();
        Frog frog = new Frog();

        ExecutorService es = Executors.newFixedThreadPool(2);
        es.execute(() -> {
            crane.eat(frog);
        });
        es.execute(() -> {
            frog.escape(crane);
        });
    }
}

```

```

    });

    es.shutdown();
}

class Crane {
    synchronized public void eat(Frog frog) {
        System.out.println();
        frog.leaveCrane();
    }

    synchronized public void spitFrog() {

    }
}

class Frog {
    synchronized public void escape(Crane c) {
        c.spitFrog();
    }


    synchronized public void leaveCrane() {

    }
}

```

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One Object One Thread 2

- One object one thread , another in another object
-

```

package ga.veee.day11;

import java.util.concurrent.ExecutorService;
import java.util.concurrent.Executors;

public class ThreadLocalDemo {
    public static void main(String[] args) {
        ExecutorService es= Executors.newFixedThreadPool(2);
        es.execute(()->{
            Resource r=ThreadLocalUtility.getResource("first");
            System.out.println(r);
            //ThreadLocalUtility.closeResource();
            r=ThreadLocalUtility.getResource("first first");
            System.out.println(r);
        });

        es.execute(()->{

```



```

        Resource r=ThreadLocalUtility.getResource("second");
        System.out.println(r);
        r=ThreadLocalUtility.getResource("second second");
        System.out.println(r);
    });

    es.shutdown();
}
}


class ThreadLocalUtility{
    private static ThreadLocal tLocal=new ThreadLocal();
    synchronized public static Resource getResource(String name){
        Resource r=(Resource)tLocal.get();
        if(r==null) {
            r=new Resource(name);
            // try {Thread.sleep(2000);}catch(Exception e) {}
            tLocal.set(r);
        }
        r.name=name;
        return r;
    }
    public static void closeResource() {
        Resource r=(Resource)tLocal.get();
        if(r!=null) {
            tLocal.remove();
        }
    }
}

class Resource{
    String name;
    public Resource(String name) {
        System.out.println("Resource Object created...");
        this.name=name;
    }
    @Override
    public String toString() {
        return this.name;
    }
}
}

```

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Callable

- Has a return type
-

```

package ga.veee.day11;

import java.util.concurrent.Callable;
import java.util.concurrent.ExecutorService;

```

```

import java.util.concurrent.Executors;
import java.util.concurrent.Future;

public class CallableDemo {
    public static void main(String[] args) throws Exception {
        ExecutorService es= Executors.newFixedThreadPool(2);

        Future f1=es.submit(new MyCallable());
        try {Thread.sleep(2000);}catch(Exception ignored) {}
        String s1=(String)f1.get();

        System.out.println(s1);

        Future f2=es.submit(new MyCallable());
        String s2=(String)f2.get();

        System.out.println(s2);


        System.out.println("main thread....");
        es.shutdown();
    }
}

class MyCallable implements Callable {
    @Override
    public Object call() throws Exception {
        // TODO Auto-generated method stub
        System.out.println("call called");
        try {Thread.sleep(2000);}catch(Exception ignored) {}
        return "hello world";
    }
}

```

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