

### Algorithm Classes

1. Arrays.
2. Collections.

@ Provide common functionalities can be applied on Array `int []` and Collection

`Collections.concurrentList();` // Thread safe equivalent



## Java - 8

### Functional-Programming

- # functional interface

- # default methods

- # static methods

- # lambdas

- # streams

- # methods references

DateTime API

Optional

Nashorn engine (javascript engine)

Extension in collection API



Traditional :( Pure OOPs ) : Imperative

Functional : Declarative

Imperative :

How : focus

Pure OOPs

Embraces data mutability

Declarative

What : focus

Functional Programming (pure function)

Data immutability

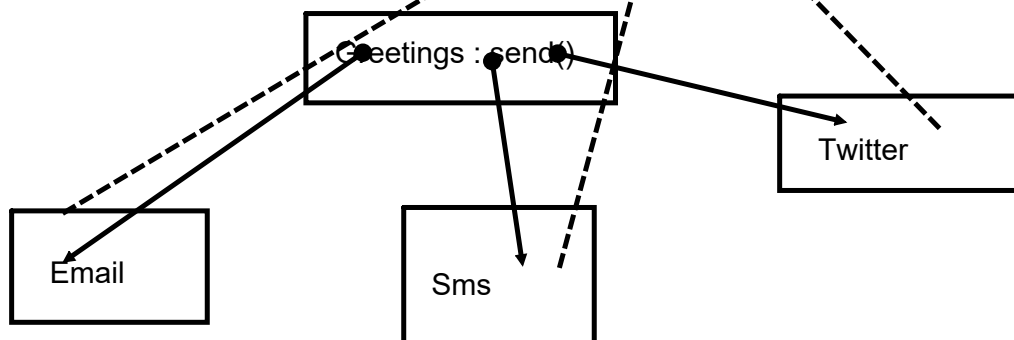
SQL style

Interfaces:

# can have functions with definitions ( default methods)

# static methods with definitions

```
public void conveyMessage(String message, Greeting){  
    // call a single method send()  
}
```



Lambda Syntax for pure function

1. not have any accessibility modifier (nothing related to class)
2. Do not any name (anonymous function)
3. no return type
4. no param type
5. (<param>) -> { <definition> }

```
void fun(String str1, int n){  
}  
(str1,n) -> {  
}
```

```
void fun(String str1){  
}  
str1 -> {  
}
```

```
void fun(){  
}  
() -> {  
}
```

```
void fun(String str1){  
    // only single instruction  
}  
str1 -> single instruction
```

```
void fun(String str1){  
    // instruction  
    return a;  
}
```

```
str1 -> {  
    // instruction  
    return a;  
}
```

```
int add(int a, int b){  
    return a+b;  
}
```

```
// for single inst not bounded in braces return is default associated  
(a, b) -> a+b;
```

interface <reference> = <lambda expression>

# only when interface is functional interface :

contains only one abstract methods

can have any number of default/static

# refrence of an interface can refer to only those lambda expression whose signature matches with the only abstract method inside the interface

Runnable :

Comparator

Comparable

# few protoypes have been identified which are common in use

api : functional interface

Consumer : void accept(<>), BiConsumer [ two param ], IntegerConsumer()

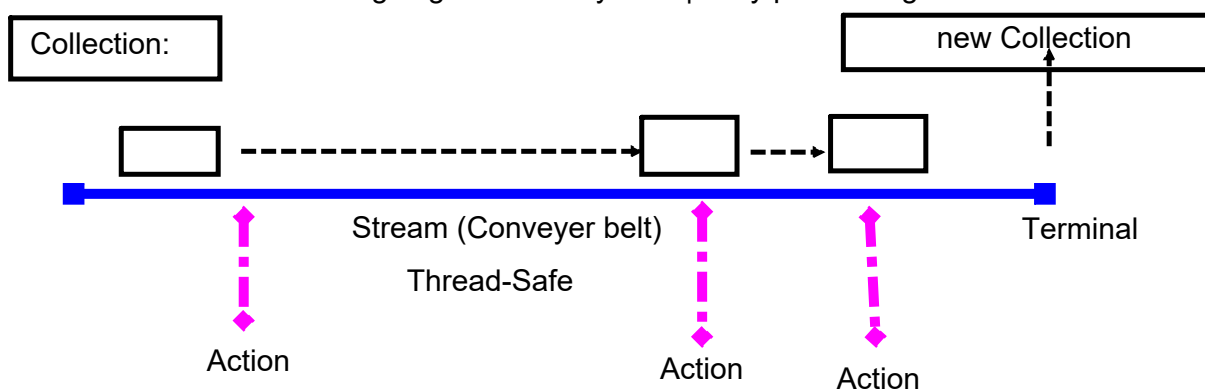
Predicate : boolean test(<>)

Function : <> apply(<>)

Supplier : <> get()

Streams : Safe/efficient way to process a collection

Not a data-structure/ not going to store any data | Lazy processing model



Stream method

1. action <intermediary methods>
2. Terminal method (stops the stream) cannot add any new activity after it

Stream are not going to initiate if no terminal activity is there

# stream : external mutable resource

# inherently complex (JVM)

want to use calculator to perform addition of stream of number

1 2 3 4 5.....      result : mutable (not thread safe)

1      Data inconsistency  
3

25 : result      5,6,7

result = result + v

result = 25 + 5

result = 25 + 6

Unboxing : buffer

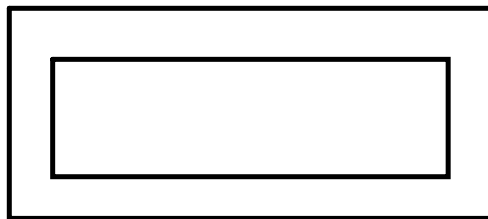
finalize() // gcm

Optional : to avoid null reference exception

# if any object being initialized by some external logic (method)

# if no explicit validation code is added to check null

Optional



wrapped instance

# forced to put validation

# functionality to handle situation



pre jdk 8

Date

Calander

Time API :

java.time

LocalDate

LocalDate

LocalDateTime

Multi-Threading

Multi-Programming :

O/S to reside more than 1 exe program in memory , not necessarily executing them

Multi-Tasking :

O/S execute more than 1 program simultaneously , interleaved fashion (time sharing)

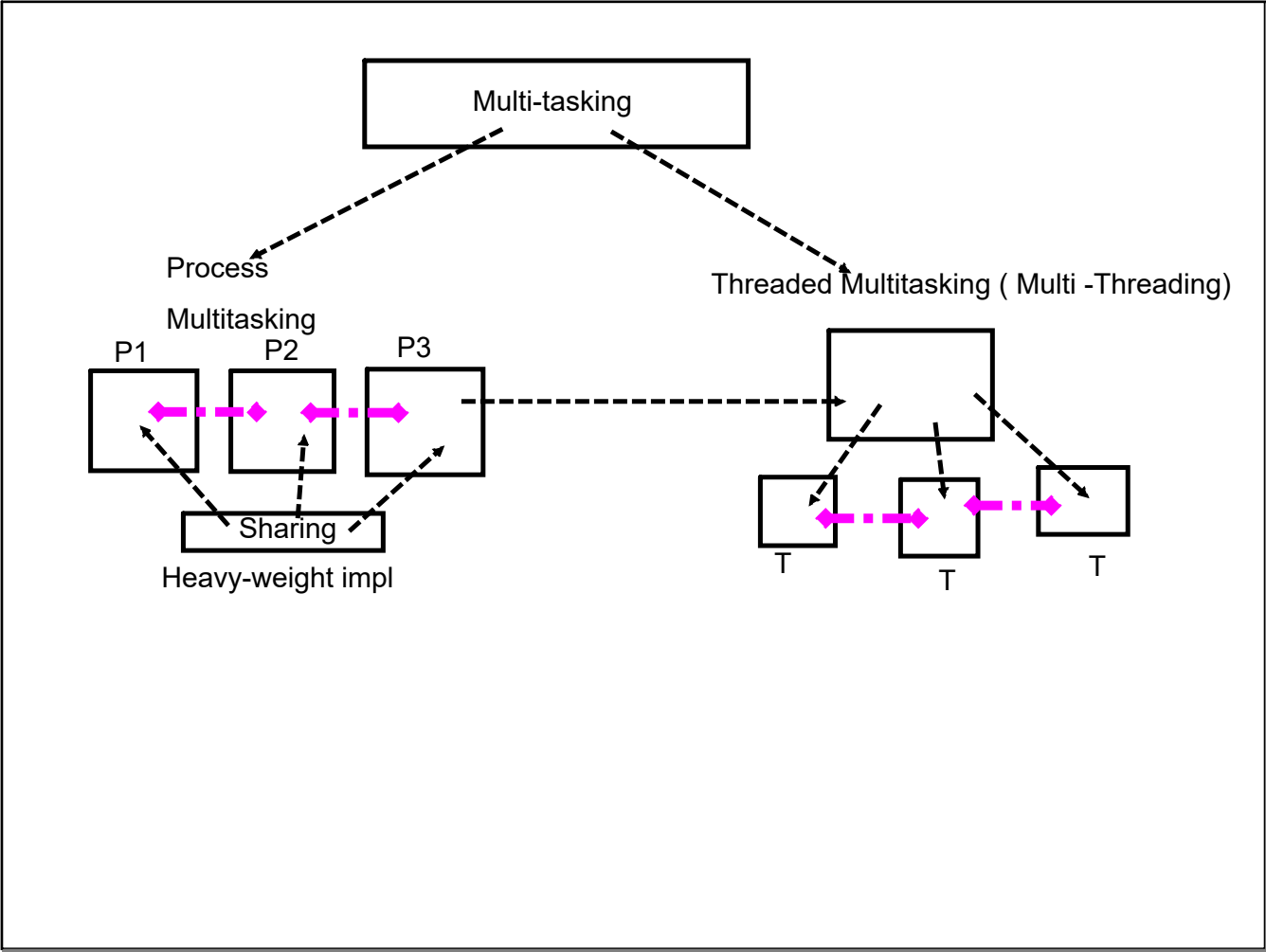
Multi-Processing

O/S to manage more than 1 processing units ( parallel / array )

O/S

Multi-tasking :

multi-core processor : multi-processing

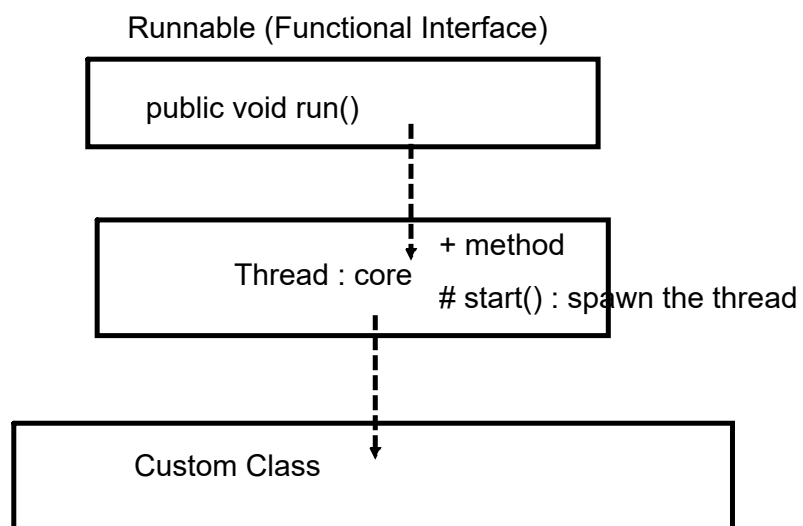


=> Thread class

=> Runnable

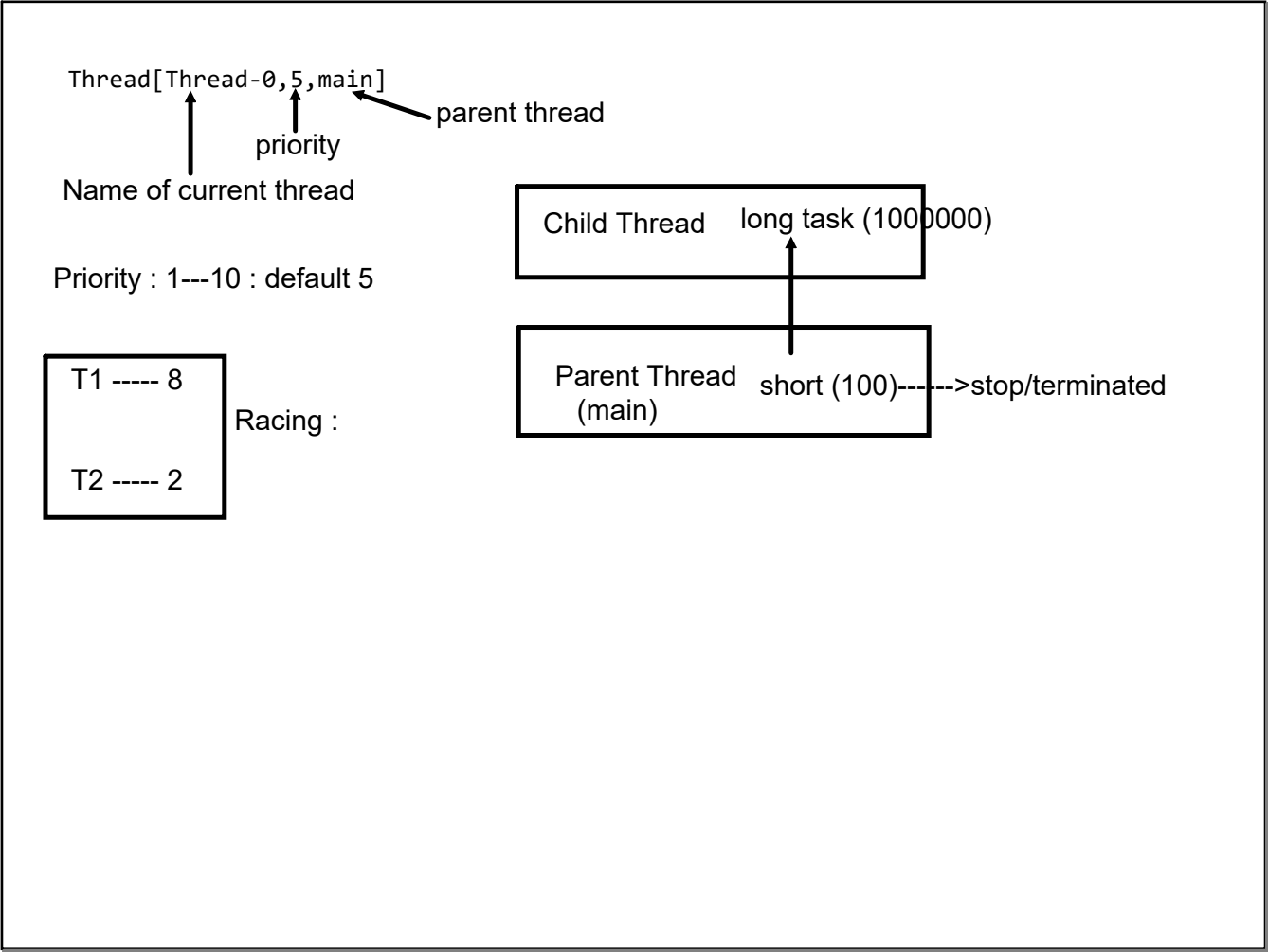
# Sharable resources : data consistency

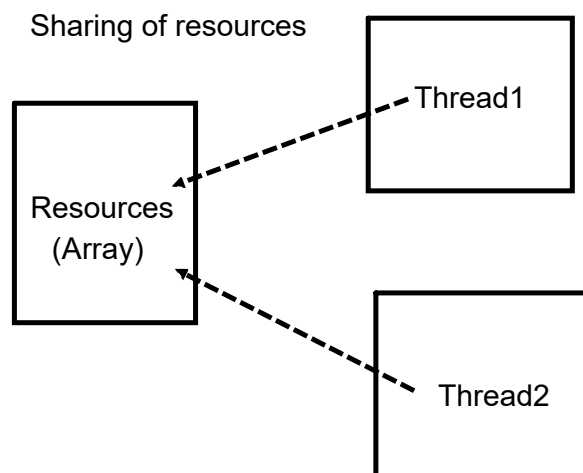
# Inter-thread communication



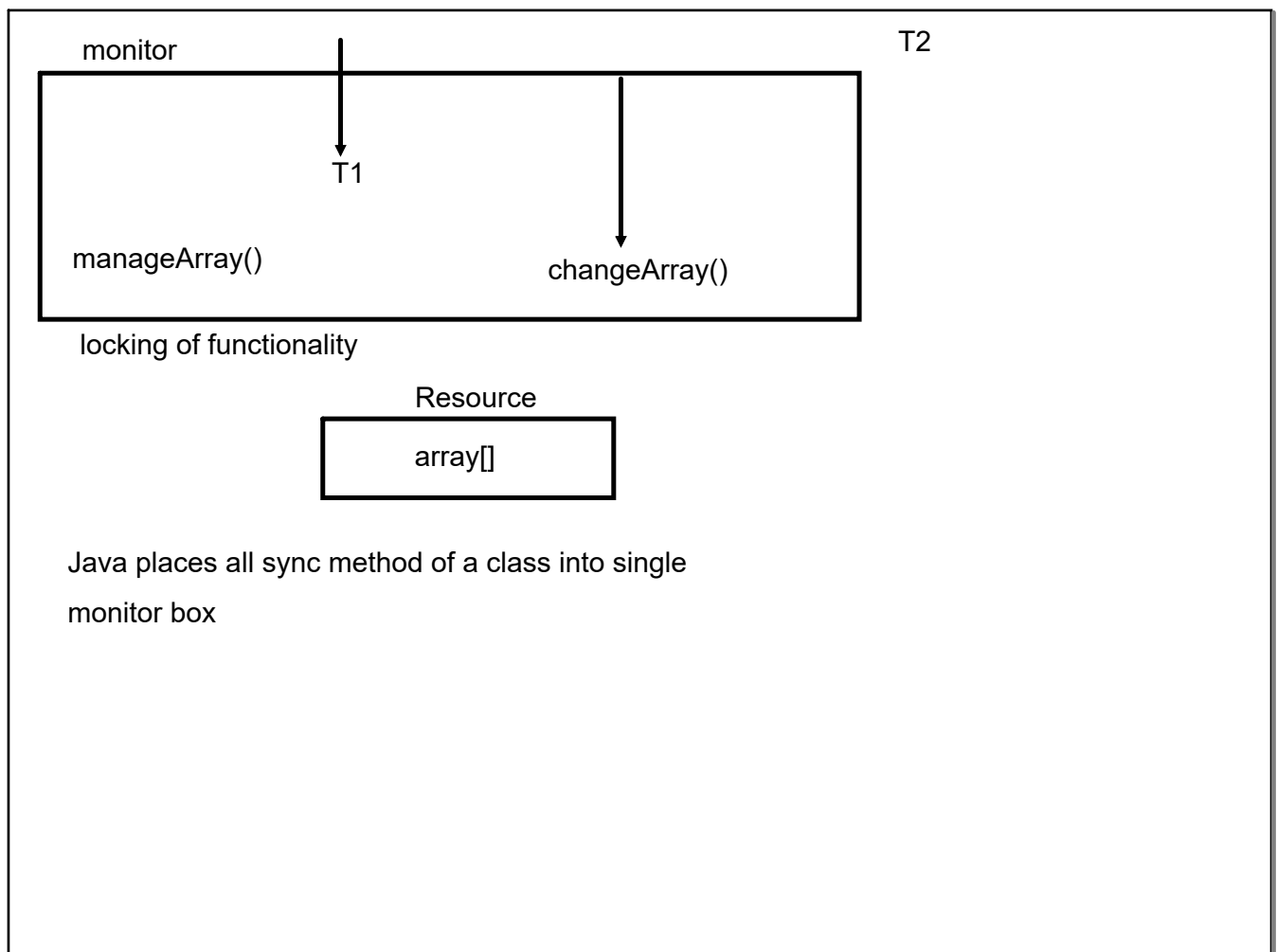
```
class Thread implements Runnable{  
    public void run(){ // empty  
    public final void start(){  
        // low level functionality to spawn a new thread  
        // native coding : C/C++  
        // call the run() : assigning thread capacity  
    }  
}
```

```
class MThread extends Thread {  
    public void run(){ // overriding run of thread  
        // thread activity  
    }  
}
```





Any method blocking the thread execution  
will throw checked exception  
InterruptedException





locking of functionality : sync method [ permanent ] : Resource owner

locking of objects : sync block [ temp ] : user

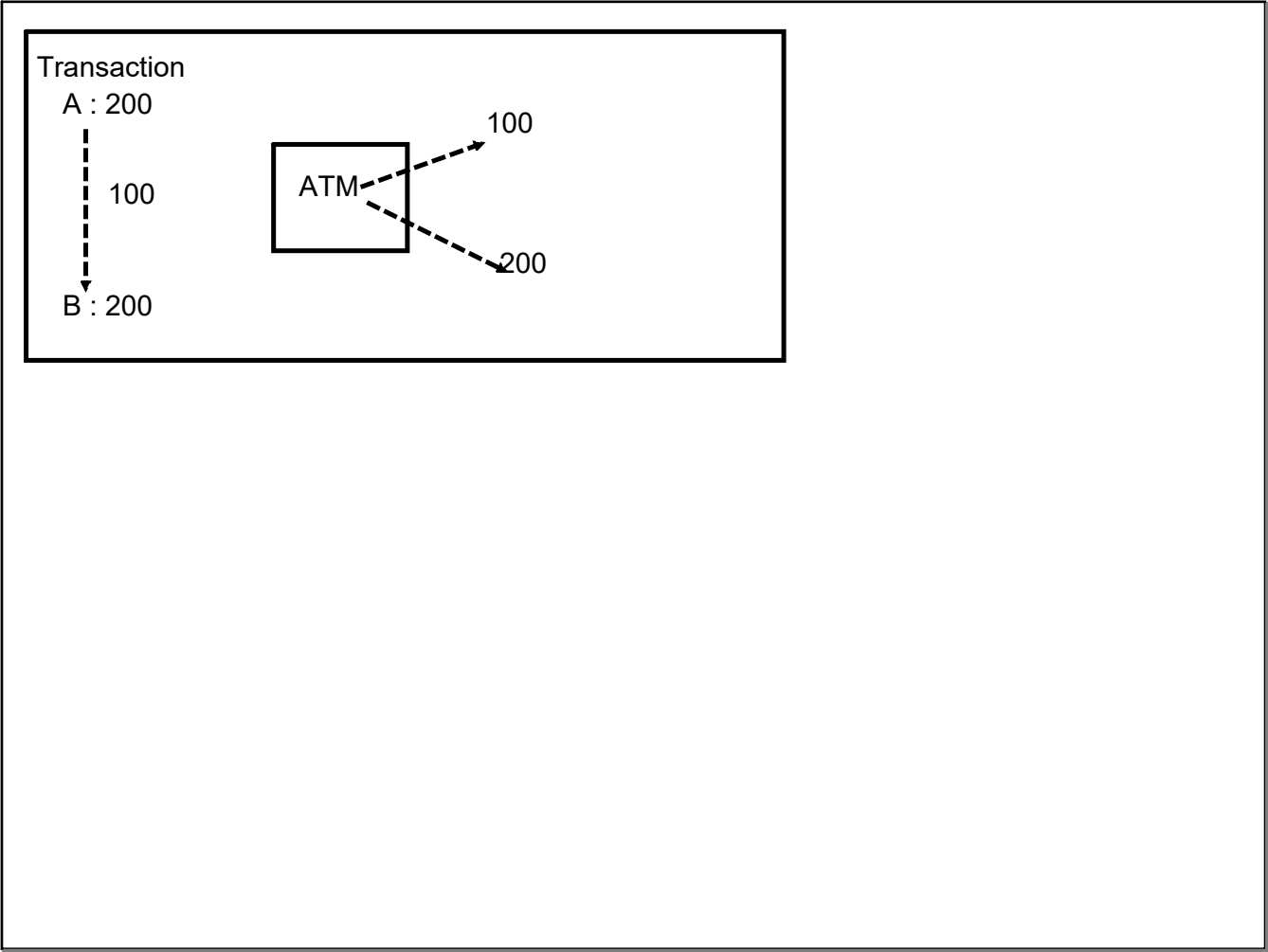
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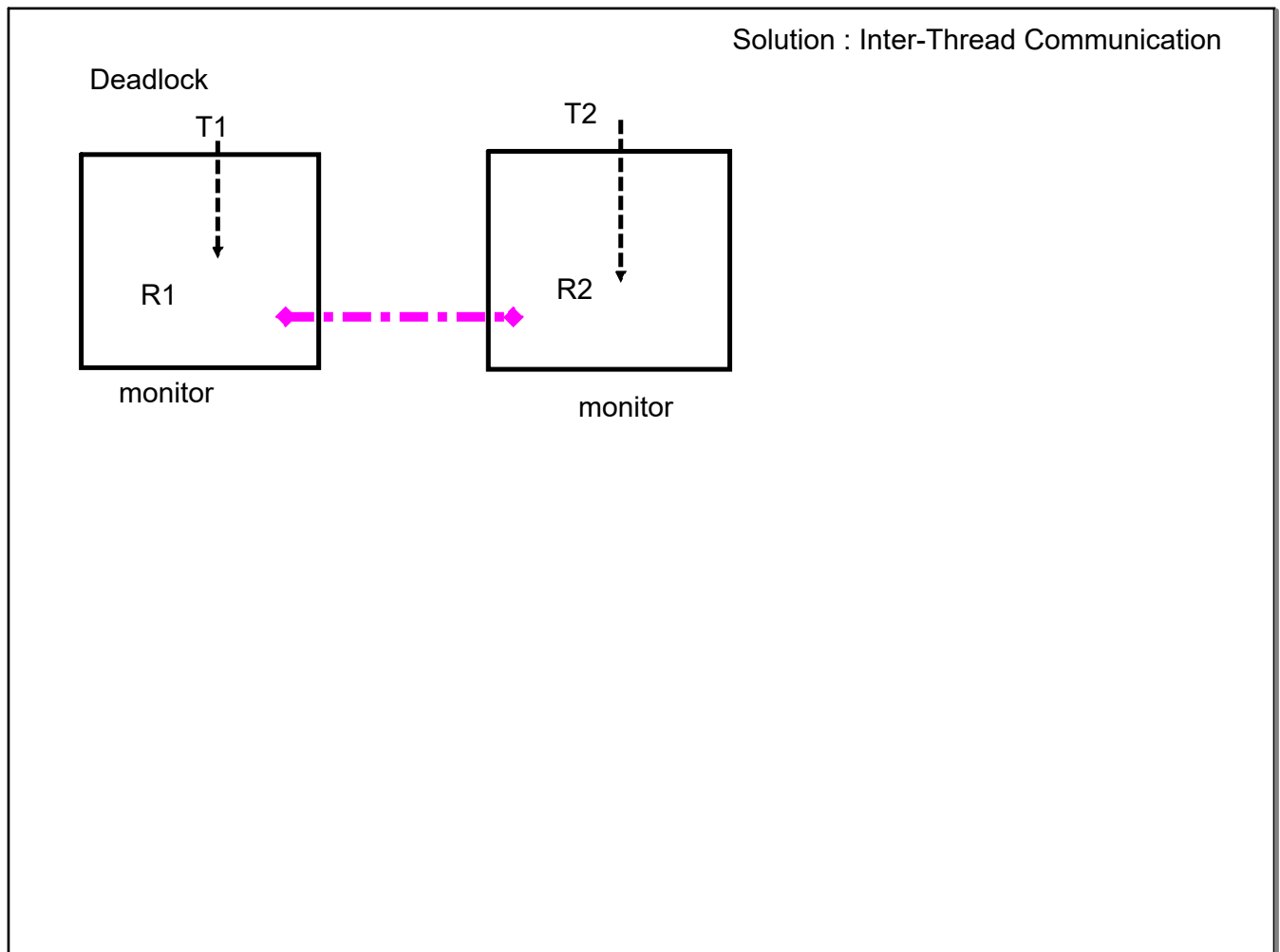
Concurrent-Collection API

High level of concurrency with Thread Safety

synchronized : method/block : Wide Spectrum of locking

granular locking : ReentrantLock();





## Classical Problem of Multi-tasking

## Producer-Consumer

