==>Java 8-11

==>Reactive Programming (Spring)

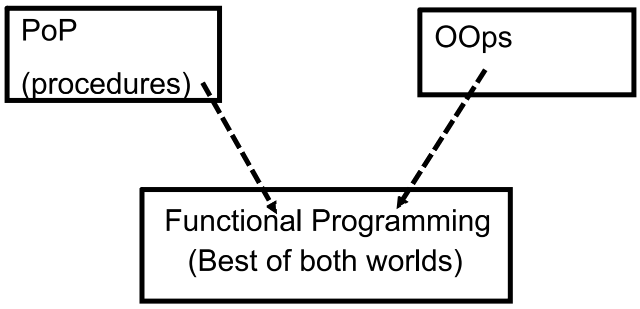
java 1.5 Functional Programming

java 1.8

==> Technological advancement : mobile/laptops/system

Java new feature simplifies concurrency operations

Functional Programming:



Embracing/ creating immutable objects

more concise and readable code

Declarative approach

Traditional : Imperative

=> Focus on how to perform

=> Object mutability

Declarative Style:

=>Focus on what result we want

=>Object immutability

=>Analogous to SQL (use of already existing part of library to achieve an objective)

Improvisation on interface:

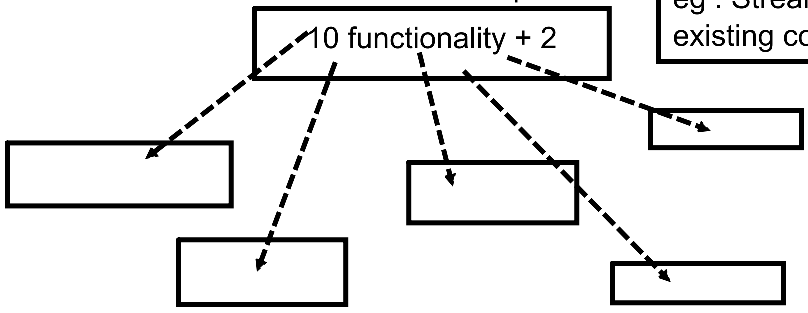
default method

static method

Demand from developer community :

#provision to add new functionality at the top without breaking existing API

interface exists at top level



eg : Stream feature req to be added in existing collection api

Functional Interface : Lambda

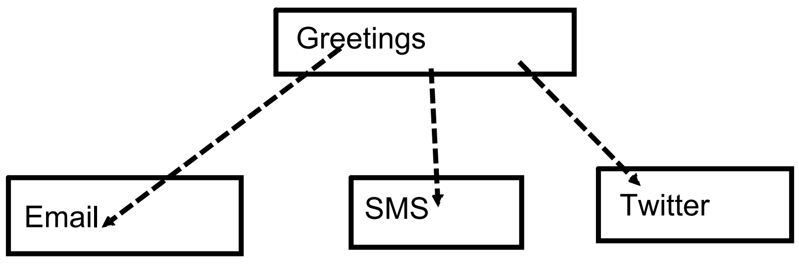
# Contains only one abstract method

# might have static method, default method (in any count)

# jdk1.8 : special annotation

@FunctionalInterface (Compile time)/ optional

# would restricts addition of any more abstract method


Greetings
Email
SMS
Twitter

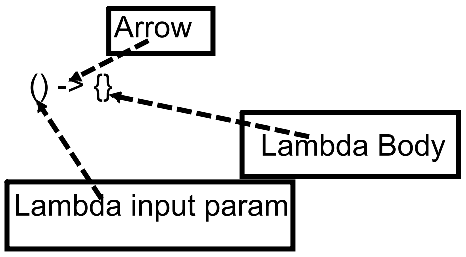
Interface can now act as a <Function type>

1. Functional Interface
2. Function definition that its reference is going to hold must match the prototype only abstract method inside it

Lambda expression:

1. anonymous function
2. method param, method body, return spec
3. Not encapsulated under any class
4. can be assigned to a variable, can be passed around

Lambda expression syntax : Compact



# no class implementation

# no object management

# saved lots of runtime overheads

(msg) -> {}

msg -> {} // if single param no need to bind in para

(msg, other) -> {} // multiple, it is necessary

() -> {} // if no param

msg -> single instruction // no need to bind in braces

(a,b) -> a+b // return a+b

// if no braces then single stmt is by default associated with return

Functional Interface : (SAM)

=>Runnable

=>Comparator

```
interface Runnable{
      void run()
}

interface Comparator<T>{
      int compare(T o1, T o2);
}
```

New Functional Interfaces of Java 8

Lambdas connect themselves with specific signature

# Java 8 has been introduced with group of
functional interfaces containing some very common prototype method
# Usage of them has been updated in existing APIs

java.util.function

Consumer : BiConsumer, <Primitive type implementation>

Predicate : BiPredicate, <Primitive type implementation>

Function : BiFunction, UnaryOperator, BinaryOperator

Supplier

Consumer interface :

    Single abstract method

    void accept(<T>)

BiConsumer interface :

    Single abstract method

    void accept(<T>, <M>)

Chaining :

Almost all functional interface has chaining facility

#connect multiple implementations of same interface

# default / static

Predicate

Single abstract method

boolean test(<T>)

Chaining :

and

or

negate

Function

only abstract method

<R> apply(<T>)

Chaining

andThen()

compose();

BiFunction

R apply(T1, T2)

UnaryOperator:

extension of Function interface

passing param type and

return value type is same

BinaryOperator:

extension of BiFunction interface

passing 2 param type and

return value type is same

2 static methods of BinaryOperator

both returns a lambda ref, which when called will return the max/min values

```
 maxBy(<Comparator>)
minBy(<Comparator>)
```

Supplier FunctionalInterface

only abstract method

```
<T> get();
```

No chaining methods available...

1.. Predicate that can filter on variable value

    Function functional implementation : return back such predicate

Method References

# simplifies the implementation of Functional interfaces

# Shortcut for writing lambda expression

=> to use already existing methods as lambdas

Syntax:

ClassName :: instance-method name

ClassName :: static-method name

instance :: method-name

1. WE are able call instance method through class name (conflict : not allowed all times)
2. method reference not matching the method signature of consumer is still valid

```
Student :: printAllActivities; Shortcut of writing lambda
(recieve an object of type Student

student -> student.printAllActivities();
```

Any instance when called, is automatically passed the instance of that class

printAllActivities(<Student>)

Constructor Reference

Constructors can also represent a lambda

# Constructor are expected to return a instance

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default methods