

# Essence of Dispatch

Taking Pharo Booleans as example

S.Ducasse, L. Fabresse, G. Polito, and P. Tesone



# Objectives

- Understand of message passing (late binding) for **real** this time
- The **heart of Object-Oriented Design**
- Look at a beautiful implementation in Pharo



# Context: Booleans

In Pharo, Booleans have a superb implementation!  
You get the classical messages:

- `&`, `|`, `not` (eager)
- `or:`, `and:` (lazy)

And some less traditional ones:

- `ifTrue:ifFalse:`, `ifFalse:ifTrue:`
  - Yes, conditionals are messages sent to boolean objects



# Three exercises

- Exo 1: Implement `not` (Not)
- Exo 2: Implement `|` (Or)
- Exo 3: What is the goal of these exercises?



# Exercise 1: Implement Not

Propose an implementation of Not in a world where:

- You have: true, false objects
- You only have objects and messages

How would you implement the message not?

```
false not  
-> true
```

```
true not  
-> false
```



## Hint 1: No conditionals

The solution does not use explicit conditionals (i.e., no if)



## Hint 2: How do we express choices in OOP?

In OOP, the choice is expressed

- By defining classes with **compatible** methods
- By **sending** a message to an instance of such a class

Let the receiver decide!



## Hint 2: An example of choice in OOP

x open

- x can be a file, a window, a tool,...
- The method is **selected** based on x's class





## Hint 3: With at least two classes

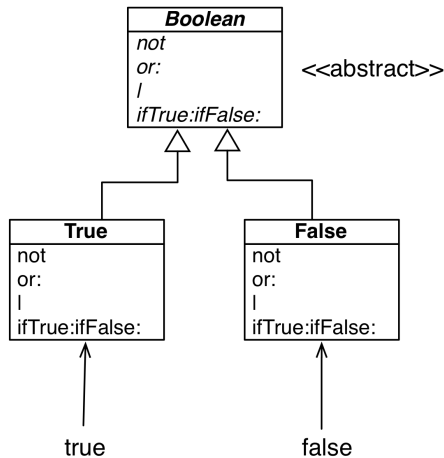
- `true` is the singleton instance of the class `True`
- `false` is the singleton instance of the class `False`

The Pharo implementation uses three classes:

- The class `Boolean` (abstract), `True`, and `False`



## Hint 3: With at least 2 classes and 2 methods



The class `Boolean` is not needed per se but it improves reuse

# Implementation of Not in two methods

False >> not

"Negation -- answer true since the receiver is false."

^ true

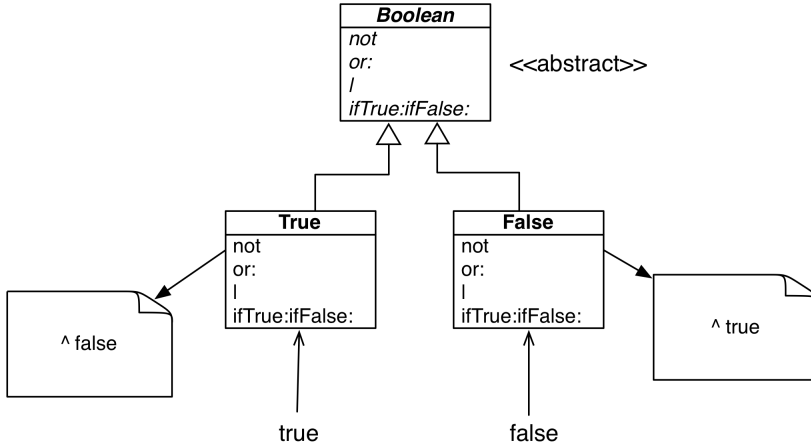
True >> not

"Negation -- answer false since the receiver is true."

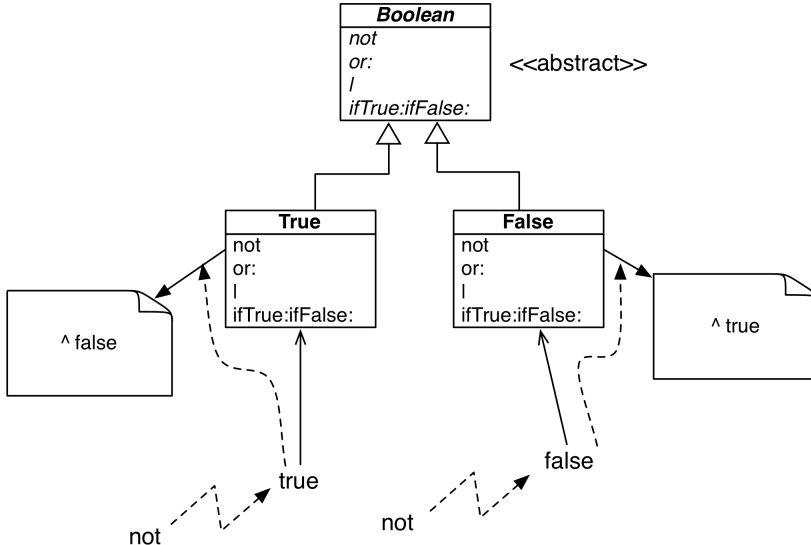
^ false



# Implementation hierarchy



# Message lookup chooses the right method



# Boolean implementation

- The class `Boolean` is abstract
- The classes `True` and `False` implement
  - logical operations `&`, `not`
  - control structures `and:`, `or:`, `ifTrue:`, `ifFalse:`, `ifTrue:ifFalse:`, `ifFalse:ifTrue:`
  - reuse some logic from `Boolean`



## Exercise 2: Implement Or

```
true | true -> true  
true | false -> true  
true | anything -> true  
  
false | true -> true  
false | false -> false  
false | anything -> anything
```



# Implementation of Or in Boolean

Boolean >> | aBoolean

"Abstract method. Evaluating Or: Evaluate the argument.  
Answer true if either the receiver or the argument is true."

**self** subclassResponsibility





# Implementation of Or in class False

```
false | true -> true  
false | false -> false  
false | anything -> anything
```



# Implementation of Or in class False

```
false | true -> true  
false | false -> false  
false | anything -> anything
```

```
False >> | aBoolean  
    "Evaluating Or -- answer with the argument, aBoolean."  
    ^ aBoolean
```



# Implementation of Or in class True

```
true | true -> true  
true | false -> true  
true | anything -> true
```



# Implementation of Or in class True

```
true | true -> true  
true | false -> true  
true | anything -> true
```

```
True >> | aBoolean  
  "Evaluating Or -- answer true since the receiver is true."  
  ^ true
```



# Real implementation of Or in class True

The object `true` is the receiver of the message!

```
True>> | aBoolean
```

```
"Evaluating disjunction (Or) -- answer true since the receiver is true."
```

```
^ true
```

So we can write it like the following:

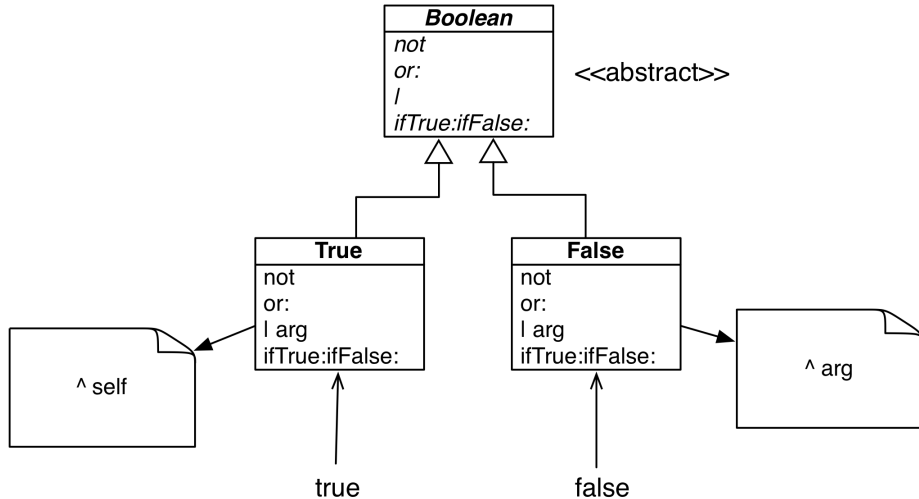
```
True >> | aBoolean
```

```
"Evaluating disjunction (Or) -- answer true since the receiver is true."
```

```
^ self
```



# Or Implementation in two methods



# Step back

- An example of **Do not ask, tell** principle application
- Here:
  - We **delegate** to the correct Boolean object
  - Each subclass implements its **own** logic



# Summary

We saw:

- The solution to implement boolean operations does NOT use explicit conditionals (if)
- **Sending a message is making a choice**

Remember two important principles

- **Do not ask, tell**
- **Let the receiver decide**





Produced as part of the course on <http://www.fun-mooc.fr>

# Advanced Object-Oriented Design and Development with Pharo

A course by

S.Ducasse, L. Fabresse, G. Polito, and P. Tesone



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