Essence of Dispatch

Taking Pharo Booleans as Example

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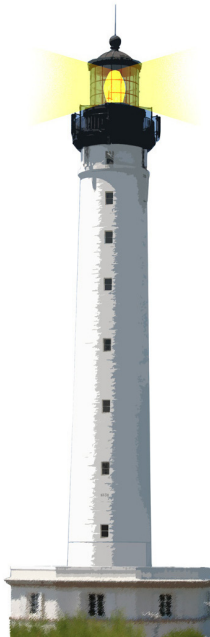


Objectives

- Understanding of message passing (late binding) for **real** this time
- The **heart of OOP**
- Looking 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
- 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 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 class
- Let the receiver decide

Example

```
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

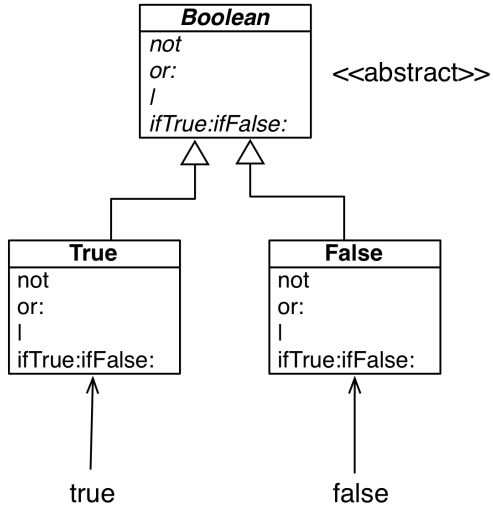
- true is the singleton instance of True
- false is the singleton instance of False

The Pharo implementation uses three classes:

- Boolean (abstract), True, and False

Hint 3: With at least two classes

Boolean is not needed per se but it improves reuse

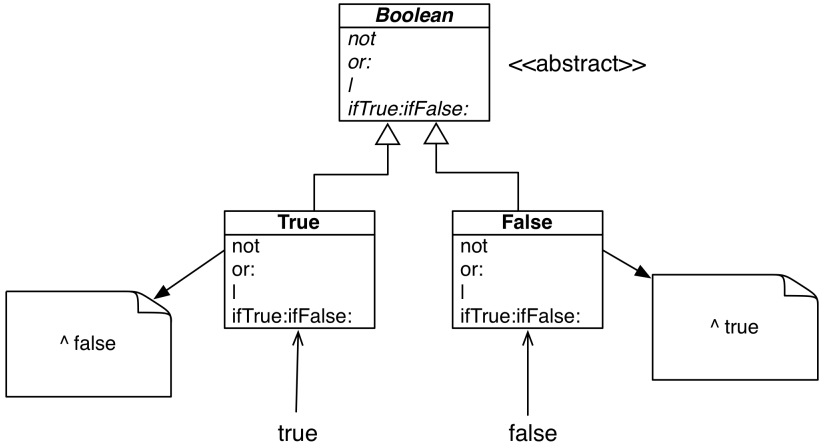


Implementation of Not in two methods

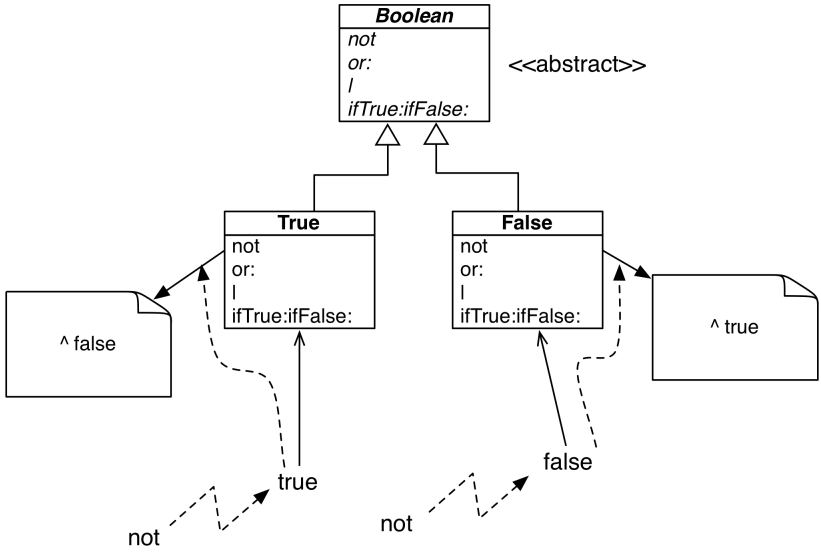
```
False >> not
  "Negation -- answer true since the receiver is false."
  ^ true
```

```
True >> not
  "Negation -- answer false since the receiver is true."
  ^ false
```

Implementation hierarchy



Message lookup is choosing the right method



Boolean implementation

- Boolean **is abstract**
- 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

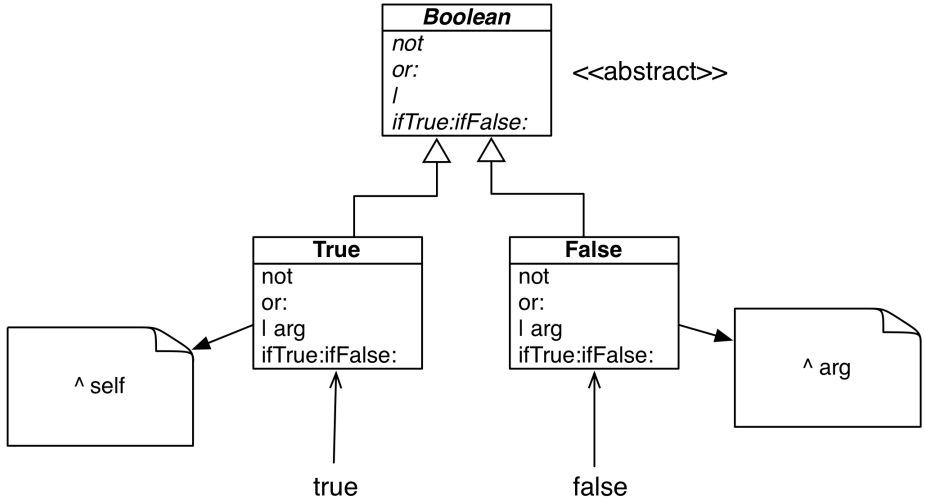
The object true is the receiver of the message!

```
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

Do not ask, tell

- we delegate to the correct Boolean object
- each subclass implements its own part

Summary

The solution to implement boolean operations:

- does NOT use conditionals (if)
- **Do not ask, tell**
  - lets the receiver decide

A course by

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