

# Essence of Dispatch

Taking Pharo Booleans as Example

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<http://www.pharo.org>



# Objectives

- Understanding of message passing (late binding)
  - the heart of OOP
  - more an OOP lecture than a Pharo one
- Insight at how beautiful Pharo's implementation is



# Context: Booleans

In Pharo, Booleans have a superb implementation!

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



# Three Exercises

1. Implement not (Not)
2. Implement | (Or)
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)

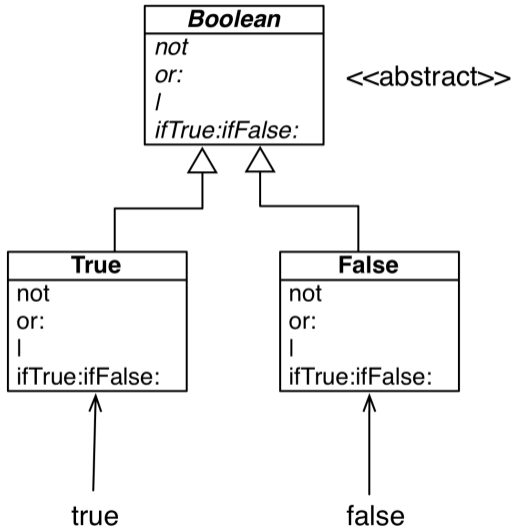


## Hint 2: With Three Classes

- The solution uses three classes:
  - Boolean (**abstract**), True **and** False
- true is the singleton instance of True
- false is the singleton instance of False



## Hint 2: Three Classes





## Hint 3: How do We Express Choice in OOP?

In OOP, choice is expressed

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

Example

```
x open
```

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



# Implementation of Not in Two Methods

**False** >> not

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

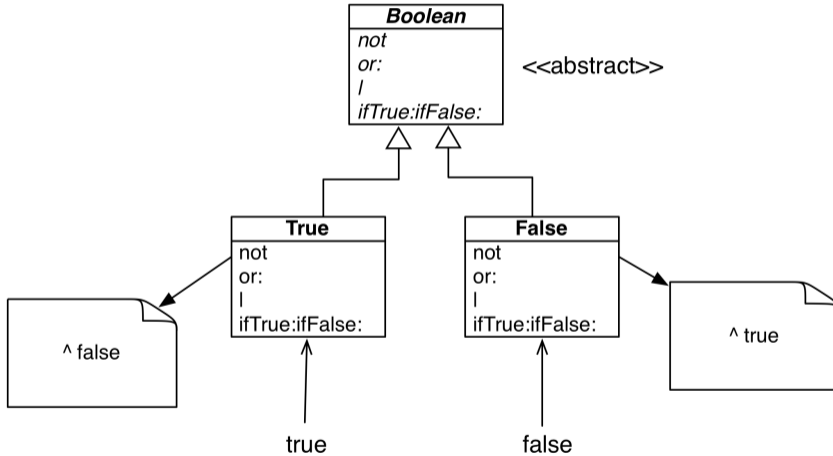
^ **true**

**True** >> not

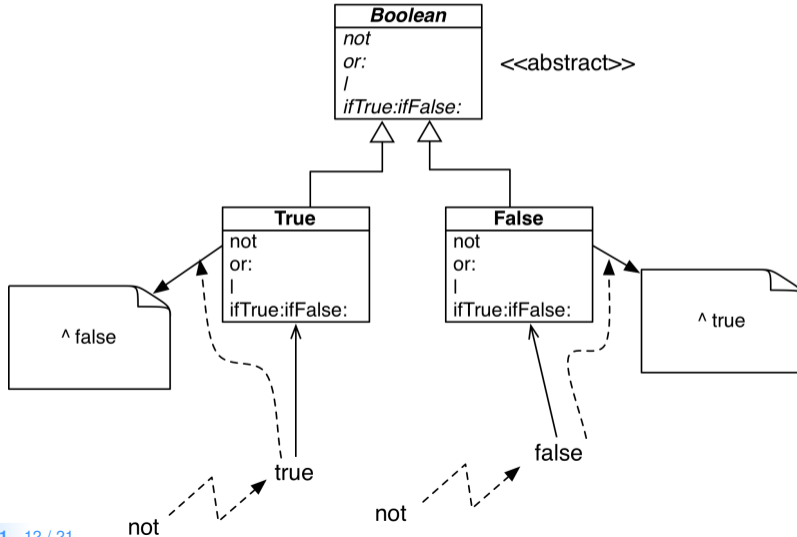
"Negation -- answer false since the receiver is true."

^ **false**

# Implementation Hierarchy



# Message Lookup is Choosing the Right Method



# Boolean Implementation

- Boolean is abstract
- Subclasses are True and False and implement
  - logical operations &, not
  - control structures and:, or:, ifTrue:, ifFalse:, ifTrue:ifFalse:, ifFalse:ifTrue:

`Boolean>>not`

"Abstract method. Negation: Answer true if the receiver is false, answer false if the receiver is true."

`self subclassResponsibility`



# Behavior of 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
```

```
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
```

```
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
```

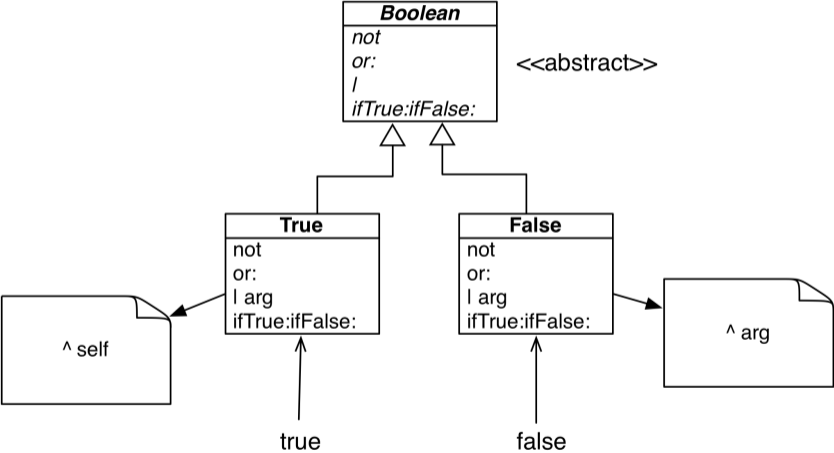
So we can write it like the following:

```
True >> | aBoolean
```

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

```
^ self
```

# Or Implementation in Two Methods



# Summary

- The solution to implement booleans' operations:
  - does NOT use conditionals (if)
  - lets the receiver decide
- Do not ask, tell



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