Advanced Object-Oriented Design

Avoid Null Checks

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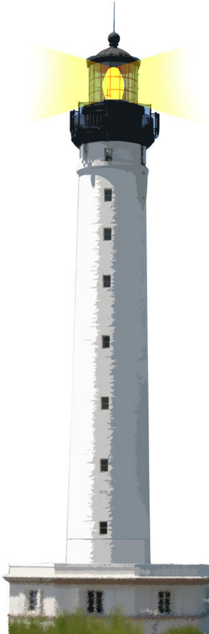


Goal

- Understanding the implication behind returning nil
- Null Object

nil?

- Unique instance of the class `UndefinedObject`
- Real object, as anybody else
- Default value of uninitialized instance variable
- Still we should be careful when to use it

Do Not Return Nil

Imagine an inferencer that looks for rules that can be applied to a fact.

```
Inferencer >> rulesForFact: aFact
  ...
  self noRule ifTrue: [ ^ nil ]
  ^ self rulesAppliedTo: aFact
```

- Here `rulesForFact:` returns `nil` to indicate that there is no rules for a fact.

Consequences!

Returning nil (e.g., ifTrue: [^ nil]) forces EVERY client to check for nil:

```
(inferencer rulesForFact: 'a')
  ifNotNil: [ :rules |
    rules do: [ :each | ... ]
```

Solution: Return Polymorphic Objects

When possible, return polymorphic objects:

- when returning a collection, return an empty one
- when returning a number, return 0

Solution: Return Polymorphic Objects

```
Inferencer >> rulesForFact: aFact
  self noRule ifTrue: [ ^ #() ]
  ^ self rulesAppliedTo: aFact
```

Your clients can just iterate and manipulate the returned value

```
(inferencer rulesForFact: 'a') do: [ :each | ... ]
```

For Exceptional Cases, Use Exceptions

For exceptional cases, replace nil by exceptions:

- avoid error codes because they require if in clients
- exceptions may be handled by the client, or the client's client, or ...

```
FileStream >> nextPutAll: aByteArray
  canWrite ifFalse: [ self cantWriteError ].
  ...
FileStream >> cantWriteError
  (CantWriteError file: file) signal
```

Solution: Initialize Your Object State

Avoid nil checks by initializing your variables

- by default instance variables are initialized with nil
- The responsibility of an object is to correctly initialize its state

```
Archive >> initialize
  super initialize.
  members := OrderedCollection new
```

Solution: Use Lazy Initialization when Necessary

You can defer initialization of a variable to its first use:

```
FreeTypeFont >> descent
  ^ cachedDescent ifNil: [
      cachedDescent := (self face descender * self pixelSize //
                        self face unitsPerEm) negated ]
```

This is only when the method descent is executed that cachedDescent will be initialized.

Solution: Use Lazy Initialization when Necessary

- Lazy initialization trades time vs runtime cost (ifNil: check)
- You should always use this accessor
- Pay attention you should NOT access directly an instance variable used in a lazy setting
- Else you can get exposed to nil value

Sometimes you have to check...

Sometimes you have to check before doing an action

- when possible, you can turn the default case into an object, a Null Object.

Example

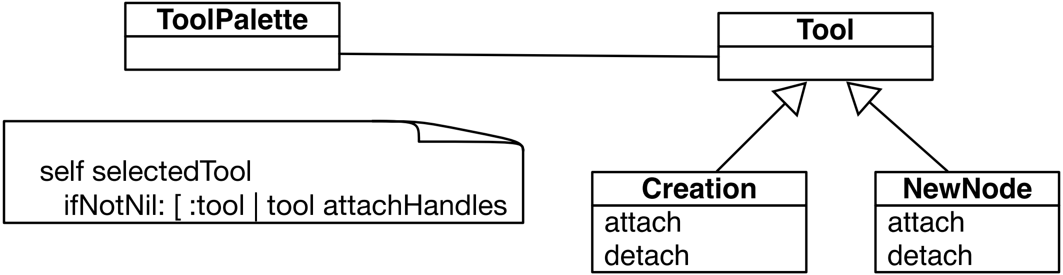
```
ToolPalette >> nextAction
  self selectedTool
    ifNotNil: [ :tool | tool attachHandles ]

ToolPalette >> previousAction
  self selectedTool
    ifNotNil: [ :tool | tool detachHandles ]
```

Here we are forced to check that there is a selected tool.

- Why not having always one selected?
- Even one doing nothing?

Example



ToolPalette

Tool

Creation

attach

detach

NewNode

attach

detach

```
self selectedTool
   ifNotNil: [ :tool | tool attachHandles
```

Solution: Use NullObject

- A null object proposes a **polymorphic** API and embeds default actions/values.
- Woolf, Bobby (1998). "Null Object". In Pattern Languages of Program Design 3. Addison-Wesley.

Let us create a NoTool class whose behavior is to do nothing.

Solution: NoTool

```
AbstractTool < #NoTool
```

```
NoTool >> attachHandles
  ^ self
NoTool >> detachHandles
  ^ self
```

Solution: Use NullObject

Initialize the ToolPalette with a NoTool instance.

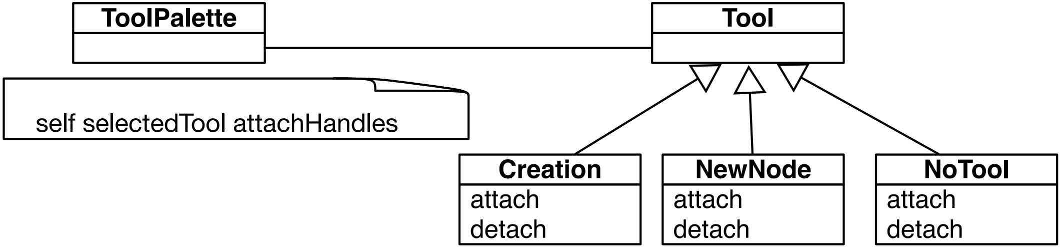
```
ToolPalette >> initialize
  self selectedTool: NoTool new
```

And we get no forced ifNil: tests anymore

```
ToolPalette >> nextAction
  self selectedTool attachHandles

ToolPalette >> previousAction
  self selectedTool detachHandles
```

Solution: With initialization and NoTool



About NullObject

Sometimes it is difficult to apply the NullObject

- Too large API
- Or would need too many NullObjects
- Unclear default "no behavior"

Conclusion

- A message acts as a better if
- Avoid null checks, return polymorphic objects instead
- Initialize your variables
- If you can, create objects representing default behavior

A course by

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