Avoid Null Checks

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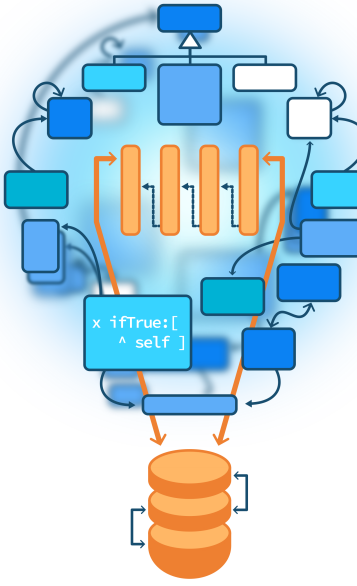


Goals

- Understand the implication behind returning nil
- Analyze at provider side
- Object initialization avoids nil propagation
- Look at client side
- Null Object

nil?

- Unique instance of the class UndefinedObject
- In Pharo, a real object, as anybody else
- Default value of uninitialized instance variables
- Still we should be careful when to use it

Looking at provider side

- What is the impact of code generating nils?

Example

Imagine an inferencer that looks for rules that correspond to a fact

```
| inf |
inf := Inferencer new.
inf
  addRule: #sunny –> #'sunglasses';
  addRule: #sunny –> #'solar cream';
  addRule: #rainy –> #'umbrella'.

inf rulesForFact: #sunny
> { Rule(sunny − sunglasses) . Rule(sunny − solar cream) }

inf rulesForFact: #cloudy
> nil
```

Example code

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

- Here rulesForFact: returns nil to indicate that there is no rules for a fact
- What are the consequences?

Consequences!

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

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

- Client code ends up full of nil checks (ifNil:, ifNotNil, isNil)

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: aFact) ifTrue: [ ^ #() ]
  ^ self rulesAppliedTo: aFact
```

Your clients can just iterate and manipulate the returned value

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

About nil

Limit the propagation of nil

- Methods should not return nil
- Avoid storing nil in variable
- **Initialize** well your object instance variables!

Initialize your object state

Remember by default instance variables are initialized with nil

- This is developer responsibilities to produce well-initialized objects
- Avoid nil checks by initializing your variables:

Initialization example

The responsibility of an object is to **correctly initialize** its state

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

- When default values are not enough, provide a constructor method

Sometimes you have to check...

- Sometimes you have to check some conditions before doing an action
- When possible, you can turn the default case into an object (a Null Object)

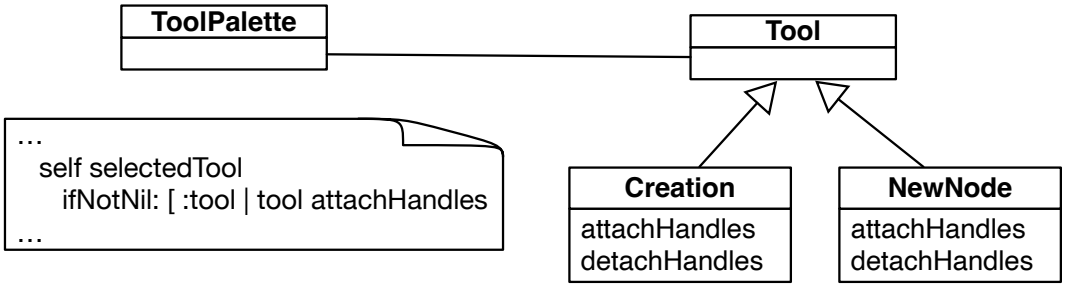
An example calling for a Null Object

- Imagine a palette manipulates tools
- Palette has a selected tool

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

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

Example


ToolPalette
Tool
…
self selectedTool
ifNotNil: [:tool | tool attachHandles
…
Creation
attachHandles
detachHandles
NewNode
attachHandles
detachHandles

Analysis

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

Forced to check that there is a selected tool

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

Solution: Apply NullObject Design Pattern

- 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
- Read it!

Solution: NoTool

Create a NoTool class whose behavior is to do nothing

```
AbstractTool << #NoTool
```

```
NoTool >> attachHandles
  ^ self

NoTool >> detachHandles
  ^ self
```

Solution: Use NullObject

Initialize the ToolPalette with a NoTool instance.

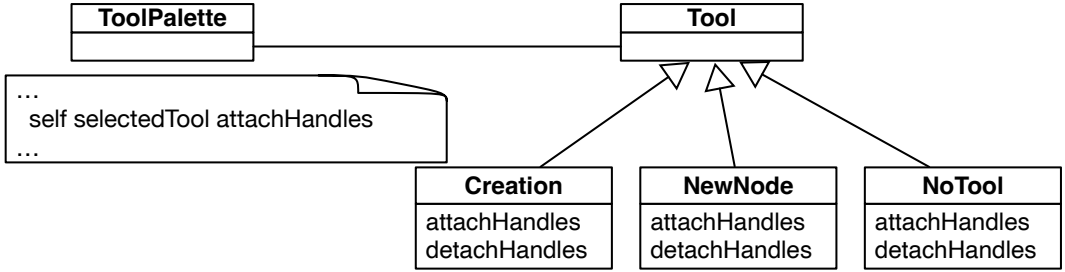
```
ToolPalette >> initialize
  self selectedTool: NoTool new
```

Not forced to use ifNil: tests anymore

```
ToolPalette >> nextAction
  self selectedTool attachHandles

ToolPalette >> previousAction
  self selectedTool detachHandles
```

Solution: With initialization and NoTool



NullObject pros

- Simplifies client code: real collaborators and null objects **offer the same API**
- Encapsulates do **nothing behavior**
- Makes do nothing behavior **reusable**

NullObject drawback

- Encapsulate null values: may be difficult to mix with real objects
- A NullObject is not mutable into a real object
- All clients should **agree on the same do-nothing** behavior

Difficulty applying NullObject

Sometimes it is difficult to apply the NullObject

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

null object vs. NullObject

Sometimes it is possible to get a specific instance initialized with null values

- NullTimeZone is instance of TimeZone but represents a null object
- Null values could be good default values: empty collections, zeros...

For exceptional cases, use exceptions

For exceptional cases, replace nil by exceptions:

- **avoid** error codes because they require if in clients
- exceptions are handled in the correct layer
- i.e., by the client, or the client's client, or ...

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

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**

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