Delegation vs. Inheritance

Basic but worth

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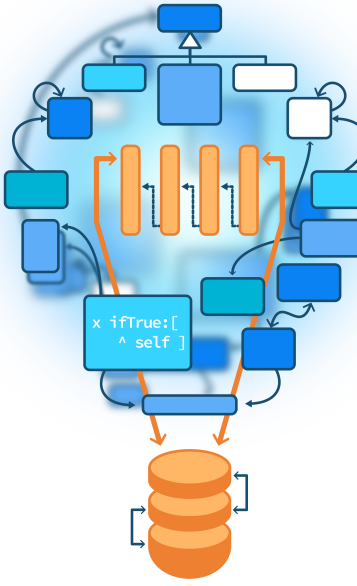


Pharo

Goals

- Delegation-based and inheritance-based designs
- Compare designs using criteria/hints

Exercise setup

Imagine the class TextEditor and the definition of several algorithms:

- formatWithTeX(t) to color TeX
- formatFastColoring(t) to fastly color the text
- formatSlowButPreciseColoring(t) to color ...
- formatRTF(t)
- ...

How can we create an editor that will format differently different texts?

Agenda

- Two first solutions:
  - with inheritance
  - with one class and conditionals
- Define some criteria to compare solutions
- A third solution with delegation
- Evaluation

With inheritance

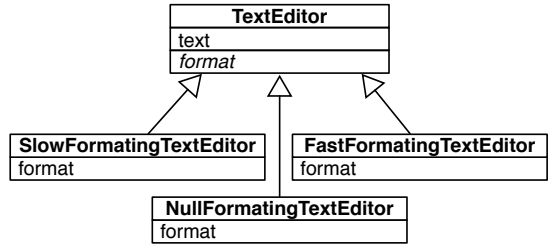
```
Object << #TextEditor
   slots: { #text }

TextEditor >> format
   self subclassResponsability
```

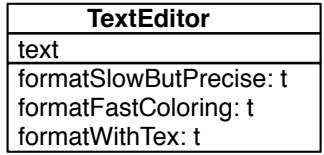
```
SlowFormatingTextEditor >> format
   self formatSlowButPreciseColoring: text
```

```
FastFormatingTextEditor >> format
   self formatFastColoring: text
```

```
NullFormatingTextEditor >> format
   ^ self "do nothing"
```



With one class and conditionals




```
TextEditor >> format
  currentSelection = #slow
    ifTrue: [ self formatSlowButPreciseColoring: text]
    ifFalse: [
        currentSelection = #fast
          ifTrue: [self formatFastColoring: text]
      ....
     ]
```

With one class, a registry and meta-programming

```
Object << #TextEditor
  slots: { #currentSelection. #formatters. #text }
```

```
TextEditor class >> initialize
  self formatters
    at: #slow put: #slowFormat: ;
    at: #fast put: #fastFormat: ;
    at: #null put: #nullFormat: ;
    at: #tex put: #texFormat:
```

```
TextEditor >> format
  self perform: (formatters at: currentSelection) with: text
```

How to compare solutions?

Some criteria:

- **Addition**
  - What is the cost to define a new formatting algorithm?
- **Packaging**
  - Can I deploy a new formatting algorithm separately from others?
- **Dynamic switch**
  - Can I dynamically switch to a another formatting algorithm?

Evaluating inheritance-based solution

Pros:

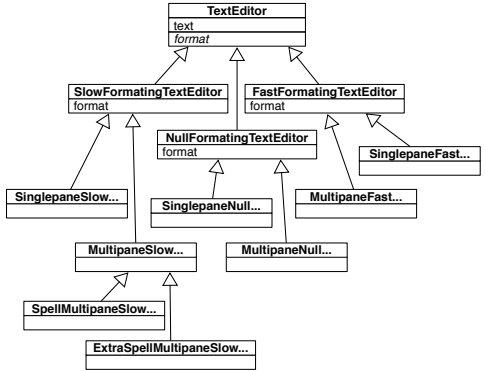
- Addition: adding a new formatting algorithm is done by subclassing
- Packaging: formatting algorithms are modularised in separate classes

Cons:

- Dynamic switch
  - Have to create the right TextEditor at beginning
  - Difficult to **change** it dynamically (external references) and we do not want to reopen the text editor
- Addition: combinatorial explosion (see next lecture)

Evaluating inheritance-based solution

- Do not want a hierarchy for each text editor features to be multiplied with previous ones (Single/Multi-Pane, completion, grammatical verification, compilation,....)
- API of TextEditor can get large: no clear identification of responsibilities



Evaluating conditionals-based solution

Pros:

- Dynamic switch: we can use a different formatting algorithm dynamically

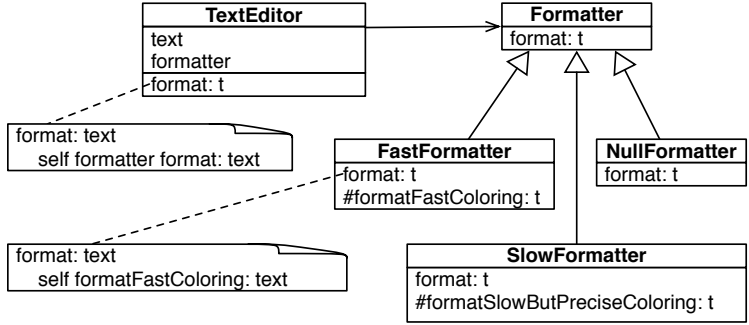
Cons:

- Addition: adding a version requires to edit and **recompile** the conditionals
- Packaging: we cannot package a new algorithm separately

Solution with delegation

Imagine a solution using delegation to another object (a formatter)

Delegating to a formatter




```
myEditor formatter: FastFormatter new.
myEditor format.
myEditor formatter: SlowFormatter new.
```

Evaluating the delegation to a formatter

Pros:

- Addition: just add a new formatter subclass
- Packaging: formatting algorithms are well **modularised** in separate classes
- Dynamic switch: just create a new formatter instance and set it in the editor
- Uniform API between the Editors and the Formatters (format:)

Cons:

- The formatter should access the state of the text (i.e. the text, positions... contained in the text editor)
- The API of the TextEditor should be opened to support it

BTW, this is a typical example of the **Strategy Design Pattern** ;-)

Conclusion

Inheritance

- is about **incremental static** definition
- can lead to static design
- helps defining **abstractions**

Delegation

- brings runtime **flexibility** and modularity

but there's no such thing as a free lunch!

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