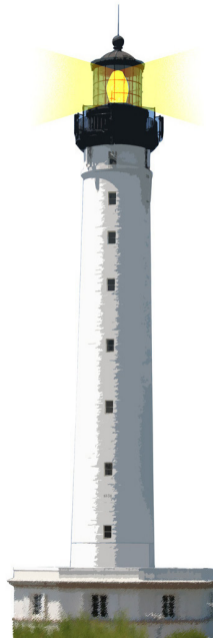


# Application settings

From a monolithic to a modular architecture

S. Ducasse

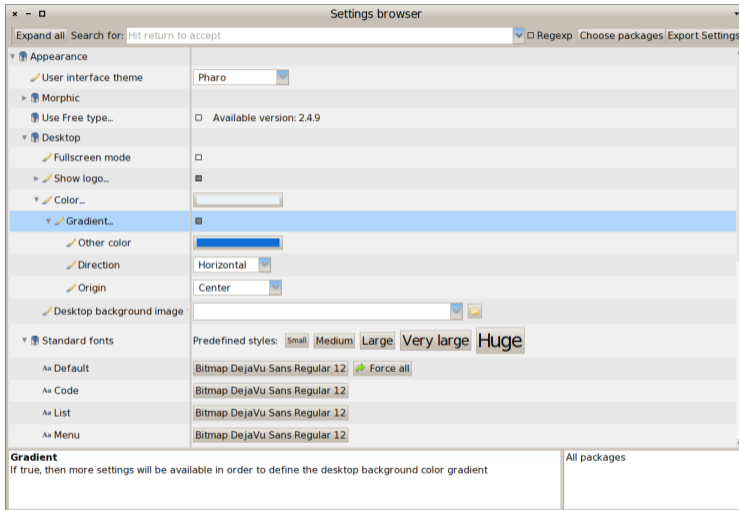


# Goals

- Think about **customizable** elements
- Think about modularity
- Study one real case: Preference in Squeak and Pharo



# The case of Preferences



# Challenges

- How to make sure that we can have
  - One application with **only its** preferences and its dependencies
  - A **modular** definition of preferences
- How do we make sure that
  - **domain** objects do **not** refer to preference objects and
  - still can offer preferences to the user?



# Looking into the problem

Back in time in Squeak 3.8

- Preferences **was** a Facade (bad Design Pattern) managing preferences
- Preferences **class** was referenced 617 times
- Preferences **was** a huge dependency attractor
  - referring to many other subsystems (reading 3D files, RTF, PNG, Compiler....)



# UI, Tools,... all referenced Preferences

```
MenuMorph >> initialize
  super initialize.
  bounds := 0@0 corner: 40@10.
  self setDefaultParameters.
  self listDirection: #topToBottom.
  self hResizing: #shrinkWrap.
  self vResizing: #shrinkWrap.
  defaultTarget := nil.
  selectedItem := nil.
  stayUp := false.
  popUpOwner := nil.
  Preferences roundedMenuCorners ifTrue: [ self useRoundedCorners ]
```



# UI, Tools,... all referenced Preferences

```
BasicButton >> label: aString font: aFontOrNil
```

```
| oldLabel m aFont |
```

```
(oldLabel := self findA: StringMorph)
```

```
  ifNotNil: [ oldLabel delete ].
```

```
aFont := aFontOrNil ifNil: [ Preferences standardButtonFont ].
```

```
m := StringMorph contents: aString font: aFont.
```

```
self extent: (m width + 6) @ (m height + 6).
```

```
m position: self center - (m extent // 2).
```

```
self addMorph: m.
```

```
m lock
```



# Even core parts of the system

```
Class class >> templateForSubclassOf: priorClassName category: systemCategoryName
```

```
Preferences printAlternateSyntax
```

```
  ifTrue: [^ priorClassName asString, ' subclass (#NameOfSubclass)
```

```
instanceVariableNames (""")
```

```
classVariableNames (""")
```

```
poolDictionaries (""")
```

```
category ('' , systemCategoryName asString , ''")]
```

```
  ifFalse: [^ priorClassName asString, ' subclass: #NameOfSubclass
```

```
instanceVariableNames: """)
```

```
classVariableNames: """)
```

```
poolDictionaries: """)
```

```
category: ''' , systemCategoryName asString , ''"]
```





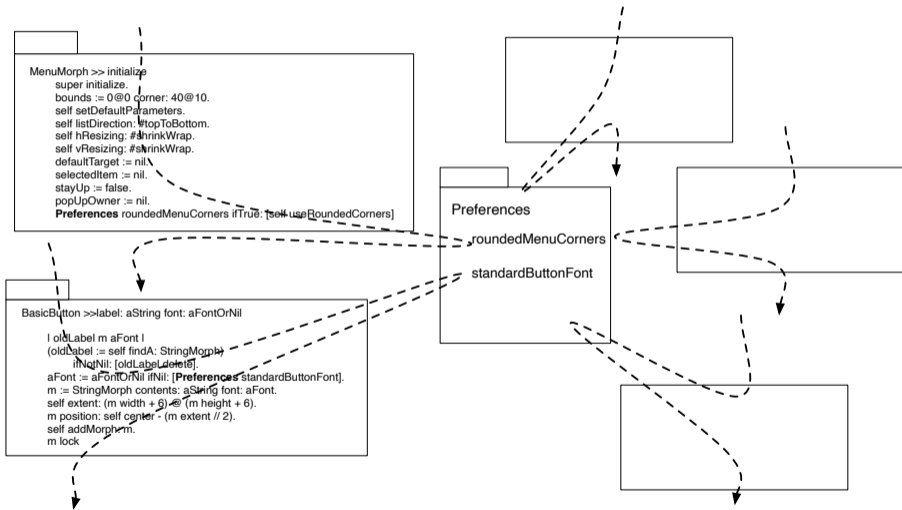
## Even core parts of the system 2

```
InputSensor >> duplicateControlAndAltKeysChanged
```

```
(Preferences  
  valueOfFlag: #swapControlAndAltKeys  
  ifAbsent: [false]) ifTrue: [  
    self inform: 'Resetting swapControlAndAltKeys preference'.  
    (Preferences preferenceAt: #swapControlAndAltKeys) rawValue: false.  
  ].  
self installKeyDecodeTable.
```

# Externalized and centralized flow of components

The octopus AntiPattern :(



# Analysis

- **Everybody** depends on Preferences
- Preferences is **not optional**
- Each time the Preferences class depends on a new item, all its **dependents are impacted**
- A clear **lost-lost**
- **Monolithic**



# Facade and Singleton are against modularity

- A Facade should **rarely** be used
  - Propose a single entry point to a subsystem
  - Compiler is probably the only working example
- A Facade is often a disguised **global variable!**
- Singleton is most of the time not understood and correctly used (see Lectures on Singleton)



# A new architecture

- A class **defines state / methods** that implement **its** customization points
- The class **declares** its settings via description
- The settings browser collects the **setting declaration** and builds a UI for the user
- The settings browser **configure** objects **using settings description**



# Supporting Internal control flow

- Limiting external dependencies
- Reinforcing locality

```
MenuMorph >> initialize
  super initialize.
  bounds := 0@0 corner: 40@10.
  self setDefaultParameters.
  self listDirection: #topToBottom.
  self hResizing: #shrinkWrap.
  self vResizing: #shrinkWrap.
  defaultTarget := nil.
  selectedItem := nil.
  stayUp := false.
  popUpOwner := nil.
  shouldUseRoundCorners ifTrue: [self useRoundedCorners]
```

```
BasicButton >>label: aString font: aFontOrNil

  | oldLabel m aFont |
  (oldLabel := self findA: StringMorph)
  ifNotNil: [oldLabel delete].
  aFont := aFontOrNil ifNil: [self standardButtonFont].
  m := StringMorph contents: aString font: aFont.
  self extent: (m width + 6) @ (m height + 6).
  m position: self center - (m extent // 2).
  self addMorph: m.
  m lock
```

# Sound obvious but so true

- An object should **be designed to be customizable** without referring to external global objects
- Think about encapsulation
- The state of customization should be internal to the object



# In Action: A class implements its customization points

```
JobProgressBarMorph >> isInterruptible  
  ^ self class isInterruptible
```

```
JobProgressBarMorph class >> isInterruptible  
  ^ IsInterruptible ifNil: [ IsInterruptible := true ]
```

```
JobProgressBarMorph >> addInterruptionButton  
  self isInterruptible ifFalse: [ ^ self ].  
  self addMorphBack: (self iconNamed: #stop) asMorph
```

- IsInterruptible is a state local to JobProgressBarMorph
- JobProgressBarMorph uses its own internal state to configure itself





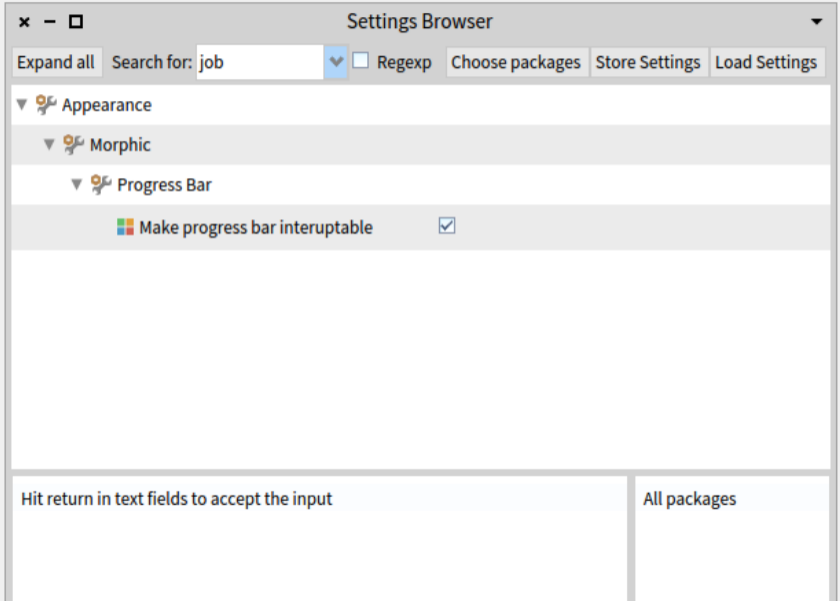
# In Action: Settings declaration using a Builder

```
JobProgressBarMorph class >> interruptionSetting: aBuilder
<systemsettings>
(aBuilder setting: #isInterruptable)
  label: 'Make progress bar interuptable';
  default: true;
  description: 'When enabled, add a button to progress bars to
interupt the action when clicked.';
  parent: #progress;
  target: self;
  order: 1
```

- Using a builder as parameter we avoid direct references to Settings classes
- Can be optionally packaged in another package if needed



# In Action: Settings Browser



The screenshot shows a window titled "Settings Browser" with a search bar containing "job" and a "Regexp" checkbox. The settings are organized into a tree view under "Appearance", "Morphic", and "Progress Bar". The "Make progress bar interruptable" setting is checked. A footer contains two columns: "Hit return in text fields to accept the input" and "All packages".

Settings Browser

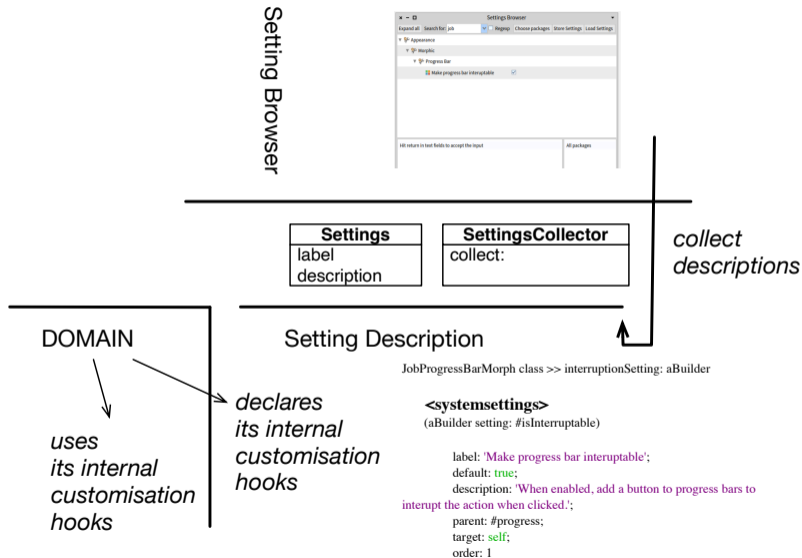
Expand all Search for: job  Regexp Choose packages Store Settings Load Settings

- Appearance
  - Morphic
    - Progress Bar
      - Make progress bar interruptable

Hit return in text fields to accept the input

All packages

# A layered and modular architecture



# Analysis

## Layered

- the domain does not depend on the setting framework
- Settings do not depend on Browser

## Modular

- The domain can be loaded alone
- Not dependencies to unnecessary stuff



# About customization

- An object should be **designed to be customisable**
- The logic flow should be **internal**
- The object logic should **not be tight to a preference object**
- The object cusotmisation can be set from an external object (like the Setting browser)



# Conclusion

- A good architecture should not promote global variable usage
- Avoid Singleton/Facade, these are anti-patterns
- Our theory is that Facade is only "useful" for Compiler :)
- Customization should first be internal



A course by

S. Ducasse, G. Polito, and Pablo Tesone



Except where otherwise noted, this work is licensed under CC BY-NC-ND 3.0 France  
<https://creativecommons.org/licenses/by-nc-nd/3.0/fr/>