

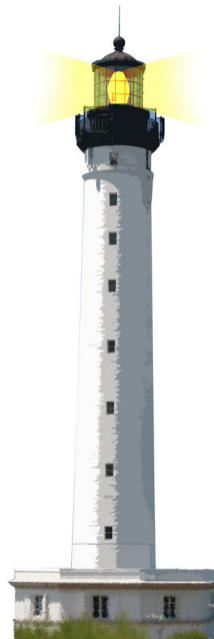
Advanced Object-Oriented Design

Builder API variations

S. Ducasse



<http://www.pharo.org>



Goal

- Discuss about builder API
- Identify and understand variations



Microdown

A better markdown :)

- compact (subset of markdown)
- more extensible (superset of markdown)

Used for:

- class comments
- slides, books, and documentation



Example

```
# Hello Pharo
```

Microdown is a cool markdown.

It is used to generate

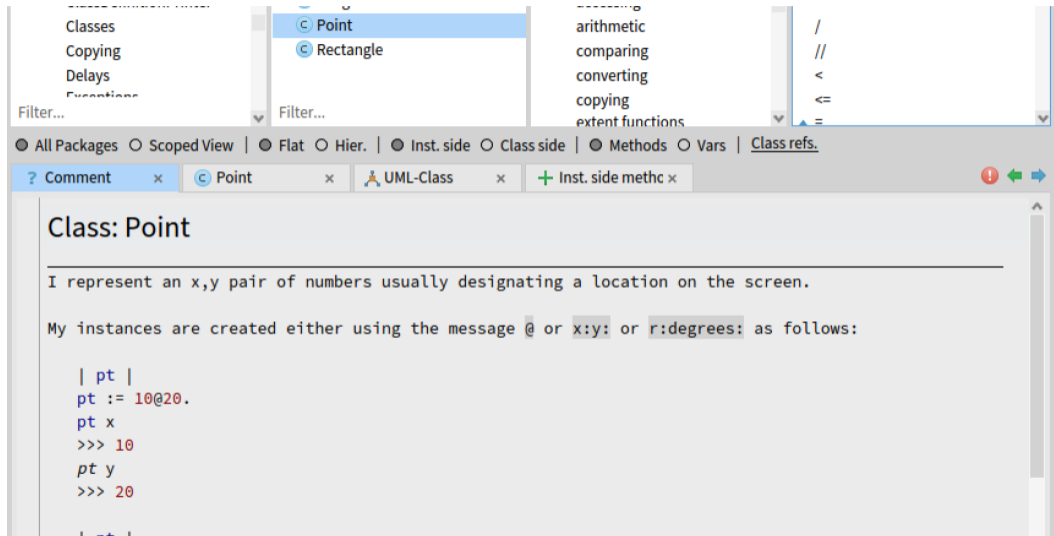
- slides
- books
- class comments

```
<!slide|title=This is a cool title&tag=nh5p
```

- a list of bullet
 - bullet 2
 - bullet 3
- ```
!>
```



# Default Microdown class comment



The screenshot shows a software development environment with a class browser on the left and a code editor on the right. The class browser lists 'Point' and 'Rectangle'. The code editor displays the following content:

```
Class: Point
```

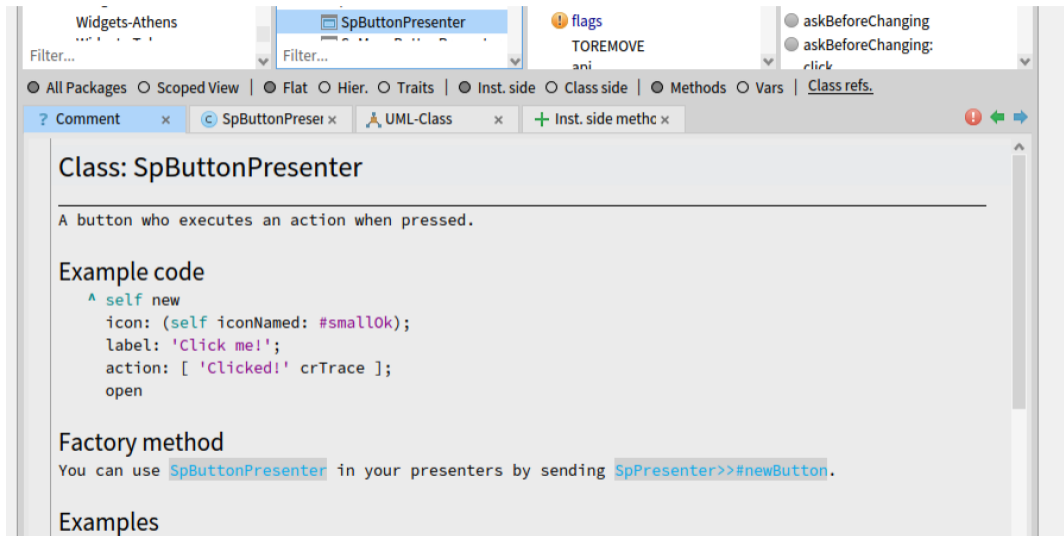
---

I represent an x,y pair of numbers usually designating a location on the screen.

My instances are created either using the message @ or x:y: or r:degrees: as follows:

```
| pt |
pt := 10@20.
pt x
>>> 10
pt y
>>> 20
```

# Specialized Microdown class comment



The screenshot shows an IDE window with the following elements:

- Project browser: Widgets-Athens
- Class browser: SpButtonPresenter
- Search filters: Filter...
- Flags: ! flags, TOREMOVE, ani
- Options: askBeforeChanging, askBeforeChanging: click
- Navigation: All Packages, Scoped View, Flat, Hier., Traits, Inst. side, Class side, Methods, Vars, Class refs.
- Tab bar: ? Comment, SpButtonPreser, UML-Class, Inst. side methc
- Content area: Documentation for SpButtonPresenter class.

**Class: SpButtonPresenter**

---

A button who executes an action when pressed.

**Example code**

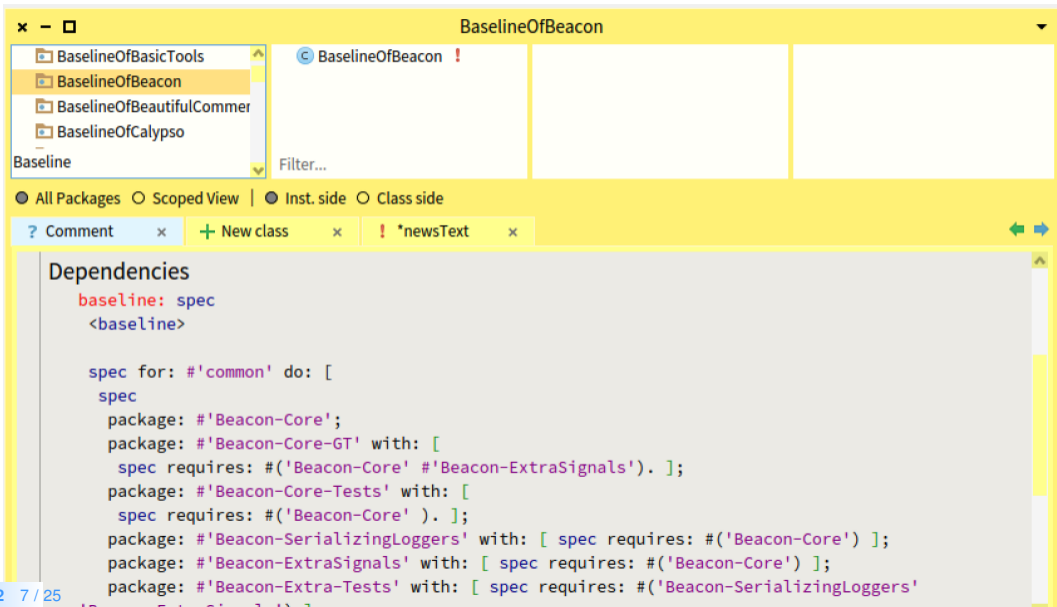
```
^ self new
 icon: (self iconNamed: #smallOk);
 label: 'Click me!';
 action: ['Clicked!' crTrace];
 open
```

**Factory method**

You can use `SpButtonPresenter` in your presenters by sending `SpPresenter>>#newButton`.

**Examples**

# Specialized Microdown class comment



The screenshot shows an IDE window titled "BaselineOfBeacon". The left sidebar displays a project tree with folders: "BaselineOfBasicTools", "BaselineOfBeacon" (selected), "BaselineOfBeautifulCommer", and "BaselineOfCalypso". Below the tree is a "Baseline" section with a "Filter..." input. The main editor area shows a class comment for "BaselineOfBeacon" with a red exclamation mark icon. The comment is displayed in a "Dependencies" view, showing the following code:

```
baseline: spec
<baseline>

spec for: #'common' do: [
spec
package: #'Beacon-Core';
package: #'Beacon-Core-GT' with: [
spec requires: #('Beacon-Core' #'Beacon-ExtraSignals').];
package: #'Beacon-Core-Tests' with: [
spec requires: #('Beacon-Core').];
package: #'Beacon-SerializingLoggers' with: [spec requires: #('Beacon-Core')];
package: #'Beacon-ExtraSignals' with: [spec requires: #('Beacon-Core')];
package: #'Beacon-Extra-Tests' with: [spec requires: #('Beacon-SerializingLoggers'
```

At the bottom left, there is a small red and white striped lighthouse icon and the text "2022 7 / 25".

# How to programmatically generate Microdown?

**No** string concatenation:

- Expose users to possible syntax changes
- Tool builders do not have to learn syntactic quirks

Better provide a **scripting API**

- **Abstract away** details
- Support **future changes**

**Hooks/Extensibility**

- Every single class can **customize** 'buildMicroDownUsing: aBuilder withComment: aString' hook





# Microdown class comment hook

renderComment: aString of: aClassOrPackage

"Return aString as part of the templated class comment, when rendering is on.  
Else aString."

| builder |

builder := Microdown builder.

aClassOrPackage buildMicroDownUsing: builder withComment: aString.

^ self render: builder contents



# Default class comments

```
Class >> buildMicroDownUsing: aBuilder withComment: aString
```

```
aBuilder
```

```
 header: [
```

```
 aBuilder text: 'Class: '.
```

```
 aBuilder text: self name]
```

```
withLevel: 1;
```

```
horizontalLine;
```

```
text: aString
```



# Hook for widgets

SpAbstractWidget >> buildMicroDownUsing: aBuilder withComment: aString

```
super buildMicroDownUsing: aBuilder withComment: aString.
```

```
self addDocumentSectionExampleCode: aBuilder.
```

```
self addDocumentSectionFactoryMethod: aBuilder.
```

```
self documentSections keysAndValuesDo: [:label :methods |
 self addDocumentSection: aBuilder label: label methods: methods].
```

```
self addDocumentExtraSections: aBuilder.
```

```
self addDocumentSectionHierarchy: aBuilder.
```

```
self addDocumentSectionTransmissions: aBuilder.
```

## Hook for widgets (2)

```
BaselineOf >> addDocumentSection: aBuilder label: label methods: methods
```

```
 methods ifEmpty: [^ self].
```

```
 aBuilder newLine.
```

```
 aBuilder header: [:builder | builder text: label] withLevel: 2.
```

```
 aBuilder unorderedListDuring: [
```

```
 (methods sorted: #selector ascending) do: [:each |
```

```
 aBuilder item: [
```

```
 aBuilder monospace: (each methodClass name, '>>#', each selector)]]]
```

# About builder API

All microdown elements and their parametrization

- text:, bold:, anchor:, codeblock:,
- comment:
- item...



# About generation of leave elements

For leaves, i.e., unstructured text or elements

- Just pass the argument
- Give simple order

```
builder text: 'Bold'
```

```
aBuilder newLine
```

# Codeblock is also a leave element

aBuilder codeblock:

'this is the contents  
of a code block.

It will be displayed with ``` around.'

# About generation of composite/nested elements

- Should provide a way to let the user defines the **inner** part
- Use blocks as a way to support element wrapping

```
builder bold: [builder text: 'This is a text in bold']
```

```
builder bold: [builder italic: [builder text: 'This is a text in bold and italic']]
```

```
builder
 header: [
 builder bold: [builder text: 'Very'].
 builder text: 'Important']
 withLevel: 2.
```





# Composite example: Cell

```
testCell
```

```
self
```

```
 assert: (builder
```

```
 cell: [
```

```
 builder text: 'this is '.
```

```
 builder bold: [builder text: 'bold']]) contents
```

```
 equals: '| this is bold |'
```



# Comparing alternate designs

What is the difference between

```
aBuilder header: [:builder | builder text: 'Factory method'] withLevel: 2.
```

And

```
aBuilder header: [aBuilder text: 'Factory method'] withLevel: 2.
```



# No parameter design

aBuilder header: [ aBuilder text: 'Factory method' ] withLevel: 2.

- Only one builder for all the messages
- More compact



# No parameter implementation

```
MicrodownTextualBuilder >> bold: aBlock
 self raw: BoldMarkup.
 aBlock value.
 self raw: BoldMarkup.
```

- The builder executes the block `aBlock` value
- Implications: there is only one builder (the message receiver/method argument)



# With block parameter design

aBuilder header: [ :builder | builder text: 'Factory method' ] withLevel: 2.

- Each API can have its own builder
- We can have a hierarchy of builders each one representing finer context
- More verbose



# With block parameter implementation

```
rawHeader: aBloc withLevel: anInteger
 self raw: (HeaderMarkup repeat: anInteger).
 self raw: String space.
aBloc value: SpecialMicrodownBuilder new
```

Each subclass can specialize `rawHeader: aBloc withLevel: anInteger`

- or an equivalent hook to use a specific builder passed as argument of the value:



# Analysis

## Pros:

- With an explicit argument builder, we can also subclass the builder and modify partially the builder behavior
  - We could have specialisation builder that produces table of contents
- It feels like visitor hooks

## Cons:

- You have to define an extra parameter to all the wrapping APIs



# Conclusion

- Design is about tradeoffs
- Extensibility can be designed





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/>