Some Points on Classes

Stéphane Ducasse
Stephane.Ducasse@univ-savoie.fr
http://www.listic.univ-savoie.fr/~ducasse/

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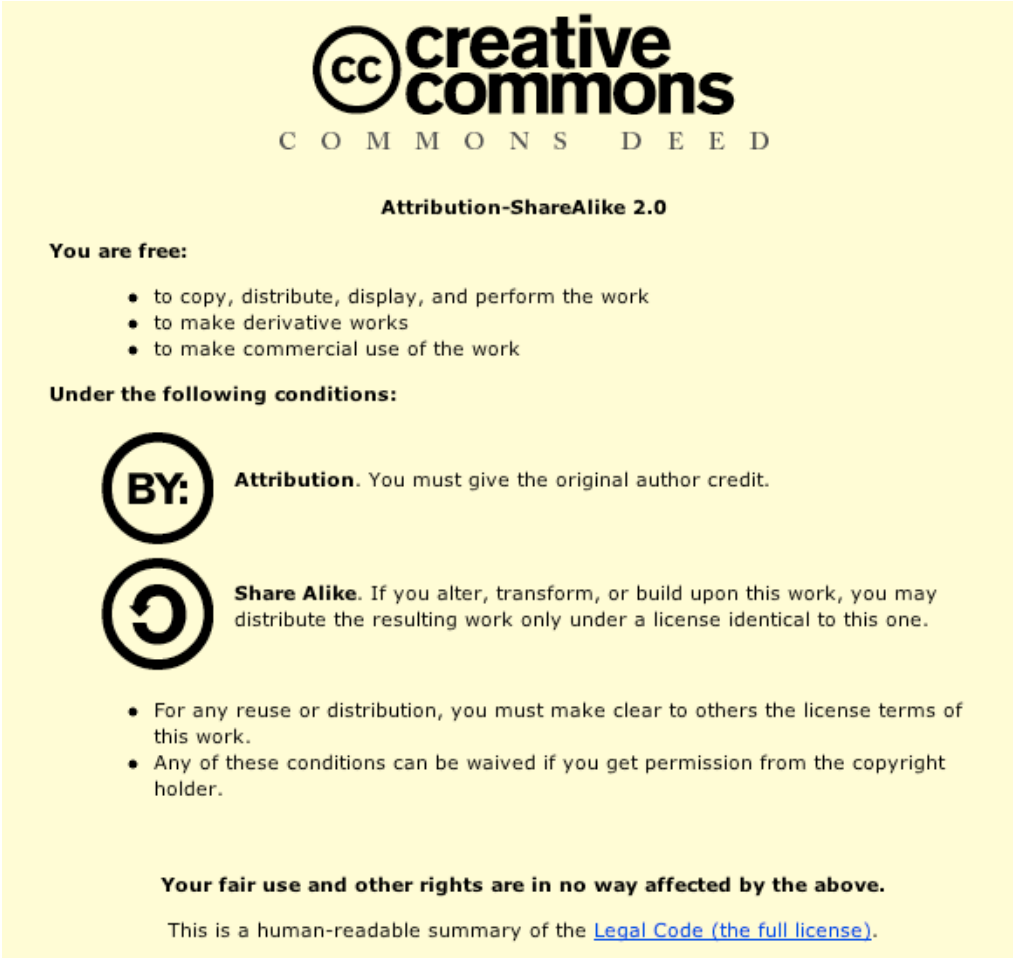

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Outline

- Class definition
- Method definition
- Basic class instantiation

Class Definition (VW)

A template is proposed by the browser:

```
Smalltalk defineClass: #NameOfClass
    superclass: #{NameOfSuperclass}
    indexedType: #none
    private: false
    instanceVariableNames: 'instVarName1
instVarName2'
    classInstanceVariableNames: ''
    imports: ''
    category: ''
```

Fill the Template (VW)

Smalltalk **defineClass**: #Packet

superclass: #{Object}

indexedType: #none

private: false

instanceVariableNames: 'contents addressee originator'

classInstanceVariableNames: ''

imports: ''

category: 'LAN'

Automatically a class named "Packet class" is created. Packet is the unique instance of "Packet class". To see it, click on the

Class Definition: (Sq)

A template is proposed by the browser:

NameOfSuperclass **subclass**: #NameOfClass
    instanceVariableNames: 'instVarName1 instVarName2'
    classVariableNames: 'ClassVarName1 ClassVarName2'
    poolDictionaries: ''
    category: 'CategoryName'

Filling the Template (Sq)

Just fill this Template in:

```
Object subclass: #Packet
    instanceVariableNames: 'contents addressee
originator '
    classVariableNames: ''
    poolDictionaries: ''
    category: 'LAN-Simulation'
```

Automatically a class named "Packet class" is created. Packet is the unique instance of Packet class. To see it, click on the class button in the browser

Named Instance Variables

instanceVariableNames: 'instVarName1 instVarName2'
...
instanceVariableNames: **'contents addressee originator '**
...

- Begins with a lowercase letter
- Explicitly declared: a list of instance variables
- Name should be unique in the inheritance chain
- Default value of instance variable is nil
- Private to the instance: instance based (vs. C++ class-based)
- Can be accessed by all the methods of the class and its subclasses
- Instance variables cannot be accessed by class methods.
- A client cannot directly access instance variables.
- The clients must use accessors to access an instance variable.

Roadmap

- Class definition
- *Method definition*
- Basic class instantiation

Method Definition

- Fill in the template. For example:

```
Packet>>defaultContents
    "returns the default contents of a Packet"
    ^ 'contents no specified'

Workstation>>originate: aPacket
    aPacket originator: self.
     self send: aPacket
```

- How to invoke a method on the same object? Send the message to self

```
Packet>>isAddressedTo: aNode
    "returns true if I'm addressed to the node aNode"
    ^ self addressee = aNode name
```

Accessing Instance Variables

Using direct access for the methods of the class

```
Packet>>isSentBy: aNode
    ^ originator = aNode
```

is equivalent to use accessors

```
Packet>>originator
    ^ originator
Packet>>isSentBy: aNode
    ^ self originator = aNode
```

Design Hint: Do not directly access instance variables of a superclass from subclass methods. This way classes are not strongly linked.

Methods always return a Value

- Message = effect + return value
- By default, a method returns self
- In a method body, the ^ expression returns the value of the expression as the result of the method execution.

```
Node>>accept: thePacket
    self send: thePacket
```

This is equivalent to:

```
Node>>accept: thePacket
    self send: thePacket.
    ^self
```

Methods always return a value

- If we want to return the value returned by #send:

```
Node>>accept: thePacket
    ^self send: thePacket.
```

- Use ^ self to notify the reader that something abnormal is arriving

```
MyClass>>foo
            …
    ^ self
```

Some Naming Conventions

- Shared variables begin with an upper case letter
- Private variables begin with a lower case letter
- For accessors, use the same name as the instance variable accessed:

```
Packet>>addressee
    ^ addressee
Packet>>addressee: aSymbol
    addressee := aSymbol
```

Some Naming Conventions

- Use imperative verbs for methods performing an action like #openOn:, #close, #sleep

- For predicate methods (returning a boolean) prefix the method with **is** or **has**
- Ex: isNil, isAddressedTo:, isSentBy:

- For converting methods prefix the method with as
- Ex: asString

Roadmap

- Class definition
- Method definition
- ***Basic class instantiation***

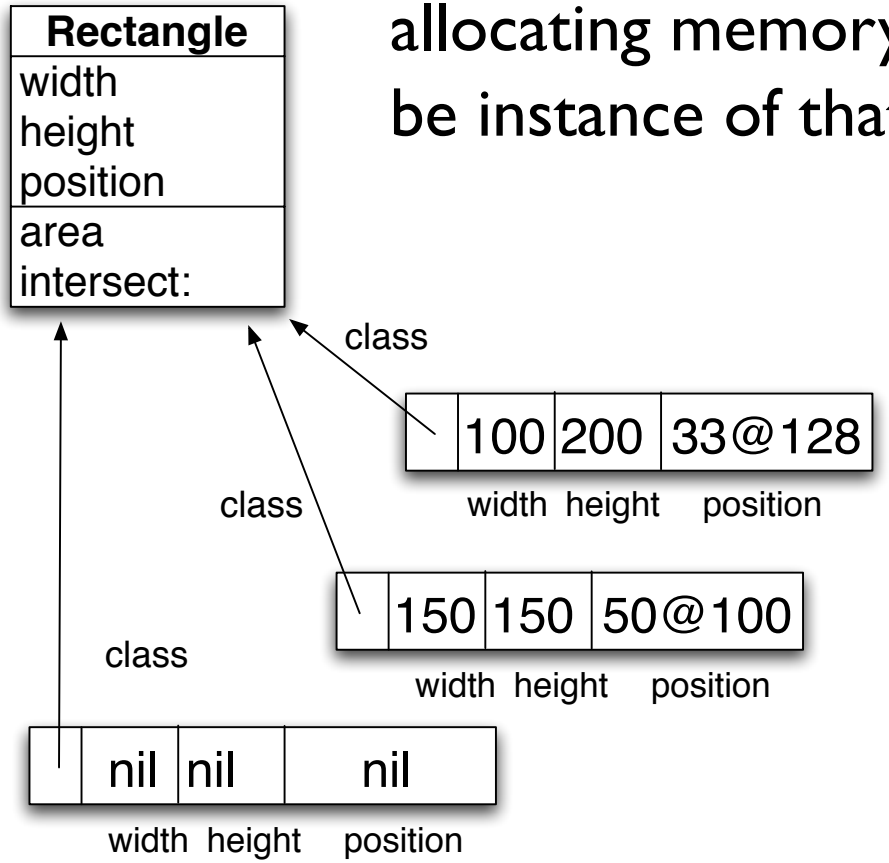
Object Instantiation

Objects can be created by:

- Direct Instance creation: new/new:
- Messages to instances that create other objects
- Class specific instantiation messages

Object Creation

- When a class creates an object =
  allocating memory + marking it to be instance of that class



Instance Creation with new

aClass new

returns a newly and *UNINITIALIZED* instance

OrderedCollection new -> OrderedCollection ()
Packet new -> aPacket

Default instance variable values are nil
nil is an instance of UndefinedObject and only understands a limited set of messages

Messages to Instances

Messages to Instances that create Objects

1 to: 6	(an interval)
1@2	(a point)
(0@0) extent: (100@100)	(a rectangle)
#lulu asString	(a string)
1 printString	(a string)
3 asFloat	(a float)
#(23 2 3 4) asSortedCollection	(a sortedCollection)

Opening the Box

1 to: 6
creates an interval

```
Number>>to: stop
    "Answer an Interval from the receiver up to the argument,
    stop, with each next element computed by incrementing the
    previous one by 1."

      ^Interval from: self to: stop by: 1
```

Strings...

1 printString

```
Object>>printString
   "Answer a String whose characters are a description
   of the receiver."

    | aStream |
    aStream := WriteStream on: (String new: 16).
    self printOn: aStream.
    ^ aStream contents
```

Instance Creation

1@2

creates a point

```
Number>>@ y
    "Answer a new Point whose x value is the receiver and
    whose y value is the argument."

    <primitive: 18>
    ^ Point x: self y: y
```

Class-specific Messages

Array **with**: 1 **with**: 'lulu'

OrderedCollection **with**: 1 **with**: 2 **with**: 3

Rectangle **fromUser** -> 179@95 corner: 409@219

Browser **browseAllImplementorsOf**: #at:put:

Packet **send**: 'Hello mac' **to**: #mac

Workstation **withName**: #mac

new and new:

- **new:**/basicNew: is used to specify the size of the created instance

Array **new:** 4 -> #(nil nil nil nil)

- new/new: can be specialized to define customized creation
- basicNew/basicNew: should never be overridden
- #new/basicNew and new:/basicNew: are class methods

Summary

How to define a class?
What are instance variables?
How to define a method?
Instances creation methods