Smalltalk in a Nutshell

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Goals

Syntax in a Nutshell
OO Model in a Nutshell

Smalltalk OO Model

Everything is an object
  Only message passing
  Only late binding
Instance variables are private to the object
Methods are public
Everything is a pointer

Garbage collector
Single inheritance between classes
Only message passing between objects

Complete Syntax on a PostCard

```
exampleWithNumber: x
"A method that illustrates every part of Smalltalk method syntax except primitives. It
has unary, binary, and key word messages, declares arguments and temporaries (but
not block temporaries),  accesses a global variable (but not and instance variable), uses
literals (array, character, symbol, string, integer, float), uses the pseudo variable true
false, nil, self, and super, and has sequence, assignment, return and cascade. It has both
zero argument and one argument blocks. It doesn't do anything useful, though"
    |y|
    true & false not & (nil isNil) ifFalse: [self halt].
    y := self size + super size.
    #($a #a 'a' 1 1.0)
                 do: [:each | Transcript
                          show: (each class name);
                          show: (each printString);
                                                              show:' '].
        ^ x < y
```

Language Constructs

^	return
"	comments
#	symbol or array
'	string
[ ]	block or byte array
.	separator and not terminator (or namespace access in VW)
;	cascade (sending several messages to the same instance)
|	local or block variable
:=	assignment
$	character
:	end of selector name
e, r	number exponent or radix
!	file element separator
<primitive: ...>	for VM primitive calls

Syntax

comment:	"a comment"
character:	$c $h $a $r $a $c $t $e $r $s $# $@
string:	'a nice string' 'lulu' 'l''idiot'
symbol:	#mac #+
array:	#(1 2 3 (1 3) $a 4)
byte array:	#[1 2 3]
integer:	1, 2r101
real:	1.5, 6.03e-34,4, 2.4e7
float:	1/33
boolean:	true, false
point:	10@120

Note that @ is not an element of the syntax, but just a message sent to a number. This is the same for /, bitShift, ifTrue:, do: ...

Syntax in a Nutshell (II)

assigment: var := aValue
block: [:var ||tmp| expr...]

temporary variable:	|tmp|
block variable:	:var
unary message:	receiver selector
binary message:	receiver selector argument
keyword based:	receiver keyword1: arg1 keyword2: arg2...
cascade:	message ; selector ...
separator:	message . message
result:	^
parenthesis:	(...)

Class Definition in St-80

```
NameOfSuperclass subclass: #NameOfClass
   instanceVariableNames: 'instVarName1'
   classVariableNames: 'classVarName1'
   poolDictionaries: ''
   category: 'LAN'
```

Method Definition

- Normally defined in a browser or (by directly invoking the compiler)
- Methods are **public**
- **Always return self**

```
Node>>accept: thePacket
    "If the packet is addressed to me, print it.
     Else just behave like a normal node"

     (thePacket isAddressedTo: self)
              ifTrue: [self print: thePacket]
              ifFalse: [super accept: thePacket]
```

Instance Creation: Messages Too!

- ‘1’, ‘abc’
- Basic class creation messages are
  new, new:,
  basicNew, basicNew:
  Monster new
- Class specific message creation (messages sent to classes)
  Tomagoshi withHunger: 10

Messages and their Composition

Three kinds of messages
Unary: Node new
Binary: 1 + 2, 3@4
Keywords: aTomagoshi eat: #cooky furiously: true
Message Priority
(Msg) > unary > binary > keywords
Same Level from left to right
Example:
(10@0 extent: 10@100) bottomRight
s isNil ifTrue: [self halt]

Blocks

- Anonymous method
- Passed as method argument or stored
- Functions
  fct(x)= x*x+3, fct(2).
  fct :=[:x| x * x + 3]. fct value: 2

```
Integer>>factorial
    | tmp |
            tmp:= 1.
            2 to: self do: [:i| tmp := tmp * i]

    #(1 2 3) do: [:each | Transcript show: each printString ; cr]
```

Yes ifTrue: is sent to a boolean

```
Weather isRaining
    ifTrue: [self takeMyUmbrella]
    ifFalse: [self takeMySunglasses]
```

ifTrue:ifFalse is sent to an object: a boolean!

Yes a collection is iterating on itself

```
#(1 2 -4 -86)
    do: [:each | Transcript show: each abs
printString ;cr ]

> 1
> 2
> 4
> 86
```

Yes we ask the collection object to

Summary

Objects and Messages
Three kinds of messages
- unary
- binary
- keywords

Block: a.k.a innerclass or closures or lambda
Unary>Binary>Keywords

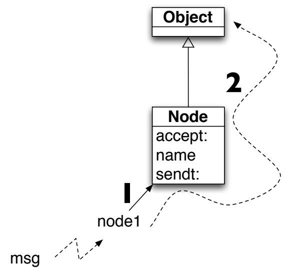
Goals

Syntax in a Nutshell
OO Model in a Nutshell

Instance and Class

- Only one model
- Uniformly applied
- Classes are objects too

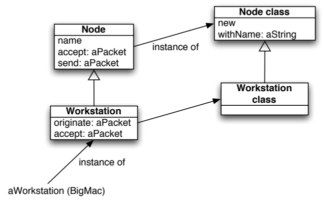
Lookup…Class + Inheritance



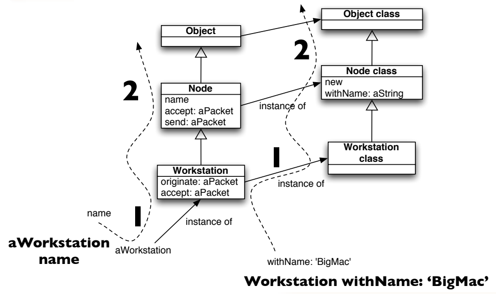
Classes are objects too

- Instance creation is just a message send to a ... Class
- Same method lookup than with any other objects
- a Class is the single instance of amanonymous class
  - Point is the single instance of Point class

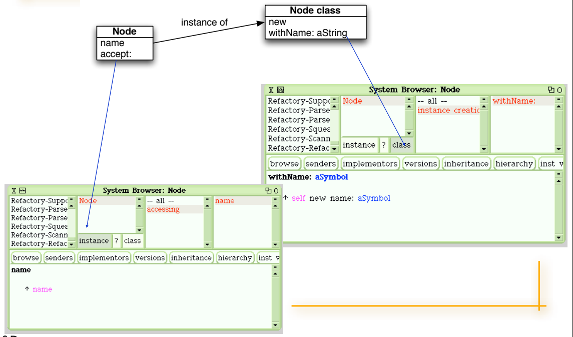
Class Parallel Inheritance



Lookup and Class Methods



About the Buttons



```
withName: aSymbol

↑ self new name: aSymbol
```

```
name

↑ name
```

Summary

- Everything is an object
- One single model
- Single inheritance
- Public methods
- Protected attributes
- Classes are simply objects too
- Class is instance of another class
- One unique method lookup
  look in the class of the receiver