The Taste of Smalltalk

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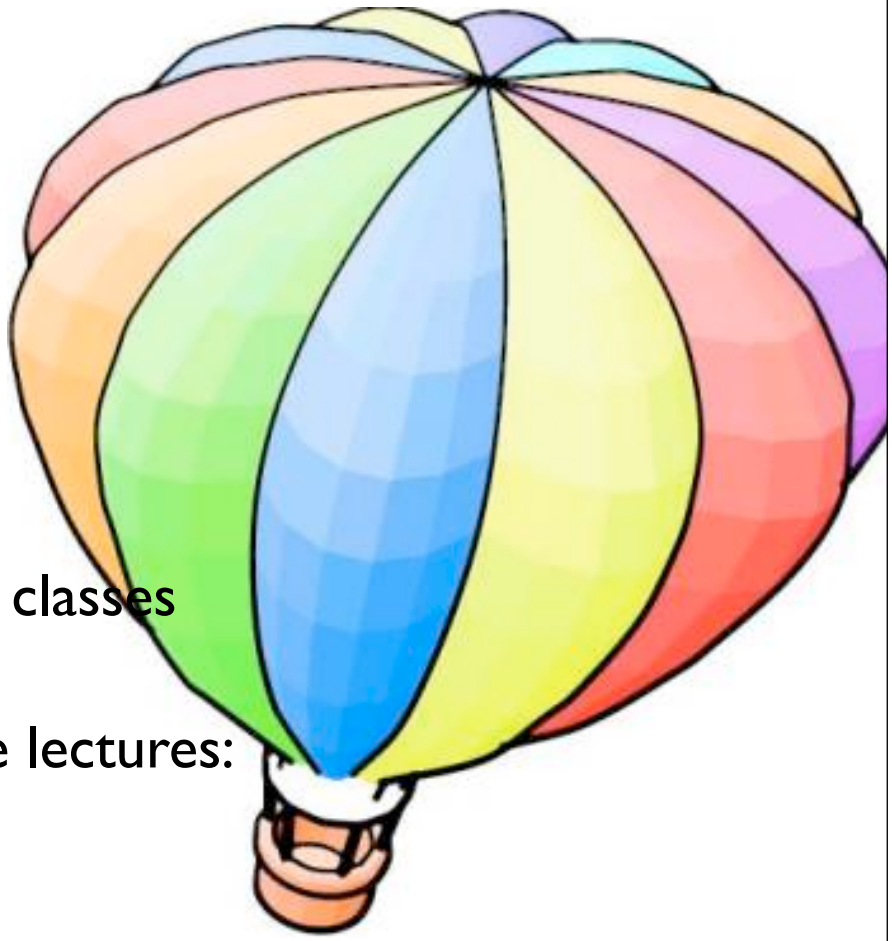
Goals

- Two examples:
  - "hello world"
  - a LAN simulator
- To give you an idea of:
  - the syntax
  - the elementary objects and classes
  - the environment
- To provide the basis for all the lectures:
  - all the code examples,
  - constructs,
  - design decisions, ...



An Advice

You do not have to know everything!!!

- “Try not to care - Beginning Smalltalk programmers often have trouble because they think they need to understand all the details of how a thing works before they can use it. This means it takes quite a while before they can master Transcript show: ‘Hello World’. One of the great leaps in OO is to be able to answer the question "How does this work?" with "I don’t care"“. Alan Knight. Smalltalk Guru

- We will show you how to learn and find your way

Some Conventions

- Return Values
  - 1 + 3 -> 4
  - Node new -> aNode
- Method selector #add:
- Method scope conventions
- Instance Method defined in class Node:
  - Node>>accept: aPacket
- Class Method defined in class Node (in the class of the the class Node)
  - Node class>>withName: aSymbol
- aSomething is an instance of the class Something

Roadmap

- "hello world"
- Syntax
- a LAN simulator

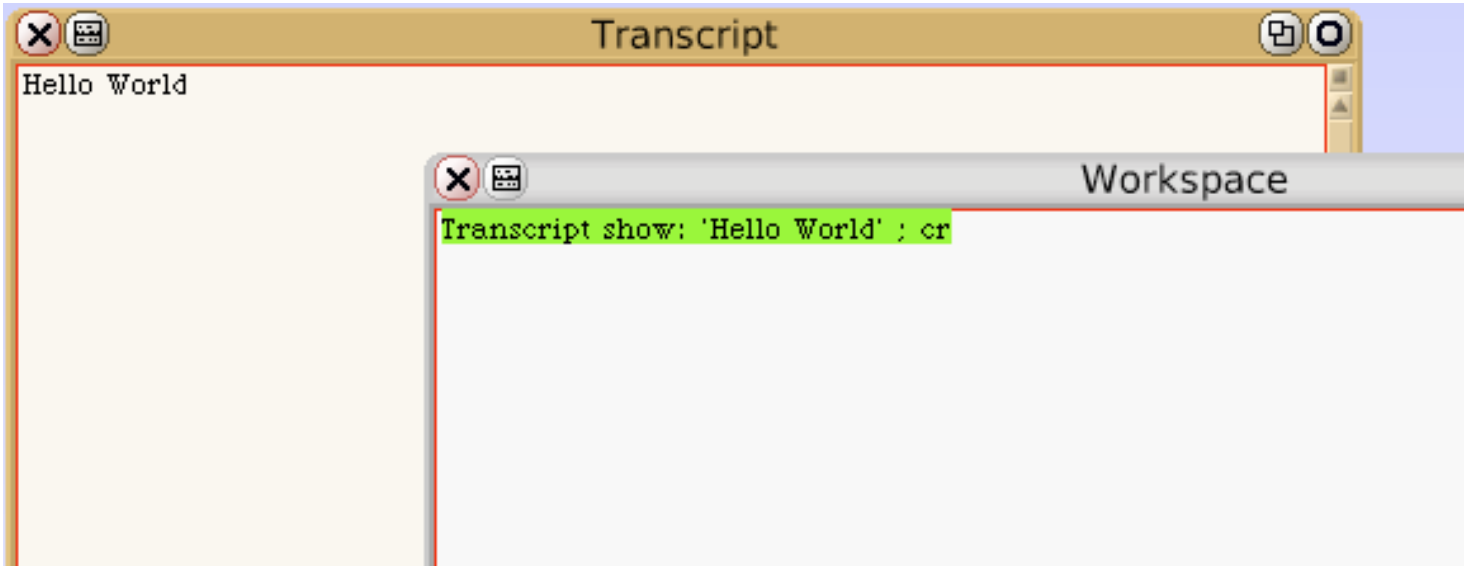
Hello World

Transcript show: 'hello world'

- At anytime we can dynamically ask the system to evaluate an expression. To evaluate an expression, select it and with the middle mouse button apply doIt.

- **Transcript** is a special object that is a kind of standard output.
- It refers to a TextCollector instance associated with the launcher.

Transcript show: 'hello world'



Everything is an Object

The workspace is an object.
The window is an object: it is an instance of ApplicationWindow.
The text editor is an object: it is an instance of ParagraphEditor.
The scrollbars are objects too.
'hello word' is an object: it is aString instance of String.
#show: is a Symbol that is also an object.
The mouse is an object.
The parser is an object: instance of Parser.
The compiler is also an object: instance of Compiler.
The process scheduler is also an object.
The garbage collector is an object: instance of MemoryObject.
Smalltalk is a consistent, uniform world written in itself. You can learn how it is implemented, you can extend it or even modify it. All the code is available and readable

Smalltalk Object 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

Roadmap

- Hello World
- First look at the syntax
- LAN Simulator

Complete Syntax on a PostCard

```
exampleWithNumber: x
    "Illustrates every part of Smalltalk method syntax. It has unary, binary, and key
word messages, declares arguments and 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."
        |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
```


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 perform the loop on itself

DoIt, PrintIt, InspectIt and Accept

- **Accept = Compile:** Accept a method or a class definition
- **DoIt:** send a message to an object
- **PrintIt:** send a message to an object + print the result (#printOn:)
- **InspectIt:** send a message to an object + inspect the result (#inspect)

Objects send messages

- Transcript show: 'hello world'
- The above expression is a message
  - the object Transcript is the ***receiver*** of the message
  - the ***selector*** of the message is #show:
  - one ***argument***: a string 'hello world'
  - Transcript is a global variable (starts with an uppercase letter) that refers to the Launcher's report part.

Vocabulary Point

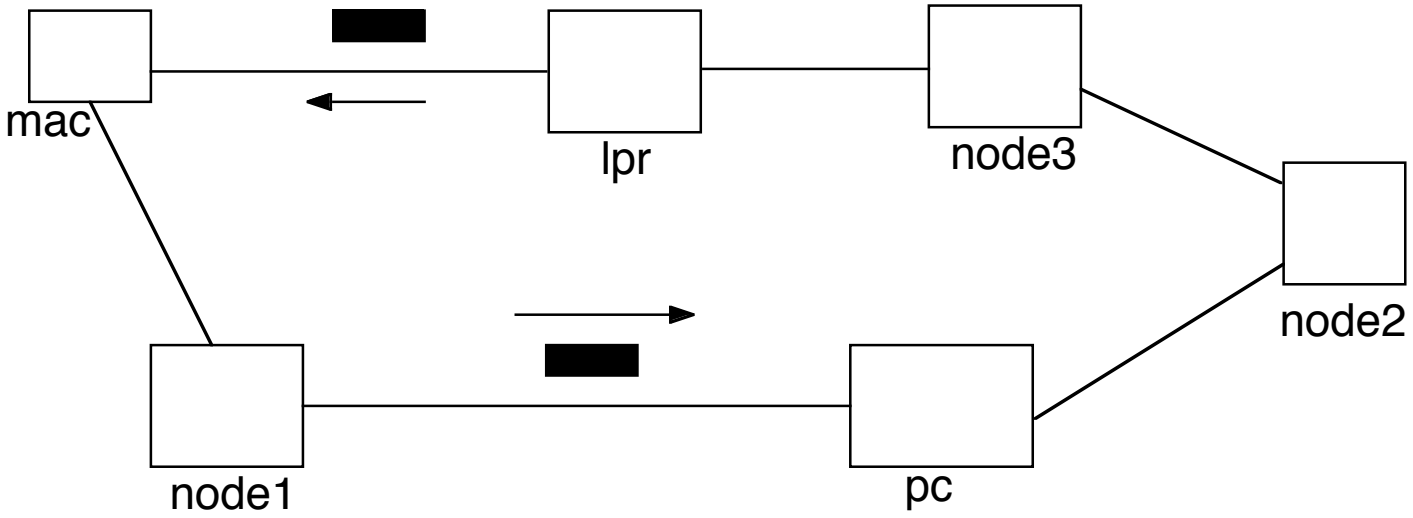
Message passing or sending a message is equivalent to
- invoking a method in Java or C++
- calling a procedure in procedural languages
- applying a function in functional languages
- of course the last two points must be considered under the light of polymorphism

Roadmap

- Hello World
- First look at the syntax
- ***LAN Simulator***

A LAN Simulator

A LAN contains nodes, workstations, printers, file servers. Packets are sent in a LAN and each node treats them differently.



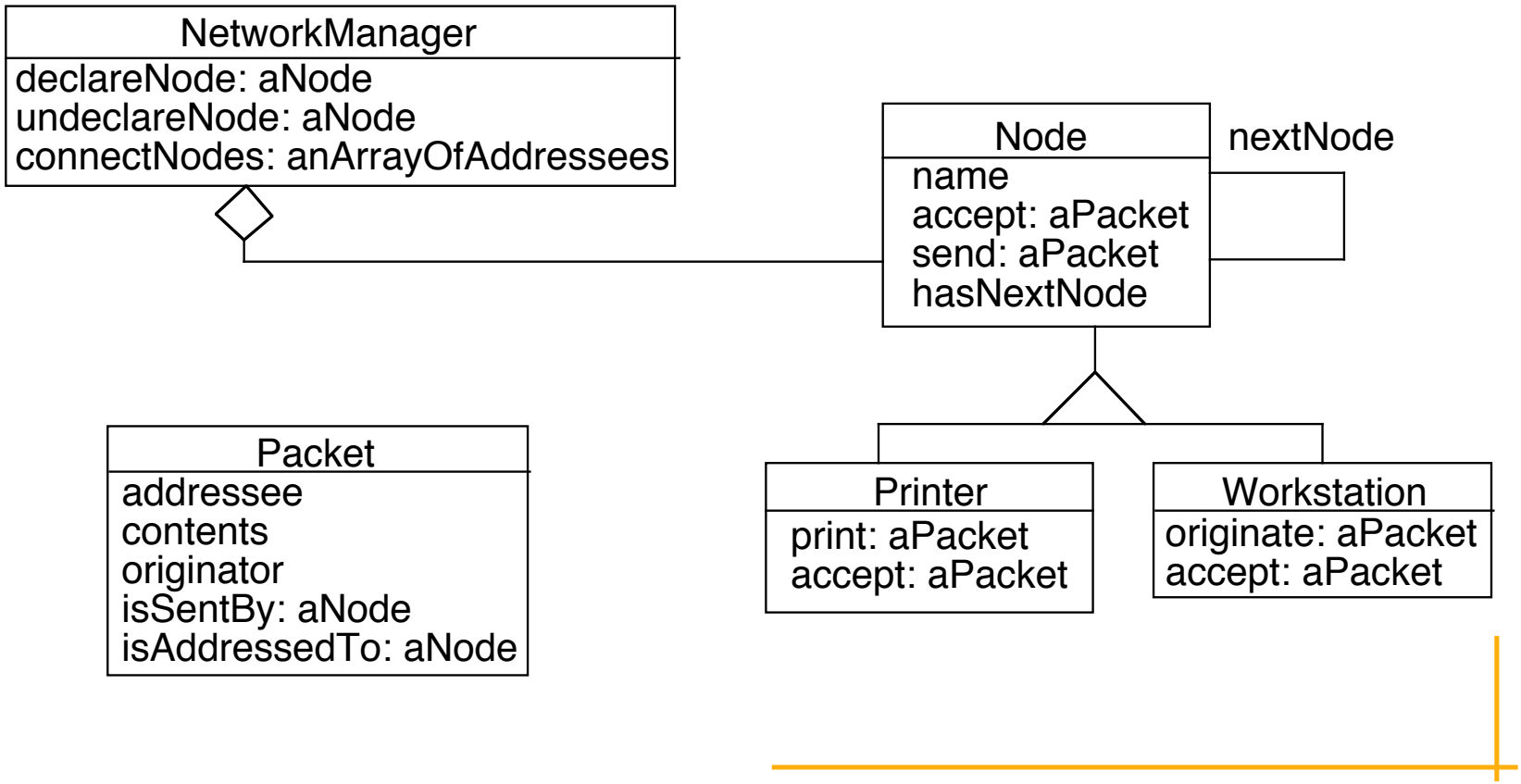
Three Kinds of Objects

Node and its subclasses represent the entities that are connected to form a LAN.

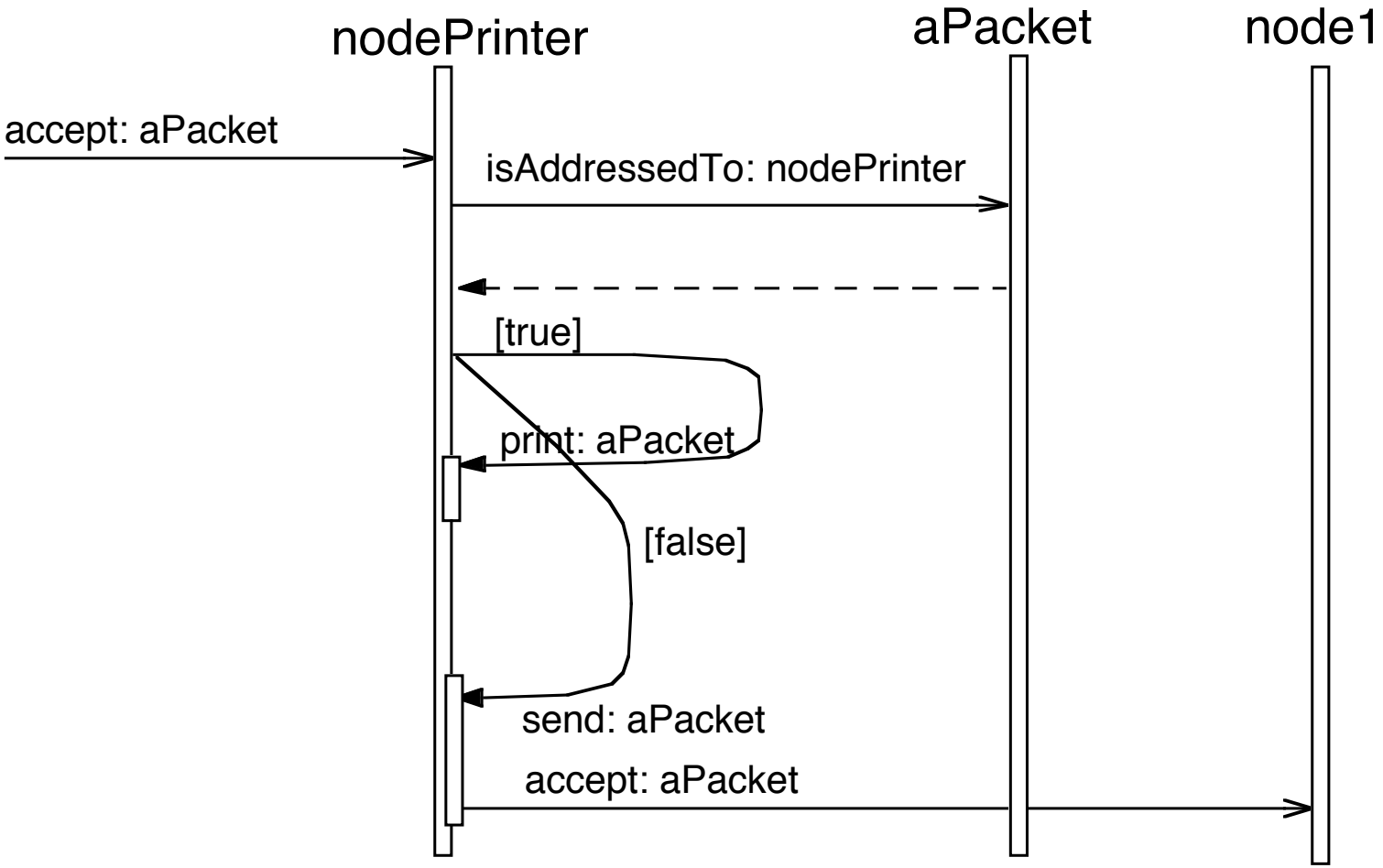
Packet represents the information that flows between Nodes.

NetworkManager manages how the nodes are connected

LAN Design


NetworkManager
declareNode: aNode
undeclareNode: aNode
connectNodes: anArrayOfAddressees
Node
name
accept: aPacket
send: aPacket
hasNextNode
nextNode
Packet
addressee
contents
originator
isSentBy: aNode
isAddressedTo: aNode
Printer
print: aPacket
accept: aPacket
Workstation
originate: aPacket
accept: aPacket

Interactions Between Nodes



Node and Packet Creation

```
|macNode pcNode node1 printerNode node2 node3 packet|
macNode := Workstation withName: #mac.
pcNode := Workstation withName: #pc.
node1 := Node withName: #node1.
node2 := Node withName: #node2.
node3 := Node withName: #node2.
printerNode := Printer withName: #lpr.
macNode nextNode: node1.
node1 nextNode: pcNode.
pcNode nextNode: node2.
node3 nextNode: printerNode.
lpr nextNode: macNode.

packet := Packet send: 'This packet travelled to' to: #lpr.
```


Objects Send Messages

Message: **1 + 2**

receiver : 1 (an instance of SmallInteger)

selector: #+

arguments: 2

Message: **lpr nextNode: macNode**

receiver: lpr (an instance of LanPrinter)

selector: #nextNode:

arguments: macNode (an instance of Workstation)

Message: **Packet send: 'This packet travelled to' to: #lpr**

receiver: Packet (a class)

selector: #send:to:

arguments: 'This packet travelled to' and #lpr

Transmitting a Packet

```
| aLan packet macNode|
...
macNode := aLan findNodeWithAddress: #mac.
packet := Packet send: 'This packet travelled to the printer' to:
#lpr.
macNode originate: packet.
        -> mac sends a packet to pc
        -> pc sends a packet to node1
        -> node1 sends a packet to node2
        -> node2 sends a packet to node3
        -> node3 sends a packet to lpr
        -> lpr is printing
        -> this packet travelled to lpr
```

How to Define a Class?

- Fill the template:

```
NameOfSuperclass subclass: #NameOfClass
    instanceVariableNames: 'instVarName1'
    classVariableNames: 'ClassVarName1  ClassVarName2'
    poolDictionaries: ''
    category: 'LAN'
```


Packet

- For example to create the class Packet

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


How to Define a Method?

message selector and argument names

"comment stating purpose of message"
| temporary variable names |
statements

accept: thePacket

"If the packet is addressed to me, print it. Otherwise just behave like a normal node."

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


In Java

- In Java we would write

```
void accept(thePacket Packet)
/*If the packet is addressed to me, print it. Otherwise just
behave like a normal node.*/

    if (thePacket.isAddressedTo(this)){          this.print
(thePacket)}
            else super.accept(thePacket)}
```

Summary

What is a message?
What is the message receiver?
What is the method selector?
How to create a class?
How to define a method?