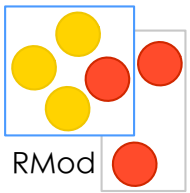
Instance Initialization

How to ensure that an instance is well initialized?

Automatic initialize
Lazy initialization
Proposing the right interface
Providing a default value

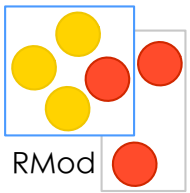
Provider Responsibility



This is the ***responsibility*** of the class to provide ***well-formed*** object

A client should not make ***assumptions*** or been responsible to send ***specific*** sequence of messages to get a working object

A First Implementation of Packet

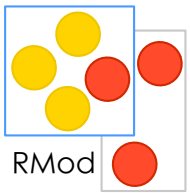



```
Object subclass: #Packet
    instanceVariableNames: 'contents addressee originator '

Packet>>printOn: aStream
   super printOn: aStream.
   aStream nextPutAll: ' addressed to: '; nextPutAll: self addressee.
   aStream nextPutAll: ' with contents: '; nextPutAll: self contents

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

Packet class Definition



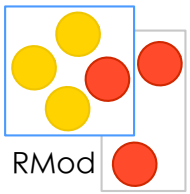
Packet class is automatically defined

```
Packet class
    instanceVariableNames: ''
```

Example of instance creation

```
Packet new
    addressee: #mac ;
    contents: 'hello mac'
```

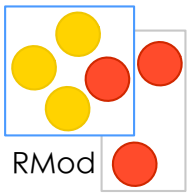
Fragile Instance Creation



If we do not specify a contents, it breaks!

```
|p|
p := Packet new addressee: #mac.
p printOn: aStream
-> error
```

Problems

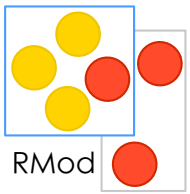


Responsibility of the instance creation relies on the ***clients***

A client can create packet without contents, without address instance variable not initialized

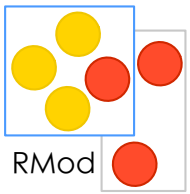
-> error (for example, printOn:)
-> system fragile

Fragile Instance Creation Solutions



Automatic initialization of instance variables
Proposing a solid interface for the creation
Lazy initialization

Instance Initialization



How to ensure that an instance is well initialized?

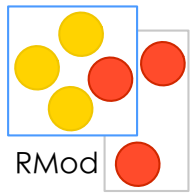
Automatic initialize

Lazy initialization

Proposing the right interface

Providing a default value

Assuring Instance Variable Initialization

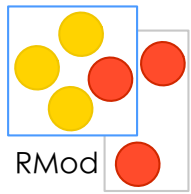


How to initialize a newly created instance ?

Define the method initialize

```
Packet>>initialize
    super initialize.
    contents := ''.
    addressee := #noAd
```

The New/Initialize Couple

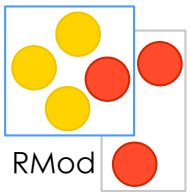


Object>>initialize

"do nothing. Called by new my subclasses override me if necessary"

^ self

(VW) Assuring Instance Variable

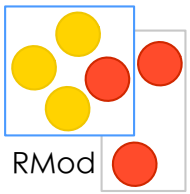


Problem: By default ***new*** class method returns instance with uninitialized instance variables.

In VisualWorks, initialize method is ***not*** automatically called by creation methods new/new:.

How to initialize a newly created instance ?

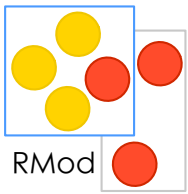
new calling initialize



Packet new
... should invoke the initialize method

```
Packet class>>new
    | inst |
    inst := super new.
    inst initialize.
    ^ inst
```

The New/Initialize Couple



Define an instance method that initializes the instance variables and override new to invoke it.

(1&2) Packet class>>new "Class Method"

```
^ super new initialize
```

(3) Packet>>initialize "Instance Method"

```
super initialize.
```

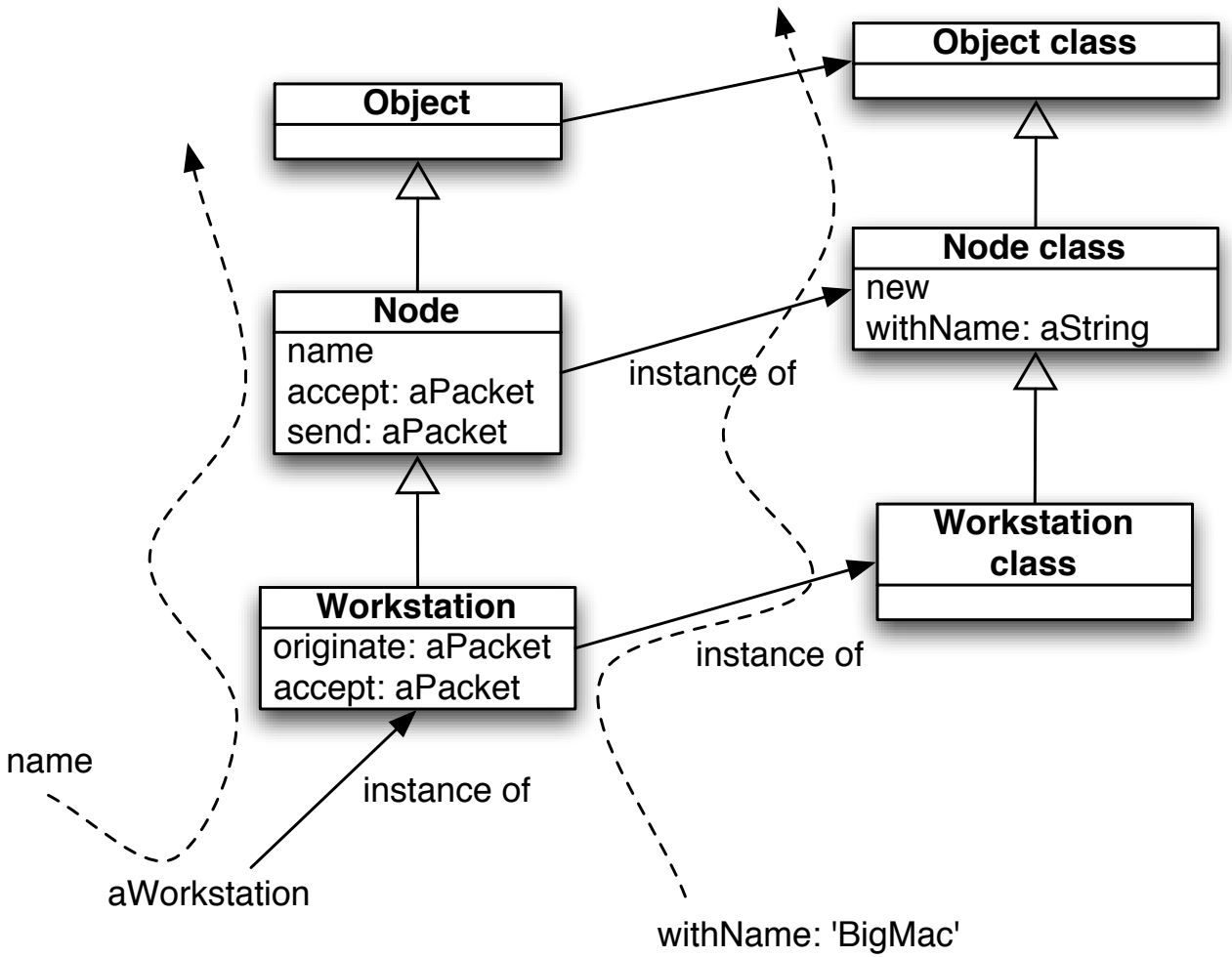
(4)

```
contents := 'default message'
```

Packet new (1-2) => aPacket initialize (3-4) => returning aPacket but initialized!

Reminder: You cannot access instance variables from a class

One single method application



Instance Initialization

How to ensure that an instance is well initialized?

Automatic initialize
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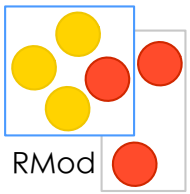
Lazy Initialization



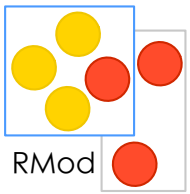
When some instance variables are:

- not used all the time
- consuming space, difficult to initialize because depending on other
- need a lot of computation

Use lazy initialization based on accessors

Accessor access should be used consistently!

Lazy Initialization Example



A lazy initialization scheme with default value

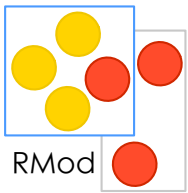
```
Packet>>contents
        contents isNil
            ifTrue: [contents := 'no contents']
        ^ contents
```

aPacket contents or self contents

A lazy initialization scheme with computed value

```
Dummy>>ratio
        ratio isNil
            ifTrue: [ratio := self heavyComputation]
```

Better




```
Packet>>contents
    contents isNil
        ifTrue: [contents := 'no contents']
    ^ contents
```

is equivalent to

```
Packet>>contents
    ^ contents ifNil: [contents := 'no contents]
```

Instance Initialization

How to ensure that an instance is well initialized?

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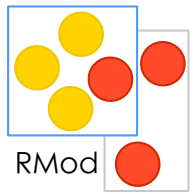
Strengthen Instance Creation Interface



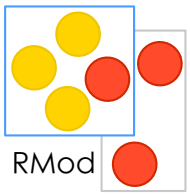
Problem: A client can still create aPacket without address.

Solution: Force the client to use the class interface creation.

Providing an interface for creation and avoiding the use of new: Packet send: 'Hello mac' to: #Mac

```
Packet class>>send: aString to: anAddress
^ self new contents: aString ; addressee: anAddress ; yourself
```

Examples of Instance Initialization



step 1. SortedCollection sortBlock: [:a :b| a name < b name]

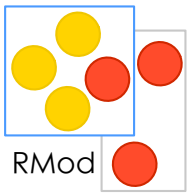
```
SortedCollection class>>sortBlock: aBlock
  "Answer a new instance of SortedCollection such that its
  elements are sorted according to the criterion specified in
  aBlock."

                ^ self new sortBlock: aBlock
```

step 2. self new => aSortedCollection

step 3. aSortedCollection sortBlock: aBlock

Another Example

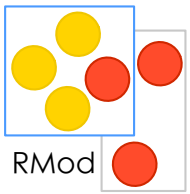


step 1. OrderedCollection with: 1

```
Collection class>>with: anObject
   "Answer a new instance of a Collection containing
    anObject."

    | newCollection |
    newCollection := self new.
    newCollection add: anObject.
    ^newCollection
```

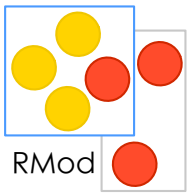
Instance Initialization



How to ensure that an instance is well initialized?

- Automatic initialize
- Lazy initialization
- Proposing the right interface
- ***Providing a default value***

Providing a Default Value

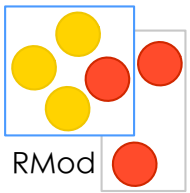


OrderedCollection variableSubclass:
#SortedCollection
instanceVariableNames: '***sortBlock*** '
classVariableNames: '***DefaultSortBlock*** '

SortedCollection ***class***>>initialize
DefaultSortBlock := [:x :y | x <= y]

SortedCollection>>initialize
"Set the initial value of the receiver's sorting algorithm to a default."

Providing a Default Value

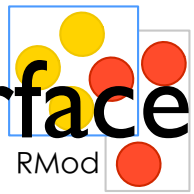



```
SortedCollection class>>new: anInteger
        "Answer a new instance of SortedCollection.
The
    default sorting is a <= comparison on elements. "

        ^ (super new: anInteger) initialize

SortedCollection class>>sortBlock: aBlock
        "Answer a new instance of SortedCollection
such
```

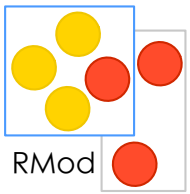
Invoking per Default the Creation Interface




```
OrderedCollection class>>new
        "Answer a new empty instance of
OrderedCollection."

        ^self new: 5
```

Forbidding new?

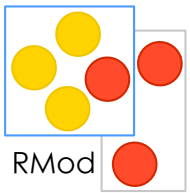


Problem: We can still use new to create fragile instances

Solution: new should raise an error!

```
Packet class>>new
                self error: 'Packet should only be created
using send:to:'
```

Forbidding new Implications

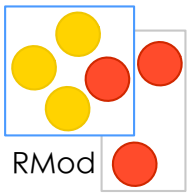


But we still ***have to be able to*** create instance!

```
Packet class>>send: aString to: anAddres
        ^ self new contents: aString ; addressee:
anAddress
 raises an error

Packet class>>send: aString to: anAddress
                ^ super new contents: aString ; addressee:
  anAddress
```

Forbidding new



Solution: use basicNew and basicNew:

```
Packet class>>send: aString to: anAddress
    ^ self basicNew
        contents: aString ;
        addressee: anAddress
```

Conclusion: Never override basic* methods else you will not be able to invoke them later

How to Reuse Superclass Initialization?

A class>>new

^ super new ***doThat; andThat; end***

B class>>forceClientInterface

^ self basicNew ***???***

Solution: *Define the initialization behavior on the instance side*

A>>doThatAndThatEnd

^ self doThat; andThat; end

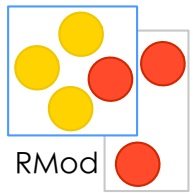
A class>>new

^ super new doThatAndThatEnd

B class>>forceClientInterface

^ self basicNew doThatAndThatEnd

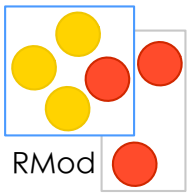
Even Better...Use initialize



But you cannot simply chain the calls...so use initialize

```
A>>initialize
        super initialize.
                self doThat; andThat; end
B>>initialize
       super initialize.
      self andFoo.
```

Different Self/Super



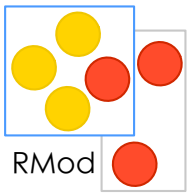
Do not invoke a super with a different method selector.

It's bad style because it links a class and a superclass.

It makes the code difficult to understand

This is dangerous in case the software evolves.

Example

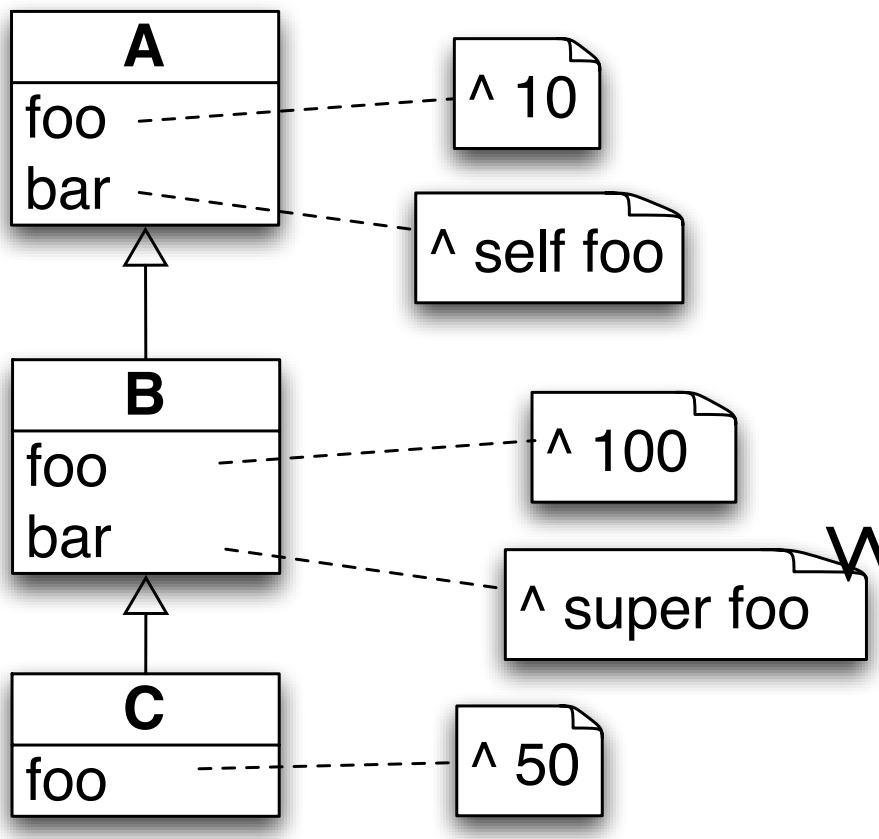



```
Packet class>>new
	self error: 'Packet should be created using send:to:'

Packet class>>send: aString to: anAddress
		^ super new contents: aString ; addressee: anAddress
```

Use basicNew and basicNew:

Super is static!



With the super foo:

A new bar

-> 10

B new bar

-> 10

C new bar

-> 10

Without the super foo:

A new bar

-> 10

B new bar

-> 100

C new bar