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
```


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

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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.

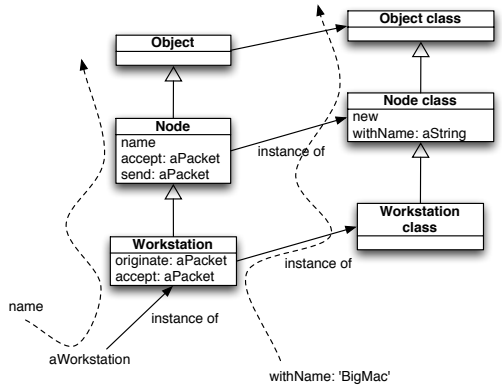
(1&2) Packet class>>new "Class Method"
^ super new initialize

(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



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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]
```


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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.

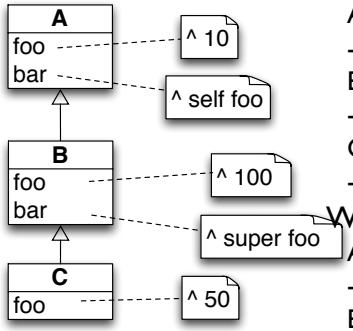
Example

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