

Advanced VisualAge Development

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Who Am I?



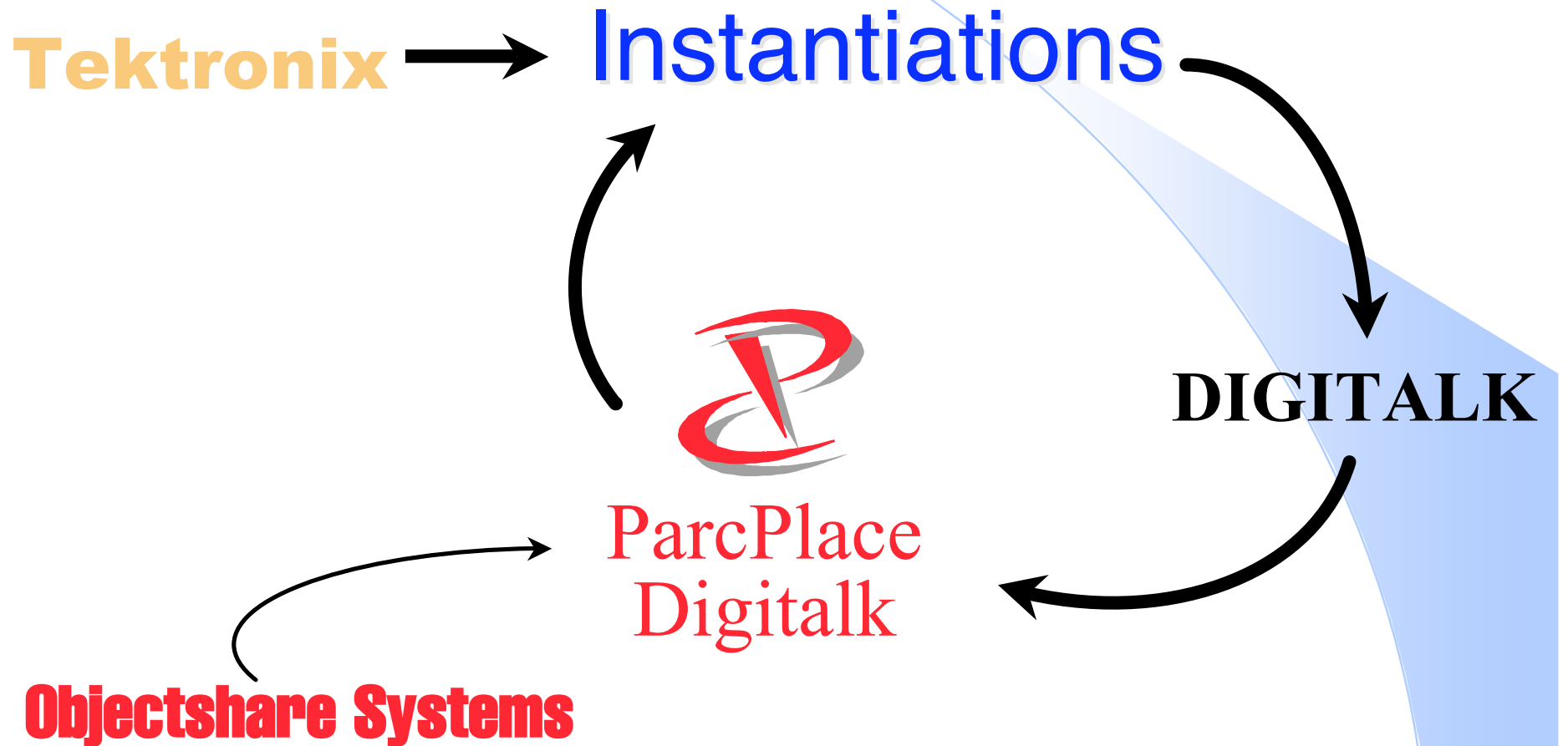
- First saw (Apple) Smalltalk in 1986; first used Smalltalk in late '80s; full-time since 1991
- Co-Founder of (the original) ObjectShare in 1992
- Developer & Chief Architect of WindowBuilder Pro and over a dozen other commercial Smalltalk add-on products (VA Assist Pro, WidgetKits, etc.)
- Vice President of Development for ParcPlace-Digitalk 1996-97
- Sr. Vice President of Product Development for Instantiations 1997-present
- Former Smalltalk Editor for VA Magazine
- Usenet Junkie

Introducing Instantiations

- Multi-faceted Software Company - founded in 1997
(out of the ashes of ParcPlace, Digitaltalk and ObjectShare)
- Create and market leading edge development tools for Enterprise software developers.
- Advanced Tier IBM Business Partner 
- Winner of the 2001 IBM Solutions Excellence Award for “Cool Tool”
- Established Fortune 1000 customer relationships - expanding global presence
- VisualAge Smalltalk product line: VA Assist Pro, WindowBuilder Pro, WidgetKits, VSE to VAST Translation Tool, GF/ST
- Also known for: VA Assist/J, jFactor, jKits, CodePro Studio for WebSphere & Eclipse, SWT & Swing Designer

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Instantiations History

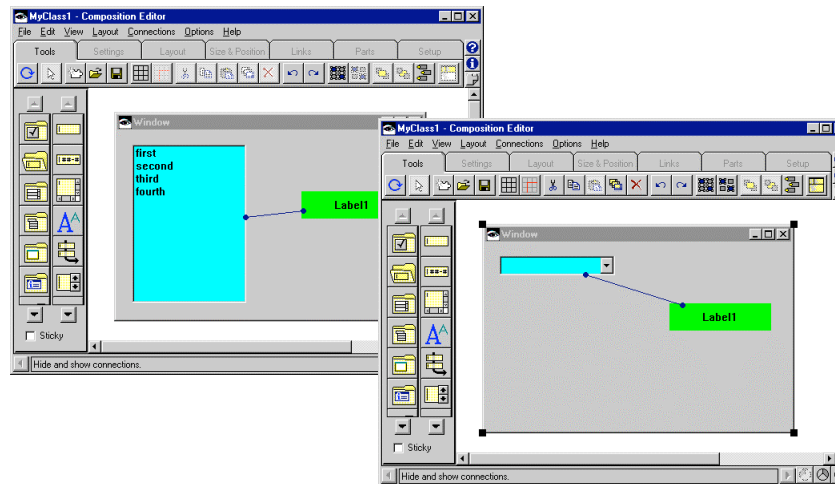
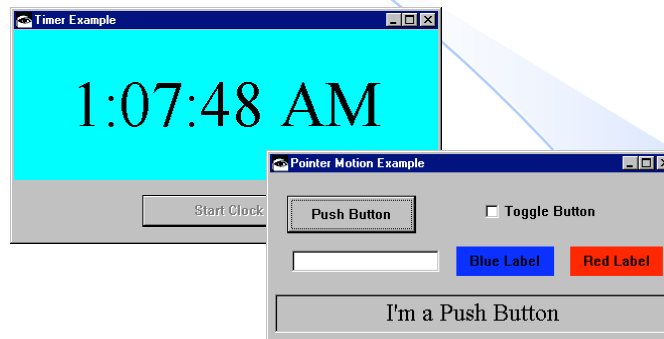


Roadmap

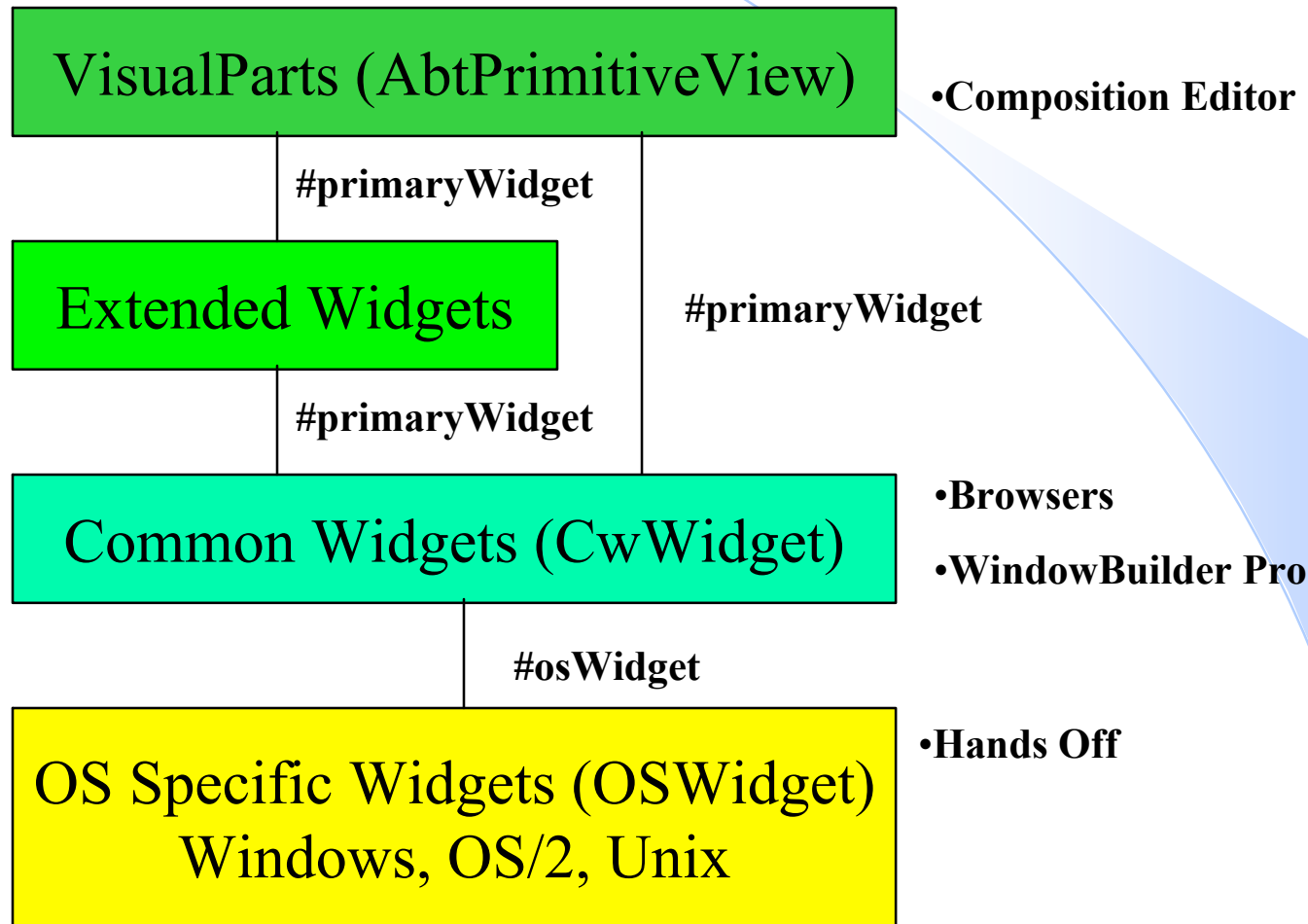
- Advanced GUI Techniques
- Complex Configuration Management
- Development Tool (Browser) Enhancements

Advanced GUI Techniques

- Widget Callbacks & Event Handlers
- Using Pointer Motion
- Using Timers & Delays
- Determining Key State
- Attachments
- Morphing



Structure of VisualAge Widgets



Widget Callbacks & Event Handlers

- Why use Callbacks and Events?
 - Abt layer exposes a subset of available protocol
 - More control
 - Create complex interactions
- What is the different between callback and event handlers?
 - Not much
 - Syntactically similar
 - Events are low-level occurrences like mouse down/up/move, pointer motion, key press/release, etc. Events are generated constantly (and may not be meaningful)
 - Callbacks are higher-level occurrences that imply some semantic meaning like button clicks, text input, focus changes
 - Abt-layer “events” are very high-level occurrences that wrapper a subset of Cw-layer callbacks
- Given an AbtPart, how do you get to its CommonWidget component?
 - Send the #primaryWidget message to the part
 - Do this in a method overriding #openInShellView or in a script triggered by the #openedWidget event (prior to opening, the primary widget is nil)

Setting up a Callback Handler

- Use the `#addCallback:receiver:selector:clientData:` method
 - First parameter - the name of the callback (e.g., `XmNactivateCallback`)
 - “receiver” - the object to send the callback message to
 - “selector” - the 3-parameter message selector to send
 - “clientData” - an object to be passed to the receiver of the callback message as the `clientData` parameter when the callback is invoked, or `nil`
 - Example:

```
<cwWidget> addCallback: XmNactivateCallback
              receiver: self
              selector: #clicked:clientData:callData:
              clientData: nil
```
- Create the handler method
 - First argument - the widget that triggered the event
 - “clientData” - the object specified when the callback was set up (usually `nil`)
 - “callData” - data specific to the specified callback type
 - Example:

```
clicked: aWidget clientData: clientData callData: callData
System message: 'Hello World'
```

Setting up an Event Handler

- Use the `#addEventHandler:receiver:selector:clientData:` method
 - First parameter - an integer event mask identifying the desired events. One or more of the following OR'ed together:
 - `KeyPressMask` - Keyboard down events
 - `KeyReleaseMask` - Keyboard up events
 - `ButtonPressMask` - Pointer button down events
 - `ButtonReleaseMask` - Pointer button up events
 - `PointerMotionMask` - All pointer motion events
 - `Button1MotionMask` - Pointer motion while button 1 down
 - `Button2MotionMask` - Pointer motion while button 2 down
 - `Button3MotionMask` - Pointer motion while button 3 down
 - `ButtonMotionMask` - Pointer motion while any button down
 - `ButtonMenuMask` - Menu request events
 - “receiver” - the object to send the event handler message to
 - “selector” - the 3-parameter message selector to send
 - “clientData” - an object to be passed to the receiver of the event handler message as the `clientData` parameter when the event handler is invoked, or `nil`
 - Example:

```
<QWidget> addEventHandler: KeyPressMask | KeyReleaseMask
receiver: self
selector: #keyPressed:clientData:callData:
clientData: nil
```

Callback/Event Handler Tricks

- Use 3-argument blocks to avoid the need for handler methods
 - Block arguments should be “widget”, “clientData” and “callData” (or any name if you don’t care)
 - The “selector” should be #value:value:value:
 - Example:

```
<cwWidget> addCallback: XmNactivateCallback  
receiver: [:widget :clientData :callData |  
           System message: 'Hello World']  
selector: #value:value:value:  
clientData: nil
```



Callback/Event Handler Tricks - 2

- Support unary & 1-argument callback handlers (like VSE)

- Add the following method to CwPrimitive (and CwComposite) to override the CwBasicWidget>>addCallback:receiver:clientData: method

```
addCallback: callbackName receiver: receiver selector: selector
clientData: clientData
    selector argumentCount <= 1
        ifTrue: [
            super
                addCallback: callbackName
                receiver: (selector argumentCount == 0
                    ifTrue: [:a :b :c |
                        receiver perform: selector]
                    ifFalse: [:a :b :c |
                        receiver perform: selector with: clientData value])
                selector: #value:value:value:
                clientData: clientData]
        ifFalse: [
            super
                addCallback: callbackName
                receiver: receiver
                selector: selector
                clientData: clientData]
```

Callback/Event Handler Tricks - 3

- Now you can set up callback handlers like this:

```
buttonWidget addCallback: XmNactivateCallback  
    receiver: self  
    selector: #clicked  
    clientData: nil
```

```
listWidget addCallback: XmNsingleSelectionCallback  
    receiver: self  
    selector: #selected:  
    clientData: [listWidget selectedItem]
```

the argument to the #selected: method



Using Event Handlers

- What are some useful things you can do with event handlers?
 - Detect clicks on static labels (using ButtonReleaseMask)
 - Detect when the mouse passes over a widget (using PointerMotionMask)
 - Implement hover/balloon help
 - Implement simple status line help
- Example (click on a static label)
 - Add the following event handler to a CwLabel

```
<aCwLabel> addEventHandler: ButtonReleaseMask
receiver: self
selector: #clicked:clientData:callData:
clientData: nil
```
 - Implement the #clicked:clientData:callData: method

```
clicked: widget clientData: clientData callData: callData
System message: 'I''m clicked'
```

Using Pointer Motion

- Example (status line help)

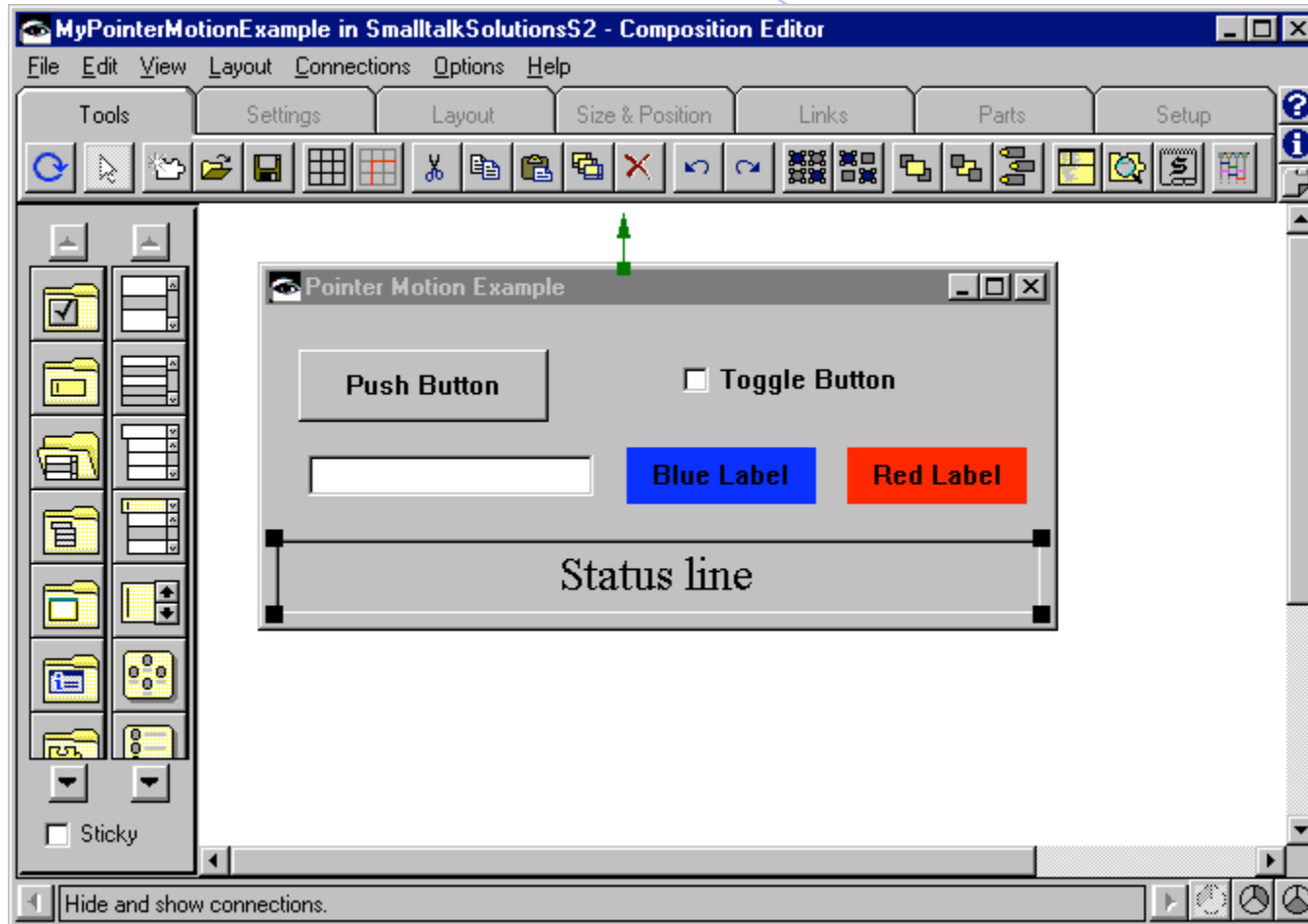
- Add the following event handler to every widget in the window (including the main form so that you can detect when the pointer isn't over a widget)

```
<aCwWidget> addEventHandler: PointerMotionMask  
    receiver: self  
    selector: #pointerMotion:clientData:callData:  
    clientData: nil
```

- Add a static text label name “statusLine” to the bottom of the window
- Implement a dictionary named “helpDict” that maps widget names to help text
- Implement the #pointerMotion:clientData:callData: method

```
pointerMotion: widget clientData: clientData callData: callData  
    self statusLine labelString:  
        (self helpDict at: widget name)
```
- Let's build it...

Pointer Motion Example



Using Delays

- Goal: execute some code after a fixed amount of time
- Solutions
 - Use a Delay
 - Use a Timer
- Example:
 - Delay for one second and then execute some code
`(Delay forMilliseconds: 1000) wait.`
`self doSomething`
 - Problem: blocks the current process
 - Solution: fork the code as a background process:
`[(Delay forMilliseconds: 1000) wait.`
`self doSomething] forkAt: Processor userBackgroundPriority`
- Example: Say 'Hello' every second for five seconds
`5 timesRepeat: [
 (Delay forMilliseconds: 1000) wait.
 Transcript cr; show: 'Hello'].`

Using Timers

- Create a one shot timer

- Use the `CwApplicationContext>>addTimeout:receiver:selector:clientData:`
- First argument - integer specifying the time interval in milliseconds
- “receiver” - the object which is the receiver of the work procedure message
- “selector” - the Symbol which is the 1-parameter message selector to send.
- “clientData” - any object which is to be passed as the parameter to the work procedure message
- Example:

```
CwApplicationContext default
```

```
addTimeout: 1000 "one second"  
receiver: [:clientData | Transcript cr; show: 'Hello']  
selector: #value:  
clientData: nil
```

Using Timers - 2

- Create a recurring timer to update a clock

- Create a static text widget named “clock”
- Create a #startClock: method

```
startClock: milliseconds
    self clock labelString: Time now printString.
    CwApplicationContext default addTimeout: milliseconds
        receiver: self
        selector: #updateClock:
        clientData: milliseconds
```

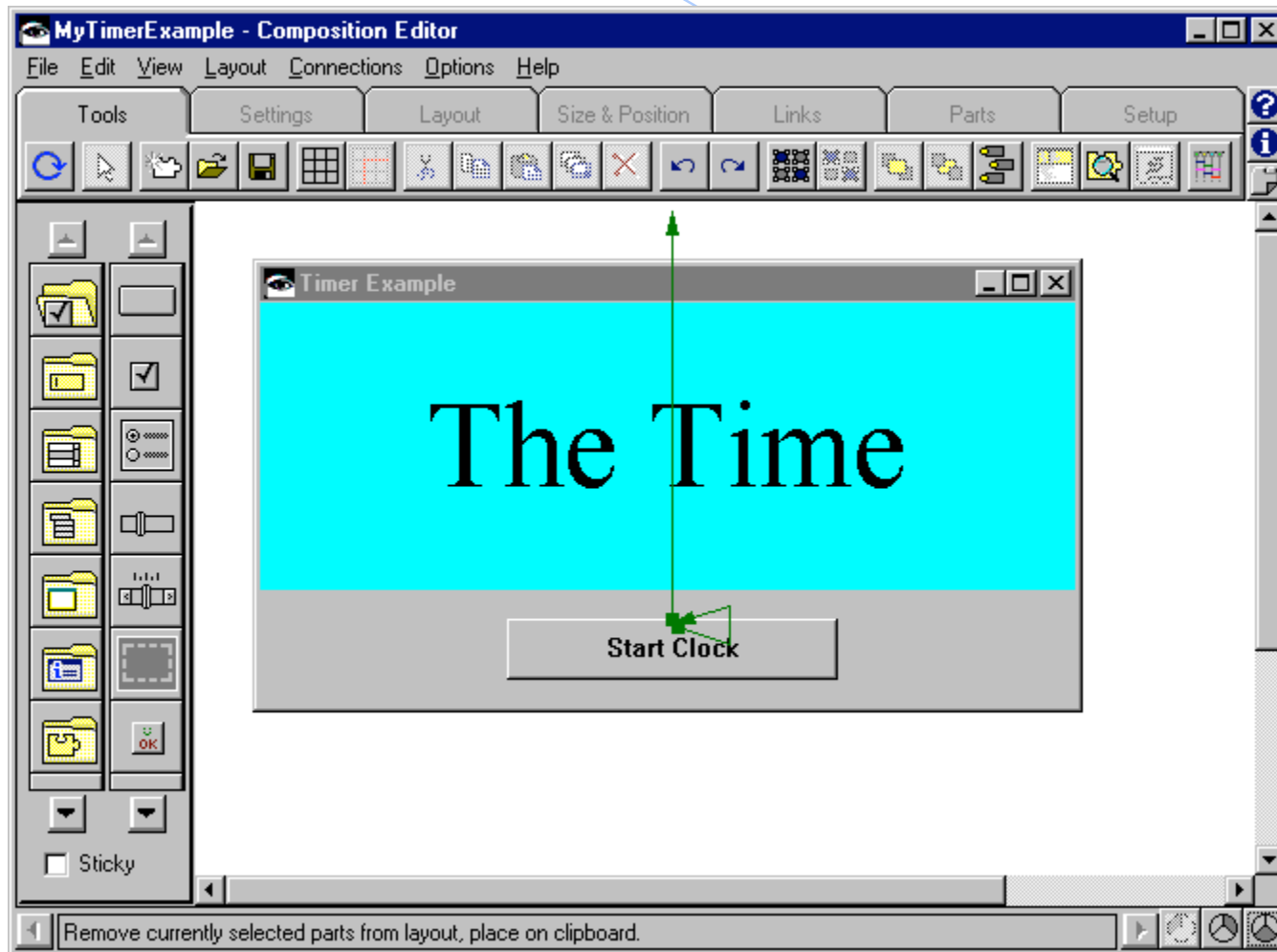
- Create an #updateClock: method

```
updateClock: milliseconds
    self clock isMapped iffFalse: [^self].
    self clock labelString: Time now printString.
    CwApplicationContext default
        addTimeout: (milliseconds -
            (Time millisecondClockValue \\ milliseconds))
        receiver: self
        selector: #updateClock:
        clientData: milliseconds
```

- Start the clock so that it updates every second:

```
self startClock: 1000
```

Clock Example



Another Way to Delay

- Use the `CwApplicationContext>>asyncExecInUI: (aBlock)` method
 - A favorite “magic” method for executing a block code after a short delay
 - Technically, what does it do?
 - Evaluates `aBlock` in the UI Process. No result is returned.
 - Processes with higher priority than the UI will NOT block.
 - In this case, `aBlock` is executed the next time the UI becomes active.
 - If this message is sent by the UI process, then `aBlock` will be executed after all previously queued background graphic requests have been executed
 - Example:

```
...
CwApplicationContext default asyncExecInUI:
    [Transcript cr; show: '1'].
Transcript cr; show: '2' .
...
```
 - Result:

```
...
2
1
...
```

Determining Key State

- Why would you need to do this?
 - Constrain behavior (e.g., Extended Select List Boxes)
 - ALT-key hacks
 - Conditional breakpoints
- How do you determine whether an arbitrary modifier key is depressed?
 - Look at the CgDisplay>>osGetModifierState method
 - Can be sent to any CgDisplay instance at any time. For example:
`CgDisplay default osGetModifierState`
 - Returns an integer encoding the key state
 - Use the Integer>>anyMask: method to test for different keys (returns a Boolean)
 - Examine the event handler data

Determining Key State - 2

- Useful methods to add to Object

- Is any key down?

`isKeyDown: keyMask`

`CgDisplay default osGetModifierState anyMask: keyMask`

- Is Alt key down?

`isAltKeyDown`

`self isKeyDown: CwConstants::Mod1Mask`

- Is Ctrl key down?

`isControlKeyDown`

`self isKeyDown: CwConstants::ControlMask`

- Is Shift key down?

`isShiftKeyDown`

`self isKeyDown: CwConstants::ShiftMask`

- Is Caps Lock key down?

`isCapsLockKeyDown`

`self isKeyDown: CwConstants::LockMask`

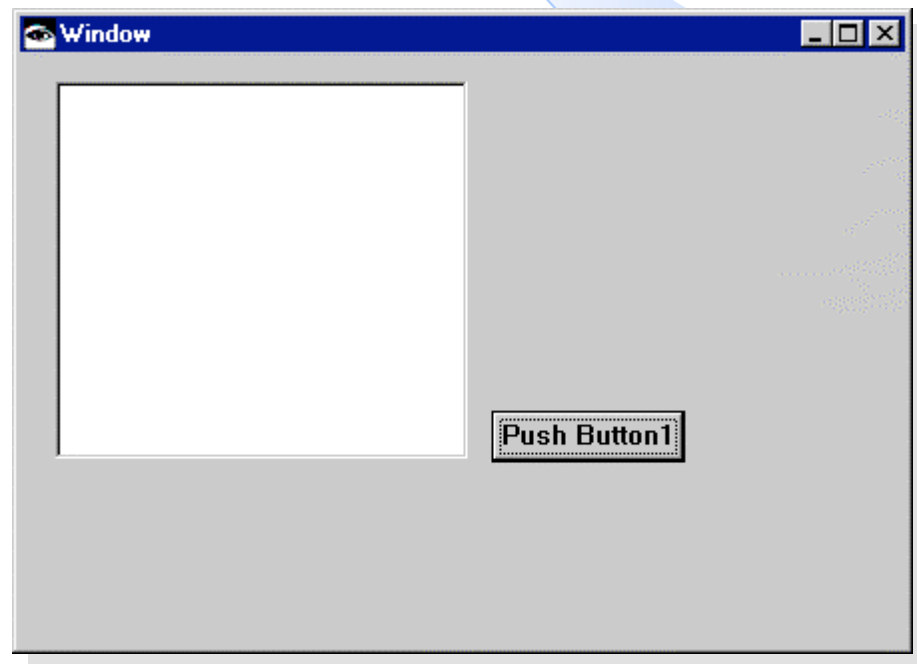
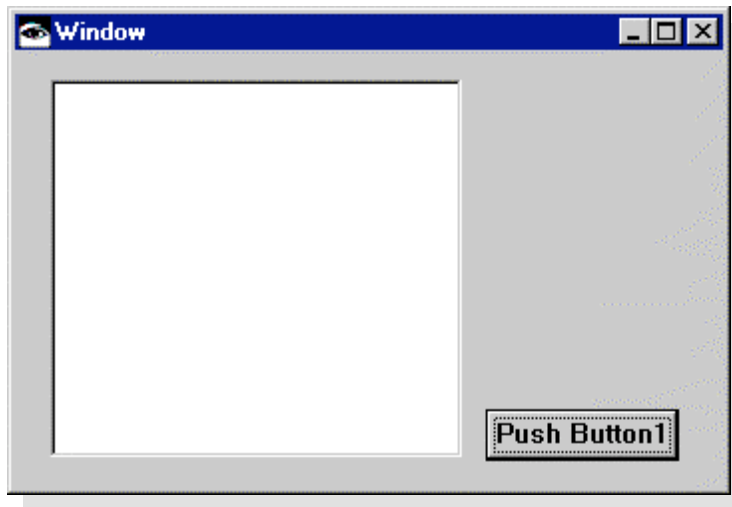
- Is Left Mouse Button down?

`isLeftMouseButtonDown`

`self isKeyDown: CwConstants::Button1Mask`

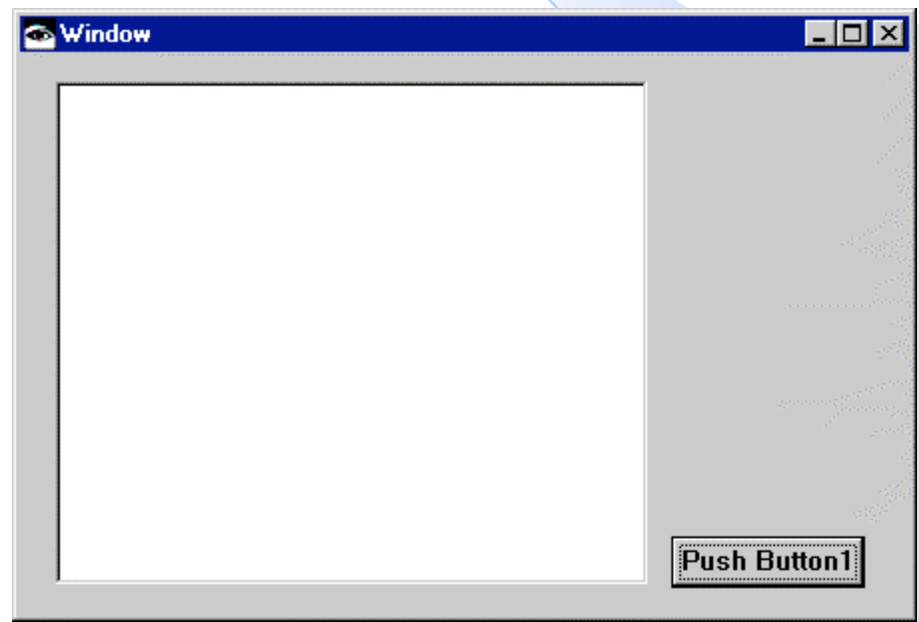
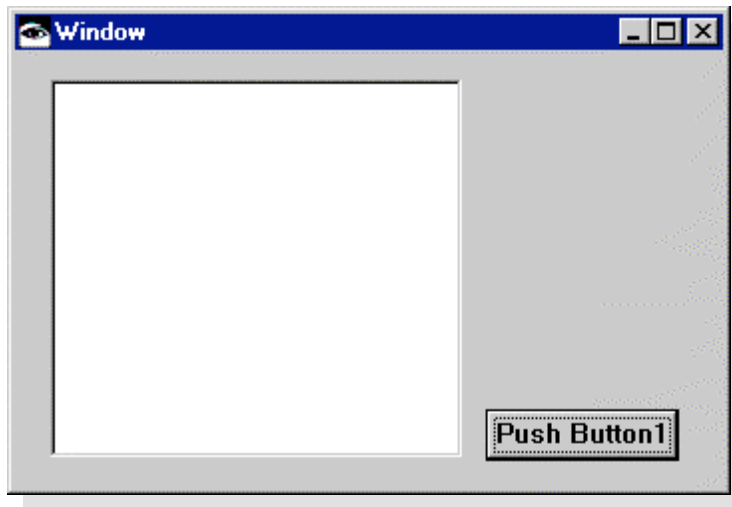
Attachments

- By default all widgets are locked to the upper left corner of a window
- For example:



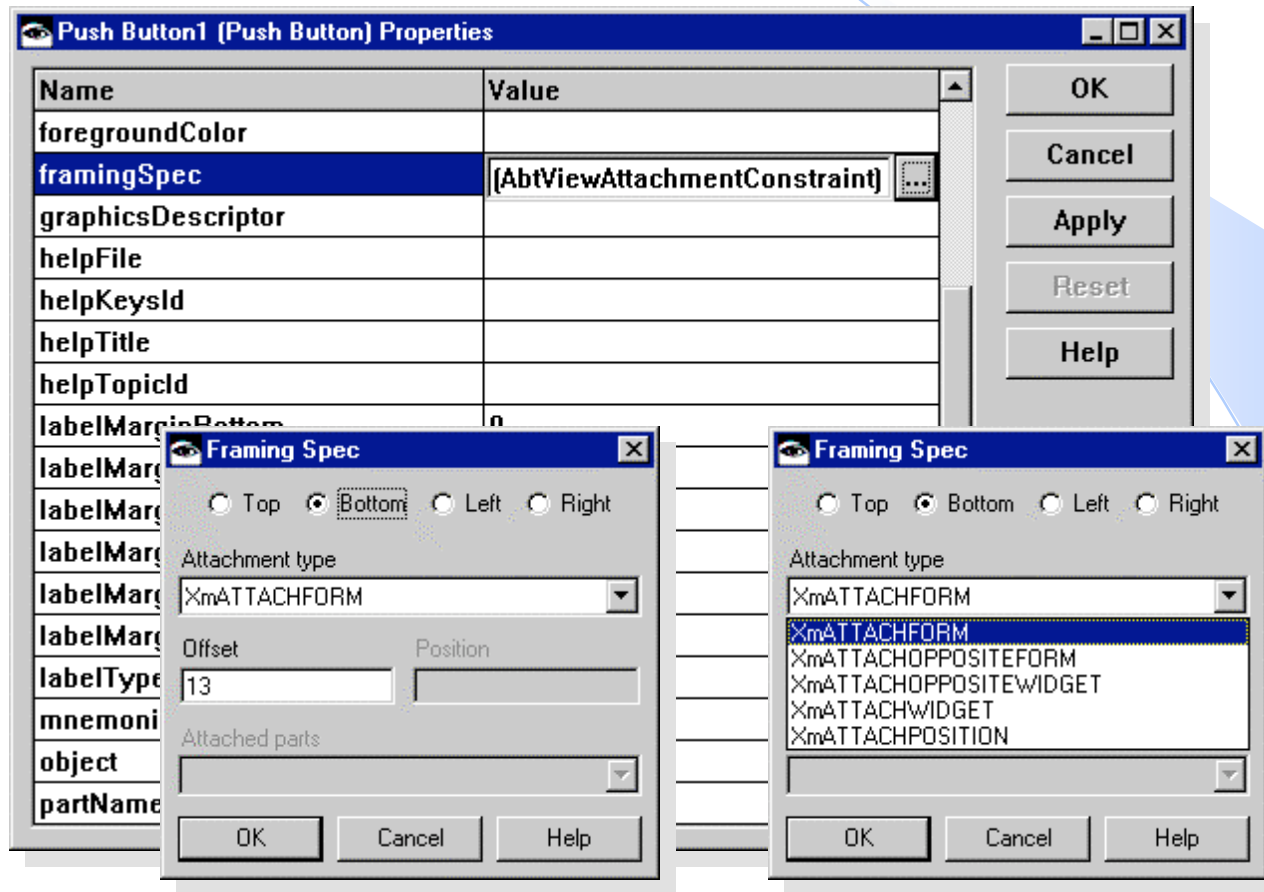
Attachments - The Ideal

- Ideally, we would like to specify what happens to each widget when the window resizes



Attachments - VA Editor

- Here's the lame attachment editor supplied with VisualAge



Attachments - Sample Code

- With very little effort, we can dramatically simplify the process
 - There are hundreds of possible attachment combinations
 - But only a few (10-20) that are commonly used
 - By optimizing those cases, we can dramatically speed up the GUI layout process
- Sample code to add a “Set Attachments” cascaded menu to the popup widget menu in the Composition Editor
 - Add the following method to AbtPrimitiveView (and AbtCompositeView)

```
abtAddOwnItemsToPopupMenu: aPopupMenu for: anEditPart
    super abtAddOwnItemsToPopupMenu: aPopupMenu for: anEditPart.
    anEditPart addAttachmentItemsToPopupMenu: aPopupMenu
```

Attachments - Sample Code 2

- Add the following methods to AbtCwEditPart

`attachAllSides`

```
self performBlockedUpdate: [| fs |
    (fs := self visualPolicy visualPartFramingSpecTranslateBy: 0@0)
    leftEdge: (fs leftEdge attachment: XmATTACHFORM currentView: self part);
    rightEdge: (fs rightEdge attachment: XmATTACHFORM currentView: self part);
    topEdge: (fs topEdge attachment: XmATTACHFORM currentView: self part);
    bottomEdge: (fs bottomEdge attachment: XmATTACHFORM currentView: self part).
self frameVisualPart: fs]
```

`attachBottomRightCorner`

```
self performBlockedUpdate: [| fs |
    (fs := self visualPolicy visualPartFramingSpecTranslateBy: 0@0)
    leftEdge: (fs leftEdge
        attachment: AbtAttachmentsConstants::XmATTACHSELFOPPOSITE
        currentView: self part);
    rightEdge: (fs rightEdge attachment: XmATTACHFORM currentView: self part);
    topEdge: (fs topEdge
        attachment: AbtAttachmentsConstants::XmATTACHSELFOPPOSITE
        currentView: self part);
    bottomEdge: (fs bottomEdge attachment: XmATTACHFORM currentView: self part).
self frameVisualPart: fs]
```

Attachments - Sample Code 3

- Add the following methods to AbtCwEditPart (continued)

```
attachBottomLeftCorner
```

```
self performBlockedUpdate: [| fs |  
  (fs := self visualPolicy visualPartFramingSpecTranslateBy: 0@0)  
  leftEdge: (fs leftEdge attachment: XmATTACHFORM currentView: self part);  
  rightEdge: (fs rightEdge  
    attachment: AbtAttachmentsConstants::XmATTACHSELFOPPOSITE  
    currentView: self part);  
  topEdge: (fs topEdge  
    attachment: AbtAttachmentsConstants::XmATTACHSELFOPPOSITE  
    currentView: self part);  
  bottomEdge: (fs bottomEdge attachment: XmATTACHFORM currentView: self part).  
self frameVisualPart: fs]
```

```
attachTopBottomRightSides
```

```
self performBlockedUpdate: [| fs |  
  (fs := self visualPolicy visualPartFramingSpecTranslateBy: 0@0)  
  leftEdge: (fs leftEdge  
    attachment: AbtAttachmentsConstants::XmATTACHSELFOPPOSITE  
    currentView: self part);  
  rightEdge: (fs rightEdge attachment: XmATTACHFORM currentView: self part);  
  topEdge: (fs topEdge attachment: XmATTACHFORM currentView: self part);  
  bottomEdge: (fs bottomEdge attachment: XmATTACHFORM currentView: self part).  
self frameVisualPart: fs]
```

Attachments - Sample Code 4

- Add the following methods to AbtCwEditPart (continued)

```
addAttachmentItemsToPopupMenu: aPopupMenu
    | cascadeMenu |
    cascadeMenu := aPopupMenu
        createPullDownMenu: 'Set Attachments'
        argBlock: nil.
    (aPopupMenu
        createCascadeButton: 'Set Attachments'
        argBlock: [:w | w subMenuId: cascadeMenu])
        manageChild.
    (cascadeMenu
        createToggleButton: 'All Sides' argBlock: nil)
        addCallback: XmNvalueChangedCallback
            receiver: [:editPart :clientDate :callData |
                self attachAllSides]
            selector: #value:value:value:
            clientData: nil;
        manageChild.
    ...
```

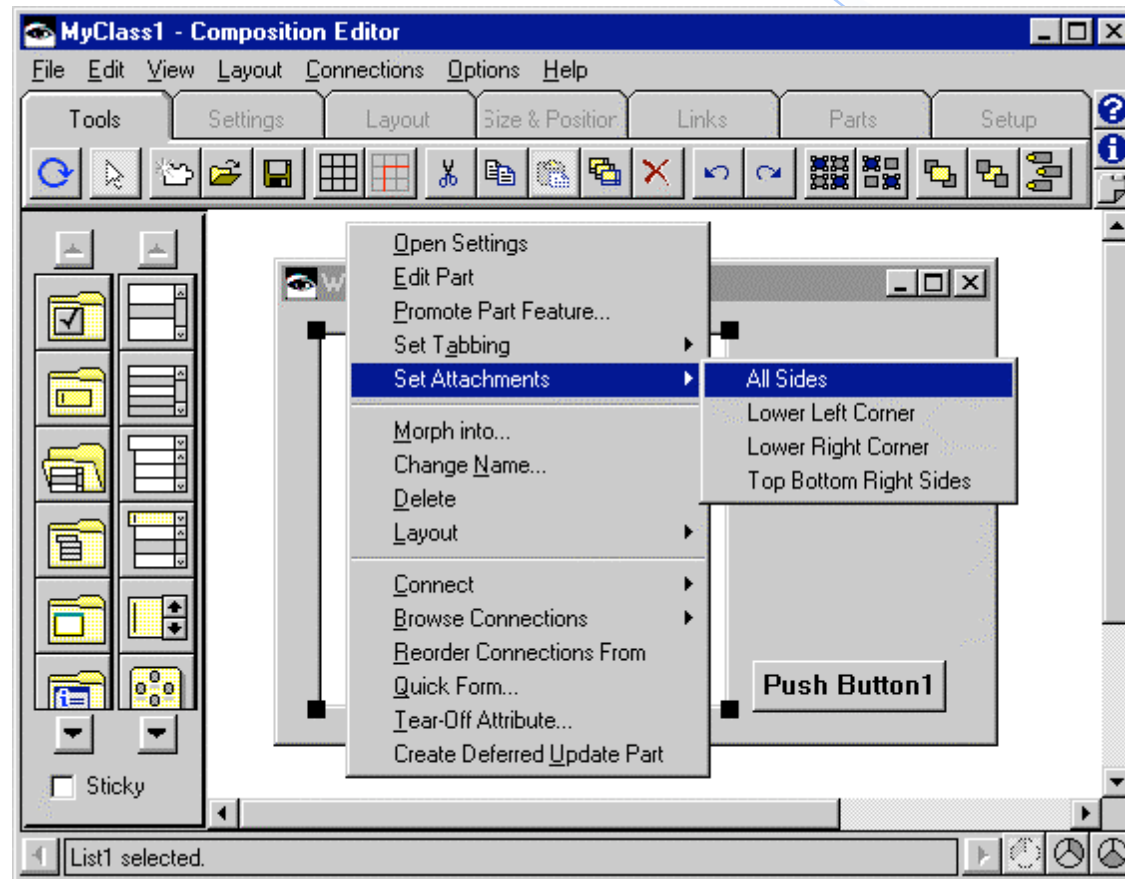
Attachments - Sample Code 5

- The # addAttachmentItemsToPopupMenu: method continued

```
...
(cascadeMenu
  createToggleButton: 'Lower Left Corner' argBlock: nil)
  addCallback: XmNvalueChangedCallback
    receiver: [:editPart :clientDate :callData |
      self attachBottomLeftCorner]
    selector: #value:value:value:
    clientData: nil;
  manageChild.
(cascadeMenu
  createToggleButton: 'Lower Right Corner' argBlock: nil)
  addCallback: XmNvalueChangedCallback
    receiver: [:editPart :clientDate :callData |
      self attachBottomRightCorner]
    selector: #value:value:value:
    clientData: nil;
  manageChild.
(cascadeMenu
  createToggleButton: 'Top Bottom Right Sides' argBlock: nil)
  addCallback: XmNvalueChangedCallback
    receiver: [:editPart :clientDate :callData |
      self attachTopBottomRightSides]
    selector: #value:value:value:
    clientData: nil;
  manageChild.
```

Attachments - New Menu

- Now we can set attachments like this



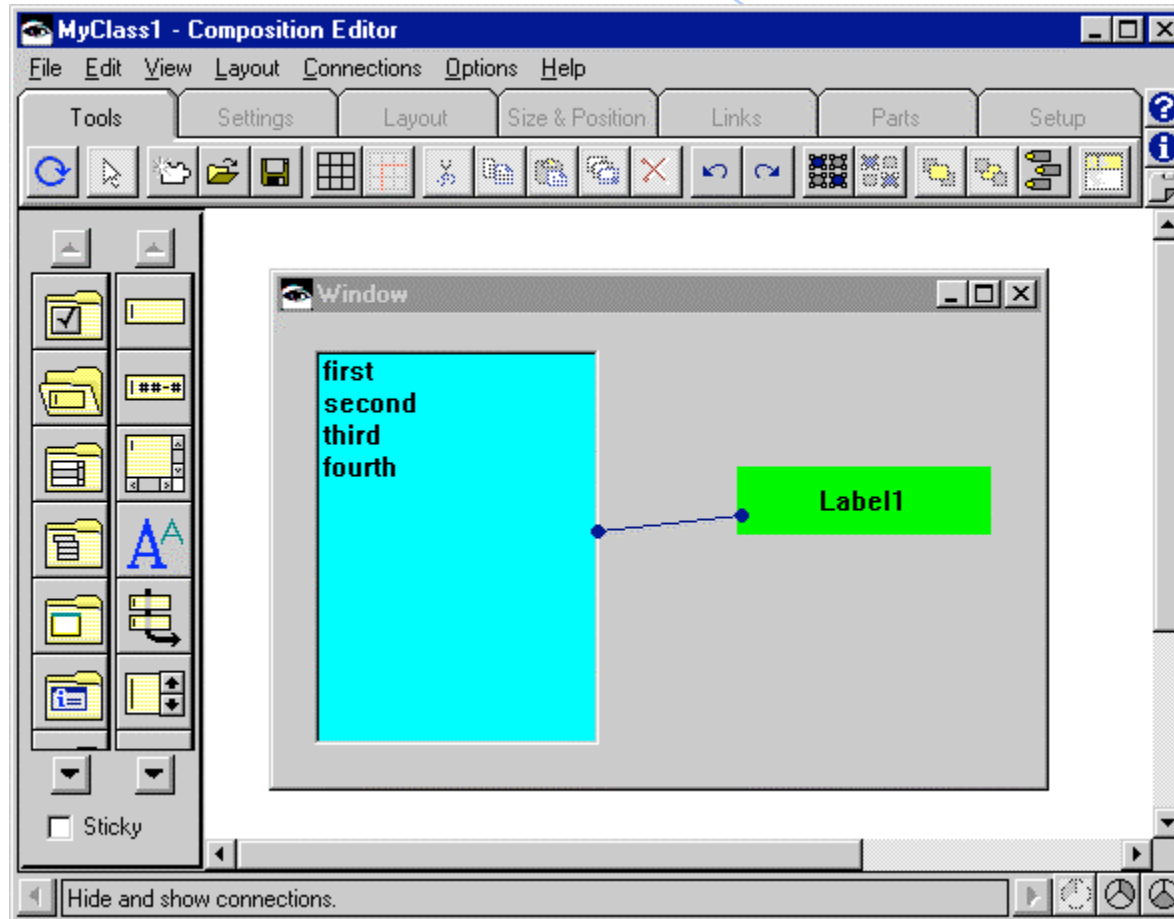
Morphing

- What is “morphing”?
 - Replace any widget in the Composition Editor with another
 - Maintain any common attributes
 - Maintain any links that still make sense
- VisualAge has a built-in framework that is used in only one place!
 - Morphing obsolete AbtNotebookView to AbtPortablePMNotebookView
 - Very easy to extend
 - Just add a #abtIsomorphicClasses class method to any AbtPart subclass
 - Answer a collection of symbols representing the classes that are valid replacements
 - Examples:

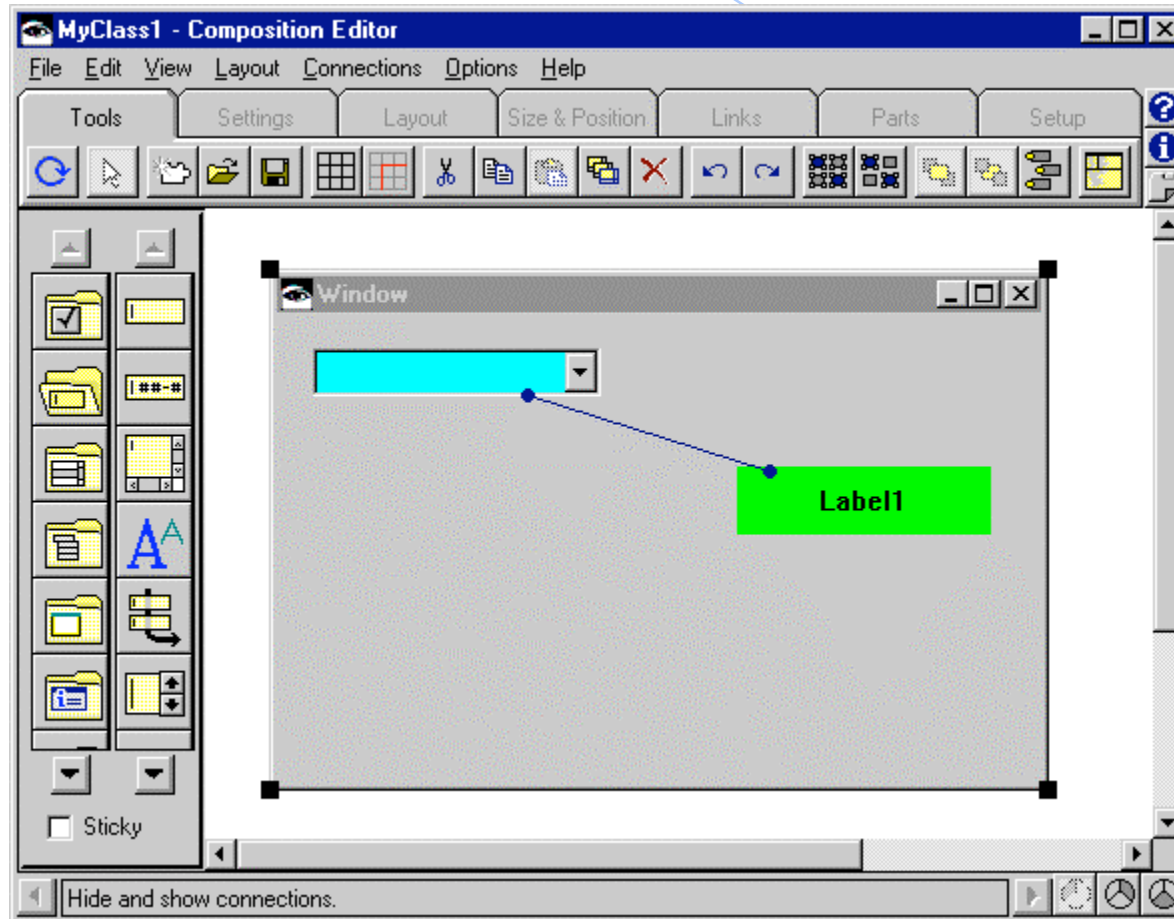
```
AbtListView class>>abtIsomorphicClasses
^#(#AbtDropDownListComboBox #AbtComboBoxView
   #AbtContainerDetailsView #AbtMultipleSelectListView
   #AbtSpinButtonView)
```

```
AbtMultipleSelectListView class>>abtIsomorphicClasses
^#(#AbtDropDownListComboBox #AbtComboBoxView
   #AbtContainerDetailsView #AbtListView
   #AbtSpinButtonView)
```

Morphing Example - Before

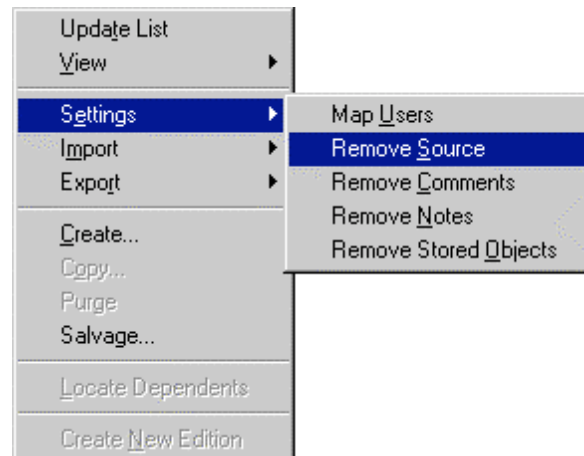


Morphing Example - After



Complex Configuration Management

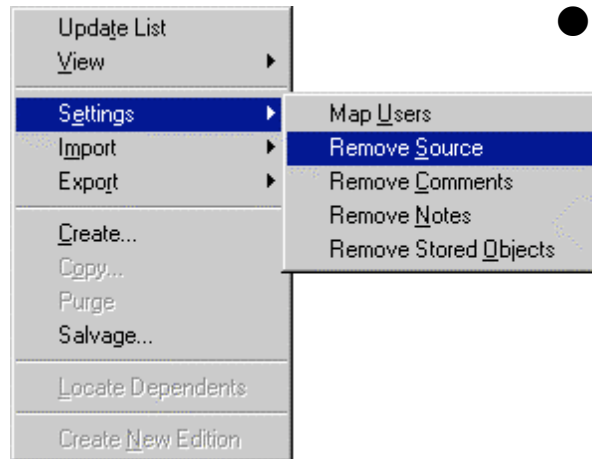
- Hiding Source
- SubApp Configurations
- Version Renaming
- Locating Dependent Configs



Hiding Source

- Why hide source?
 - Black Box deployment with no “user-serviceable” parts
 - Hide implementation so that a vendor has more freedom to change the guts later on
 - Hide security features (e.g., eval testing / unlocking code)
- Pitfalls
 - Once source is hidden and imported into a manager that DOES have source code, that source code may be wiped out such that developers can no longer view the source to their methods
 - Hiding source for any method that is forced to be recompiled (such as for compile time constants) will break for any VM updates
 - Hiding source should be used SPARINGLY

Hiding Source - 2



● Mechanics

- Source is hidden on export to DAT files
- Source is hidden on an export by export basis (controlled by the Configuration Maps Browser's "Names | Settings | Remove Source" command)
- What is hidden is stored in an application specific data structure (a Dictionary) that is stored in the library (as an inherited user field)
- Use the SubApplication class>>removeSourceStructure method to retrieve the current settings
- Use the SubApplication class>>removeSourceStructure: method to change the current settings

● Data Structure

- Dictionary of class symbols
- Values are either
 - "nil" meaning "hide all the source in the class"
 - an Association where the
 - key is either
 - the collection of instance method symbols that should be hidden
 - "nil" to hide all instance methods
 - value is either
 - the collection of class method symbols that should be hidden
 - "nil" to hide all class methods

Hiding Source - 3

- Example

Application: FooBar

- Class: Foo
 - Class Methods
 - classMethod1
 - classMethod2
 - Instance Methods
 - instanceMethod1
 - instanceMethod2
- Class: Bar
 - Class Methods
 - classMethod1
 - classMethod2
 - Instance Methods
 - instanceMethod1
 - instanceMethod2

- Hide everything in FooBar

```
FooBar removeSourceStructure:  
(Dictionary new  
  at: #Foo put: nil;  
  at: #Bar put: nil;  
  yourself)
```

- Hide all instance methods in Foo

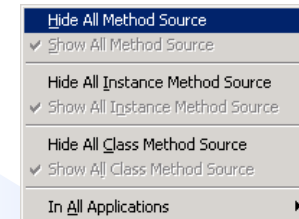
```
FooBar removeSourceStructure:  
(Dictionary new  
  at: #Foo put: (Association key: nil value: #());  
  yourself)
```

- Hide all class methods in Bar

```
FooBar removeSourceStructure:  
(Dictionary new  
  at: #Bar put: (Association key: #() value: nil);  
  yourself)
```

- Hide one class and one instance method in Foo

```
FooBar removeSourceStructure:  
(Dictionary new  
  at: #Foo put:  
    (Association  
      key: #(#instanceMethod1)  
      value: #(#classMethod2));  
  yourself)
```



SubApp Configurations

● Why Use?

- Organize functionality
- Custom Loading
 - OS-specific
 - Other conditions

● Sample config expressions

- Load always
true
- Window only
**#('WIN32s' 'WIN-NT') includes:
(System subsystemType: 'CW')**
- OS/2 only
**#('PM') includes:
(System subsystemType: 'CW')**
- Only if OLE is loaded
**Smalltalk includesKey:
#AbtBaseOleApp**
- Only if Foo is loaded
Smalltalk includesKey: #Foo

● Example

- MyApp
 - MySubApp1
 - MySubApp2
 - MySubApp3
 - ...
 - MySubAppN

● Problem

- Combinatorial explosion
 - 2 subapps = 4 possible configs
 - 3 subapps = 8 possible configs
 - 4 subapps = 16 possible configs
 - Etc.
- Must be a better way...

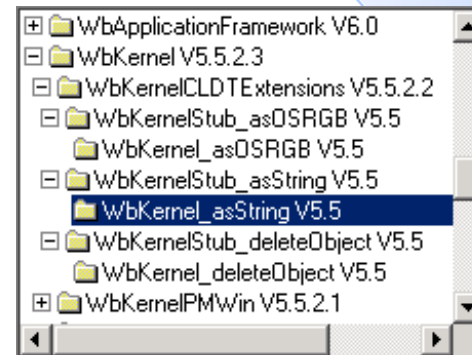
Two-Tier Config Expressions

- Solution to the combinatorial explosion problem
- Rather than
 - MyApp
 - MySubApp1
 - MySubApp2
 - MySubApp3
- Use
 - MyApp
 - MySubApp1Stub
 - MySubApp1
 - MySubApp2Stub
 - MySubApp2
 - MySubApp3Stub
 - MySubApp3
- In first case, MyApp would need up to 8 different *complex* configs to support loading each subapp independently from its siblings
- In the second case, MyApp would need only one config (i.e., “true”) that would load all of its subapps
- Each sub app would then have *simple* configs that only controlled the loading of its single subapp
- This technique can also be used at the config map and application level to solve the problem of context-sensitive prereqs

Two-Tier Config Expressions Example

- Two-Tier Configs can be used by third-parties to avoid loading collisions
- Example
 - The ubiquitous Object>>asString method
 - Not part of the VisualAge base
 - Supplied by several third parties
 - Common source of conflicts
- Solution: Two-Tier Configs
 - MyApp
 - MyObject_asStringStub
 - MyObject_asStringApp
 - Configuration Expression

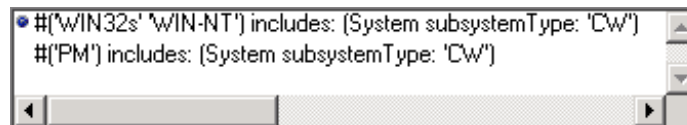
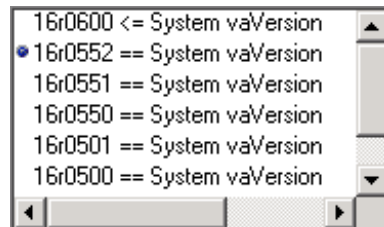
```
(Object respondsTo: #asString) not  
or: [(Object>>#asString) application name == #MyApp]
```



Expression Indicator

- Here's a handy mod which will make it easy for you to tell when a config expression is currently true or not
 - First, implement the following method in EtWindow:

```
expressionIndicatorBlock
  ^[:exp |
    ([Compiler evaluate: exp] when: ExError
      do: [:sig | sig exitWith: nil]) == true
      ifTrue: [EtTools loadedIndicator]
      ifFalse: [EtTools blankLoadedIndicator]]
```
 - Second, modify any #expressionsListWidget method to set the #statusBlock: parameter to “self expressionIndicatorBlock”. Here are two:
 - EtApplicationEditionsBrowser>> expressionsListWidget
 - EtConfigurationMapsBrowser>> expressionsListWidget



Version Renaming

- Why rename versions?
 - Consistency
 - Baselining apps and classes for delivery
 - Correcting naming mistakes
- Why isn't this dangerous?
 - The ENVY library only cares about time stamps
 - APIs exist to change version names after they have been set
 - These APIs have remained consistent for many years
 - IBM/OTI uses this technique to baseline VisualAge releases
 - All version sorting is done by timestamp. Version names are cosmetic only

Version Renaming - Applications

- Pick a version name and select the applications to modify
- Iterate over the application list
- For each application, compare its version name to the new desired name (no point in changing the name if it isn't necessary)
- For each application that needs changing, update the edition record

```
| versionName applications |
versionName := <New Version Name>.
applications := Array with: <App1> with: <App2>.
applications do: [:application |
    application timeStamp versionName = versionName
    ifFalse: [
        application updateEdition: [:editionRecord |
            editionRecord
                setVersionName: versionName;
                insert]].
```

Version Renaming - Classes

- Pick a version name, an application and a set of classes to modify
- Iterate over the class list
- For each class, compare its version name to the new desired name
- For each class that needs changing, update the edition record

```
| versionName application classes |
versionName := <New Version Name>.
application := <Application>.
classes := Array with: <Class1> with: <Class2>.
classes do: [:class |
    timeStamp := class timeStampIn: application.
    timeStamp versionName = versionName
        ifFalse: [
            timeStamp versionName: versionName.
            class updateIn: application with: [:editionsRecord |
                | entry oldLength |
                entry := editionsRecord currentEntry.
                oldLength := entry versionName size.
                entry
                    replaceElement: 2 with: versionName;
                    length: entry length - oldLength + versionName size;
                    yourself]]].
```

Version Renaming - Config Maps

- Pick a version name and select the configuration map to modify
- Find the most recent edition of the config map
- Update the edition record of the config map edition with the new version name

```
| versionName configMapName configMapEdition |  
versionName := <New Version Name>.  
configMapName := <Config Map Name>.  
configMapEdition := (EmConfigurationMap  
    editionsFor: configMapName) first.  
configMapEdition  
    relocateRecordWith: [:editionRecord |  
        editionRecord  
            replaceElement: 2 with: versionName;  
            insert].
```

Locating Dependent Configs for an (Sub)Application

- Get the name of the root application
- Scan through all Config Map names in the system
- For each configuration, find the first (most recent edition)
- Check to see whether its application names include the target

```
| appName dependentConfigs |
appName := <Application> rootApplication name asString.
dependentConfigs := EmConfigurationMap configurationMapNames
  select: [:mapName | | editions |
    editions := EmConfigurationMap editionsFor: mapName.
    editions first applicationNames
      includes: appName].
^dependentConfigs
```


Locating Dependent Configs for a Config Map (Direct)

- Specify the name of the configuration map
- Scan through all Config Map names in the system
- For each configuration, find the first (most recent edition)
- Check to see whether its required maps names include the target

```
| configName dependentConfigs |  
configName := <Configuration Map Name>.  
dependentConfigs := EmConfigurationMap configurationMapNames  
    select: [:mapName | | map |  
        map := (EmConfigurationMap editionsFor: mapName) first.  
        (map allPossibleRequiredMaps  
            detect: [:mp | mp name = configName]  
            ifNone: []) notNil].  
^dependentConfigs
```

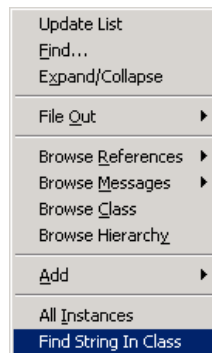
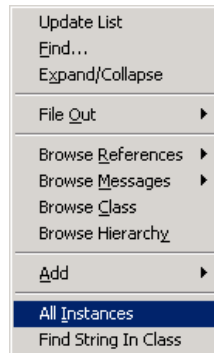
Locating Dependent Configs for a Config Map (Indirect)

- Collect the names of all of the application names contained by the map
- Scan through all Config Map names in the system
- For each configuration, find the first (most recent edition)
- Check to see whether its application names include all of the application names in the target

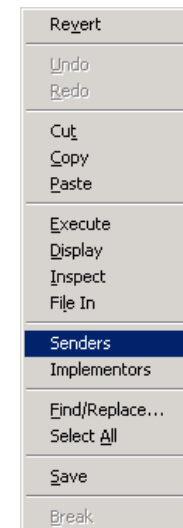
```
| configName applicationNames dependentConfigs |
configName := <Configuration Map Name>.
applicationNames := (EmConfigurationMap
  editionsFor: configName) first applicationNames.
dependentConfigs := EmConfigurationMap configurationMapNames
  select: [:mapName | | editions names |
    mapName ~= configName and: [
      editions := EmConfigurationMap editionsFor: mapName.
      names := editions first applicationNames.
      applicationNames conform: [:app |
        names includes: app]]].
^dependentConfigs
```

Development Tool (Browser) Enhancements

- Extension API
- Subclassing TextSelectionManager
- Hooking KeyPress in Text Widgets
- Enhanced Text Menu



```
sampleMethod: arg1 with: arg2
  "This is a multi-line comment
  This is a multi-line comment"
  | temp1 |
  <primitive: ThisIsAPrimitive>
  temp1 := Array with: arg1 with: instVar1 with: #aSymbol.
  "Another comment"
  1 to: temp1 size do: [:blockArg |
    | temp2 |
    (temp2 := temp1 at: blockArg)
    setSensitive: true;
    setLabel: CwConstants::xMOK;
    backgroundColor: (CgRGBColor blue: 65535 // 2 + 1);
    recomputeSize;
    triggerCallback: arg2 withArguments: ##(A #B 3);
    propertyAt: false put: ##(1 2 3 4).
    self callCallbacks: temp2 callData: instVar2].
  self
  propertyAt: $A;
  propertyAt: 'aString' put: nil.
  ^super sampleMethod: arg1 with: temp1
```



Extension API

- What is it?
 - Create by Joseph Pelrine and enhanced by Paul Baumann
 - Public domain
 - Easy way for multiple vendors (and users) to extend the VisualAge browsers without collision
- How does it work?
 - Overrides the normal #classesMenu (and other menu creation methods) with code that (essentially) looks like this:

```
classesMenu
  | aMenu |
  aMenu := super classesMenu.
  SubApplication currentlyLoaded reverseDo: [:app |
    app addToClassesMenu: aMenu browser: self].
  ^aMenu
```
 - Adds a #addToClassesMenu:browser: method (and siblings) to SubApplication that does nothing
 - First argument is the menu being added to
 - Second argument is the current browser (a source of valuable state information)
 - Other applications override these methods to add in their own menu commands

Example - Adding All Instances

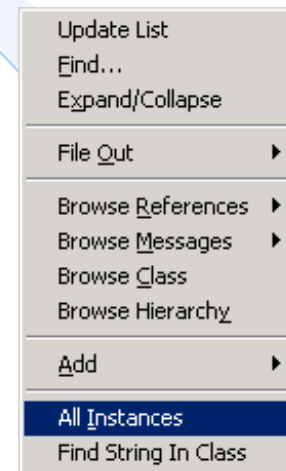
- Create an application called MyApplication
- Add the following class method to the MyApplication class:

```
addToClassesMenu: aMenu browser: aBrowser
    ^aMenu
        addLine;
        add: #allSelectedClassInstances
            label: 'All ~Instances'
            enable: [aBrowser isOneClassSelected];
        yourself
```

- Add the following method to EtCodeWindow:

```
allSelectedClassInstances
    self selectedClass allInstances inspect
```

- All of the Classes menus in all of the browsers should now have an “All Instances” method which will automatically enable/disable whenever a class is selected or not



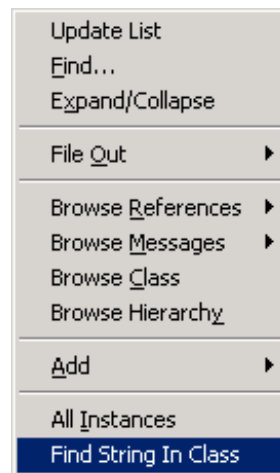
Using Progress Dialogs

- VisualAge has a nice progress dialog facility you can use for managing long running, interruptible tasks
- Use the `EtWindow>>`
`execLongOperation:message:allowCancel:showProgress:` method
 - First parameter is a one-argument block of code that will be forked to a background process. The block argument is the dialog itself
 - The “message” parameter is the text displayed in the dialog
 - The “allowCancel” parameter determines whether a Cancel button is available
 - The “showProgress” parameter determines whether a progress bar is displayed
- Several messages can be sent to the block argument (dialog) above
 - `#fractionComplete:` - set the value shown on the progress bar (a fraction between 0 and 1)
 - `#messageString:` - sets the message string in the dialog
 - `#cancelled` - answers a boolean specifying whether the Cancel button was clicked

Example - Finding Strings

- Modify our #addToClassesMenu:browser: method like this:

```
addToClassesMenu: aMenu browser: aBrowser
  ^aMenu
  addLine;
  add: #allSelectedClassInstances
    label: 'All ~Instances'
    enable: [aBrowser isOneClassSelected];
  add: #findStringInClass
    label: 'Find String In Class'
    enable: [aBrowser isOneClassSelected];
  yourself
```



Example - Finding Strings - 2

- Add the following method to the EtCodeWindow class:

```
findStringInClass
| aString found |
aString := System prompt: 'Methods including string?'.
(aString isNil or: [aString isEmpty]) ifTrue: [^self].
self
    execLongOperation: [:dialog |
        found := self
            findString: aString
            inClass: self selectedClass
            dialog: dialog]
    message: 'Gathering methods...'
    allowCancel: true
    showProgress: true.
found isEmpty
ifTrue: [System message: 'None found.']
ifFalse: [
    ((EtTools browser: #highlightingMethods)
        on: (found asSet asSortedCollection: CompiledMethod sortBlock)
        labeled: ('Methods in %1 including %2'
            bindWith: self selectedClass with: aString printString)
        highlighting: aString)
        owningImage: System image;
        open]
```


Example - Finding Strings - 3

- Also add this method to the EtCodeWindow class:

```
findString: aString inClass: aClass dialog: dialog
| methods size found cancelled |
methods := OrderedCollection new.
aClass methodDictionary do: [:method |
    methods add: method].
aClass class methodDictionary do: [:method |
    methods add: method].
size := methods size.
dialog fractionComplete: 0.
dialog messageString: 'Found: 0'.
found := OrderedCollection new.
cancelled := false.
methods doWithIndex: [:method :index | | source |
    (cancelled := cancelled or: [dialog cancelled])
    ifFalse: [
        source := method record source.
        (source notNil and: [
            (source
                indexOfSubCollection: aString
                startingAt: 1 ifAbsent: [0]) > 0])
            ifTrue: [
                found add: method.
                dialog messageString: 'Found: ', found size printString].
            dialog fractionComplete: index / size]].
^found
```

Enhancing the Text Selection Manager

- What is the Text Selection Manager?
 - Handles double-click word select
 - Handles finding matching parens and brackets
- What can we do to enhance it?
 - Add double-click line select
 - Watch for special key strokes to insert text or expand abbreviations
- How do we start?
 - Subclass `CwSmalltalkTextSelectionManager` with `MyTextSelectionManager`
 - Override the `#new` method so that we get our version instead:

```
new
  ^MyTextSelectionManager basicNew
```

- Override the `#doubleClick` method like this:

```
doubleClick
  super doubleClick
    ifTrue: [^true].
  self selectLine
    ifTrue: [^true].
  ^false
```

Very Sneaky

Enhancing the Text Selection Manager - 2

- Override the #selectWord method like this:

```
selectWord
  | leftPos rightPos |
  leftPos := self findSeparatorLeft.
  rightPos := self findSeparatorRight.
  leftPos == rightPos ifTrue: [^false].
  CwAppContext default asyncExecInUI: [
    self owner setSelection: leftPos @ rightPos].
  ^true
```

- Implement the #selectLine method like this:

```
selectLine
  | leftPos rightPos |
  leftPos := self findLineEndLeft.
  rightPos := self findLineEndRight.
  CwAppContext default asyncExecInUI: [
    self owner setSelection: leftPos @ rightPos].
  ^true
```

Enhancing the Text Selection Manager - 3

- Implement the #findLineEndLeft method like this:

```
findLineEndLeft
| findStream lineDelimiter position start |
findStream := self contentStream.
lineDelimiter := findStream lineDelimiter.
(position := self cursorPos) == 0 ifTrue: [^0].
[position > 0 and: [start isNil]] whileTrue: [
    position := position - 1.
    findStream position: position.
    (lineDelimiter includes: findStream peek)
    ifTrue: [start := position + 1]].
position := start.
[findStream atEnd] whileFalse: [
    findStream next isSeparator
    ifFalse: [^findStream position - 1]].
^self ownerSize
```

Enhancing the Text Selection Manager - 4

- Implement the #findLineEndRight method like this:

```
findLineEndRight
| findStream lineDelimiter position |
(findStream := self contentStream) position: self cursorPos.
lineDelimiter := findStream lineDelimiter.
[findStream atEnd not and: [position isNil]] whileTrue: [
    (lineDelimiter includes: findStream next)
    ifTrue: [position := findStream position - 1]].
position isNil
    ifTrue: [^self ownerSize].
[position = 0] whileFalse: [
    position := position - 1.
    findStream position: position.
    findStream peek isSeparator
    ifFalse: [^position + 1]].
^0
```

Hooking KeyPress in Browser Text Widgets

- What else can we do with our new Text Selection Manager?
 - Watch for special key strokes
 - Examples
 - VW goodies - Ctrl+g/f/t
 - Inserting parens, brackets, etc.
 - Expanding Abbreviations

- Let's start with the first one: "VW Goodies"

- How do we do it?

- Override the CwTextManager class>>for: method

```
for: aCwText
  | manager |
  manager := super for: aCwText.
  aCwText
    addEventHandler: KeyPressMask
    receiver: self
    selector: #keyPress:clientData:callData:
    clientData: manager.
  ^manager
```

VW Goodies - Ctrl+G/F/T

- VisualWorks implements several keyboard macros
 - Ctrl+G inserts “:=”
 - Ctrl+T inserts “ifTrue:”
 - Ctrl+F inserts “ifFalse:”
- Implement the MyTextSelectionManager>> insertString: method

```
insertString: aString  
  | pos |  
  pos := self owner getInsertionPosition.  
  self owner  
    setInputFocus;  
    replace: pos toPos: pos + 1 value: aString
```

VW Goodies - Ctrl+G/F/T - 2

- Implement the MyTextSelectionManager>>

keyPress:clientData:callData: method

```
keyPress: textWidget clientData: clientData callData: callData
| ctrl shift |
ctrl := callData state anyMask: ControlMask.
shift := callData state anyMask: ShiftMask.
ctrl & shift
  ifTrue: [
    callData keysym == XKT
      ifTrue: [self insertString: 'ifTrue: ['].
    callData keysym == XKF
      ifTrue: [self insertString: 'ifFalse: ['].
    callData keysym == XKG
      ifTrue: [self insertString: ':= '].
```


Inserting Matching Prens

- Implement the MyTextSelectionManager>> parenthesizeSelectedText method

```
parenthesizeSelectedText
| selectionPosition |
(selectionPosition := self owner getSelectionPosition) = (0@0)
  ifTrue: [^self].
self owner
  replace: selectionPosition x
    toPos: selectionPosition y
    value: '(' , self owner getSelection , ')';
  setSelection:
    selectionPosition x @ (selectionPosition y + 2);
  setInputFocus
```

Inserting Matching Prens - 2

- Modify the MyTextSelectionManager>>

keyPress:clientData:callData: method

```
keyPress: textWidget clientData: clientData callData: callData
| ctrl shift |
ctrl := callData state anyMask: ControlMask.
shift := callData state anyMask: ShiftMask.
ctrl & shift
    ifTrue: [
        callData keysym == XKT
            ifTrue: [self insertString: 'ifTrue: ['].
        callData keysym == XKF
            ifTrue: [self insertString: 'ifFalse: ['].
        callData keysym == XKG
            ifTrue: [self insertString: ':=']].
ctrl
    ifTrue: [
        (callData keysym == XKparenleft
         or: [callData keysym == XK9])
        ifTrue: [^self parenthesizeSelectedText]].
```

Expanding Abbreviations

- Implement the MyTextSelectionManager>>insertAbbreviation method

```
insertAbbreviation
```

```
| pos start abbrev expansion |  
pos := self owner getInsertionPosition - 1.  
start := self findSeparatorLeftStartingAt: pos.  
abbrev := self owner value copyFrom: start + 1 to: pos.  
expansion := self class abbreviations  
    at: abbrev ifAbsent: [^nil].  
self owner  
    setInputFocus;  
    replace: start toPos: pos + 1 value: expansion
```

- Implement the #findSeparatorLeftStartingAt: method

```
findSeparatorLeftStartingAt: anInteger
```

```
| findStream position |  
findStream := ReadStream on: self owner value.  
position := anInteger.  
[position = 0] whileFalse: [  
    position := position - 1.  
    findStream position: position.  
    findStream peek isAlphaNumeric ifFalse: [^position + 1]].
```

```
^0
```

Expanding Abbreviations - 2

- Implement the MyTextSelectionManager class>>abbreviations method

abbreviations

```
^Dictionary new
  at: 'int' put: 'isNil ifTrue: []';
  at: 'inf' put: 'isNil ifFalse: []';
  ...
  yourself
```

- Modify the MyTextSelectionManager>>

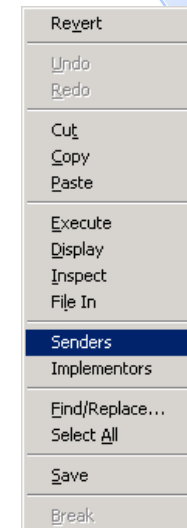
keyPress:clientData:callData: method

```
keyPress: textWidget clientData: clientData callData: callData
| ctrl shift |
ctrl := callData state anyMask: ControlMask.
shift := callData state anyMask: ShiftMask.
ctrl & shift ifTrue: [...].
ctrl ifTrue: [...].
shift
  ifTrue: [
    callData character == CldtConstants::Space
      ifTrue: [^self insertAbbreviation]].
```

The Joy of Parse Trees

- VisualAge has a very powerful built in parser
- What is a parse tree?
 - A top down, hierarchical representation of a method
 - Ammo for countless browser hacks!
- What can you use it for?
 - Color syntax highlighting
 - Senders and Implementors
 - Spell Checking
 - Limited static analysis

```
sampleMethod: arg1 with: arg2
  "This is a multi-line comment
  This is a multi-line comment"
  | temp1 |
  <primitive: ThisIsAPrimitive>
  temp1 := Array with: arg1 with: instVar1 with: #aSymbol.
  "Another comment"
  1 to: temp1 size do: [:blockArg |
    | temp2 |
    (temp2 := temp1 at: blockArg)
    setSensitive: true;
    setLabel: CwConstants::XmOK;
    backgroundColor: (CgRGBColor blue: 65535 // 2 + 1);
    recomputeSize;
    triggerCallback: arg2 with: argmnts: ##(A #B 3);
    propertyAt: false put: ##[1 2 3 4].
    self callCallbacks: temp2 callData: instVar2].
  self
  propertyAt: $A;
  propertyAt: 'aString' put: nil.
  ^super sampleMethod: arg1 with: temp1
```



Parse Tree Example

- Example Method

```
foo
  self doSomething.
  ^self foo: self bar bar: foo.
```

- Parse Tree

```
EsMethod "foo"
  statements:
    EsStatement "self doSomething"
      EsMessageExpression
        receiver: EsVariableWithBinding "self"
        messagePattern: EsUnaryPattern "doSomething"
    EsStatement "self foo: self bar bar: foo"
      EsMessageExpression
        receiver: EsVariableWithBinding "self"
        messagePattern: EsKeywordPattern "foo: self bar bar: foo"
        selector: #(#foo: #bar:)
        arguments:
          EsMessageExpression "self bar"
            receiver: EsVariableWithBinding "self"
            messagePattern: EsUnaryPattern "bar"
          EsVariableWithBinding "foo".
```

Creating a Parse Tree

- The `EsCompiler>>parse:forEvaluation:environment:errorHandler:` method answers an `EsCompilationResult` that holds onto a parse tree
- The “forEvaluation” parameter should be false for a method and true for a `DoIt`.
- The “environment” parameter provides a default namespace that the compiler can use to resolve the variables
- The “errorHandler” parameter is set to an `EsSilentErrorHandler` (we don’t care about errors)

```
parseTreeFor: aString
  ^ (Compiler
    parse: aString
    forEvaluation: false
    environment: (EsNameEnvironment new
      environment: Smalltalk;
      sourceClass: Object)
    errorHandler: EsSilentErrorHandler new) parseTree
```

Find the Selector at the Cursor

- Get the index of the cursor in the browser text widget
- Generate the parse tree for the text in the browser
- Loop through all of the parse tree nodes looking for the node containing the cursor index
- Answer the selector held by the parse node or nil if the parse node does not represent a selector (e.g., a global, a literal, self, super, etc.)

```
EtWindow>>selectorAtCursor
  | textWidget index parseTree |
  index := (textWidget := self targetTextWidget) cursorPosition.
  (parseTree := self parseTreeFor: textWidget getString) notNil
    ifTrue: [| targetNode |
      parseTree allNodesDo: [:node |
        (node sourceStart - 1 <= index and: [node sourceEnd > index])
          ifTrue: [targetNode := node]].
      (targetNode notNil and: [targetNode selector notNil])
        ifTrue: [^targetNode selector]].
  ^nil
EsParseNode>>selector
  ^nil
```


Sender & Implementors

● Senders

- Find the selector at the cursor
- Ask the system for all senders of that method

```
EtWindow>>sendersAtCursor
| symbol |
(symbol := self selectorAtCursor) isNil
  ifFalse: [
    self owningImage allMethodsSending: symbol]
```

● Implementors

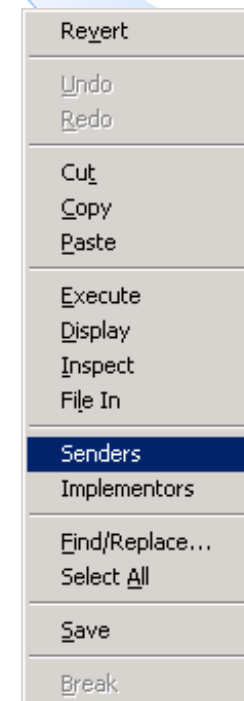
- Find the selector at the cursor
- Ask the system for all methods by that name

```
EtWindow>>implementorsAtCursor
| symbol |
(symbol := self selectorAtCursor) isNil
  ifFalse: [
    self owningImage allMethodsNamed: symbol]
```

Enhancing the Popup Text Menu

- Use the Extension API to enhance the `EtWindow>>defaultTextMenu` method
- Add the following class method to the `MyApplication` class to add new “Senders” and “Implementors” items

```
addToDefaultTextMenu: aMenu browser: aBrowser
    ^aMenu
        add: #sendersAtCursor
            label: 'Senders'
            enable: true
            after: #menuEditFileIn;
        add: #implementorsAtCursor
            label: 'Implementors'
            enable: true
            after: #sendersAtCursor;
        addLineAfter: #implementorsAtCursor;
        yourself
```



VisualAge Resources

- IBM

- Smalltalk Home Page
<http://www.ibm.com/software/awdtools/smalltalk/>
- Support Page
<http://www.ibm.com/software/awdtools/smalltalk/support/>
- Add-on products
<http://www.developer.ibm.com/solutions/isv/igssg.nsf/OCsappWeb?OpenView>
- Newsgroup
<news://news.software.ibm.com/ibm.software.vasmalltalk>
- FTP patches
<ftp://ps.boulder.ibm.com/ps/products/visualage/fixes/>
- Download VAST 6.0.2
<http://www6.software.ibm.com/dl/vasmtlk/vasmtlk-p>

- General

- Smalltalk Language Newsgroup
<comp.lang.smalltalk>
- *Mastering ENVY/Developer*
Cambridge University Press, ISBN: 0-521-66650-3
- Instantiations' Smalltalk Web Site
<http://www.instantiations.com/sts>
- Me ;-)
<mailto:clayberg@instantiations.com>