

# XML Notepad 2007 Design

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**Summary:** This article introduces a new version of XML Notepad. The tool was first introduced in 1998 but has been unavailable for several years. This version leverages System.Xml and adds new features.

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I finally got around to fulfilling a promise I made to a friend at MSDN. Back in 1998, we shipped an XML Notepad, written by Murray Low in C++. Later on it fell behind in support for XML standards and, because we didn't have time to fix it, we pulled it off MSDN. But Murray apparently did such a nice job that MSDN was inundated with requests to put the notepad back up, so MSDN asked me for a replacement.

I've been working on System.Xml in C# since 1999, so I figured I could crank out a replacement using the .NET Framework pretty quickly. Well, the problem was it was one of those side projects on my "one-day" list — you know how that goes! Fortunately, a good friend of mine, Michael Corning, took interest in it, helped hold my feet to the fire, and also added some cool features himself. Dan Doris also took pity on me and helped identify some great bugs. So here we are, finally, with something that should be useful to those who want a quick way to view and edit XML documents.

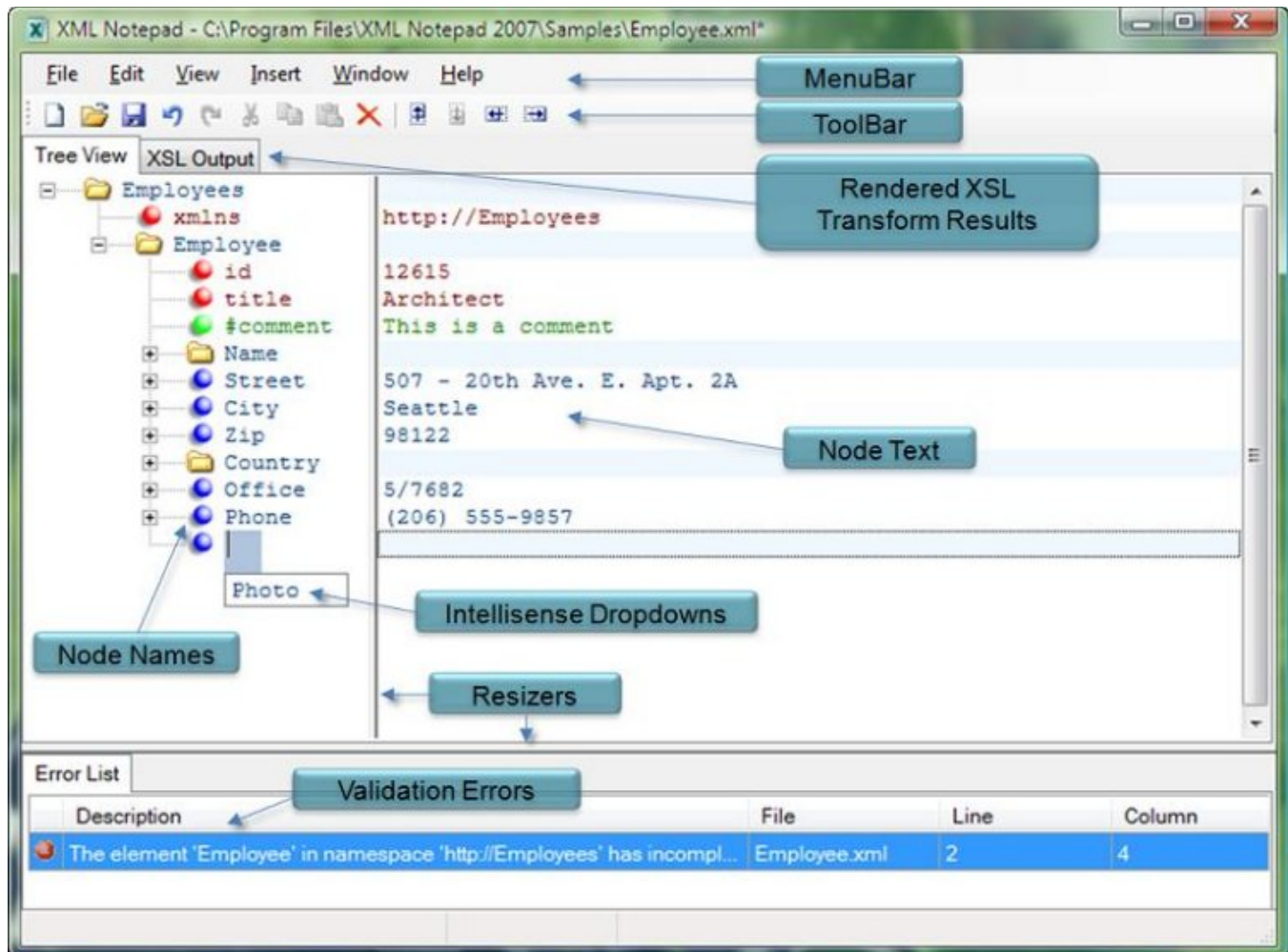
For those who know the original version, the interface should look familiar: a tree view on the left synchronized with a node text view on the right and handy nudge toolbar buttons for quick movement of nodes up and down the tree (see Figure 1). Because it's been so long since the first version, I've had to leverage the cool stuff in System.Xml and add some bells and whistles that the original version didn't have:

- Incremental search (CTRL+I) in both tree and text views, so that as you type it navigates to the most matched node.
- Cut/copy/paste with full namespace support in a simple interoperable XML format.
- Drag/drop support for easy manipulation of the tree, even across different instances of XML Notepad and from the file system.
- Infinite undo/redo for all edit operations.
- In-place, pop-up, multi-line editing of large text node values and IntelliSense based on expected elements and attributes.
- Configurable fonts and colors via the options dialog.
- Full find/replace dialog with support for regex and XPath expressions.
- Good performance on large XML documents (loading a 3 MB document in about one second).

- Instant XML schema validation while you edit with errors and warnings shown in the task list window.
- Support for custom editors for date, dateTime, time, and color datatypes.
- HTML viewer for displaying XSLT transformation results.
- Built-in XML Diff tool.

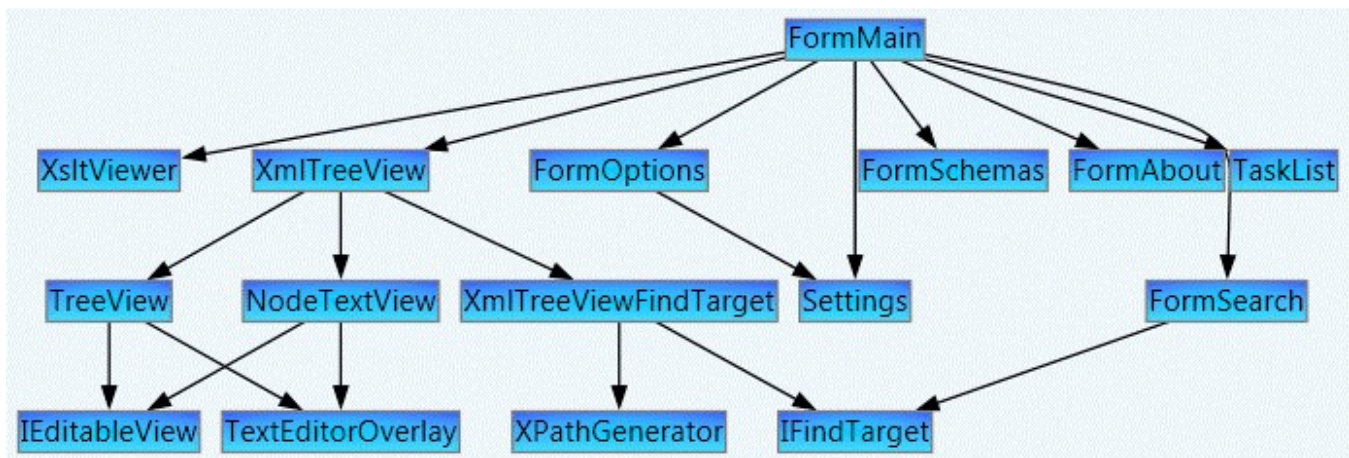
## Design and Implementation

In the [downloadable package](#) you'll find the core XmlNotepad dll project, an Application project that builds XmlNotepad.exe, the XmlDiff library projects used in the XML diff feature, a Setup project for building the .msi installer, the UnitTest project for testing XML Notepad, and a Help project for building the Help.chm file using the HTML Help Workshop tools.



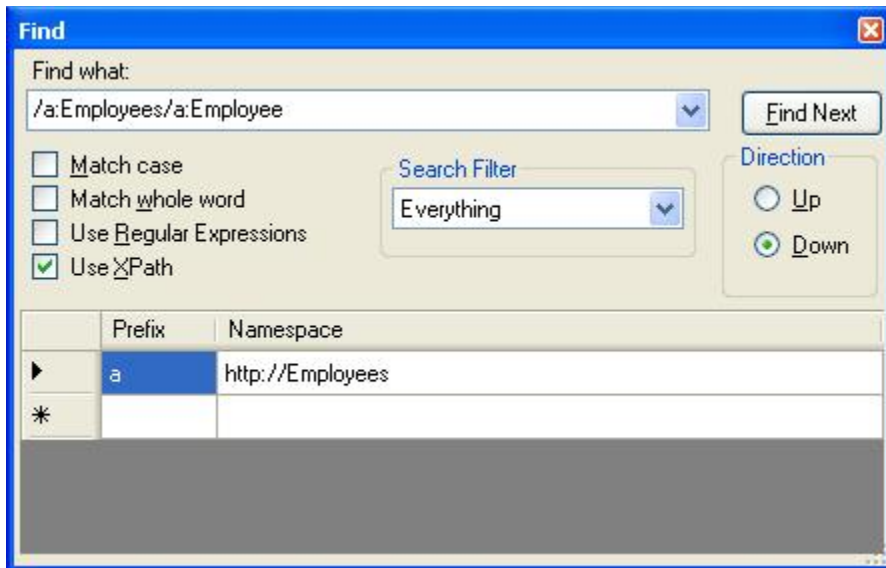
**Figure 1. XML Notepad interface**

The following diagram shows the relationships between the main UI classes. The main form contains all the UI elements from the TaskList to the main XmlTreeView with Resizers in between; it's the launching point for the dialogs such as FormSearch, FormSchemas, FormOption, and FormAbout.



**Figure 2. Main UI classes**

The main tab control contains the XmlTreeView and the XsltViewer for showing XSL output. The XmlTreeView contains a TreeView on the left and a NodeTextView on the right and coordinates scrolling between these two views. Both the TreeView and NodeTextView provide the same IntelliSense editing functionality using a TextEditorOverlay component. The XmlTreeView implements IFindTarget, which is used by the Find dialog (FormSearch) to implement find/replace functionality.



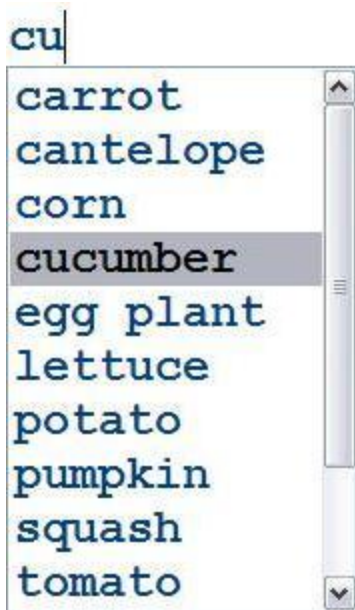
**Figure 3. Find dialog**

The Find dialog supports full text, regex, or XPath expressions and can filter by names or values. Here you see the XPath search, which also provides a table for entering namespace prefix mappings used in the query.

## Validation, IntelliSense, and Custom Editors

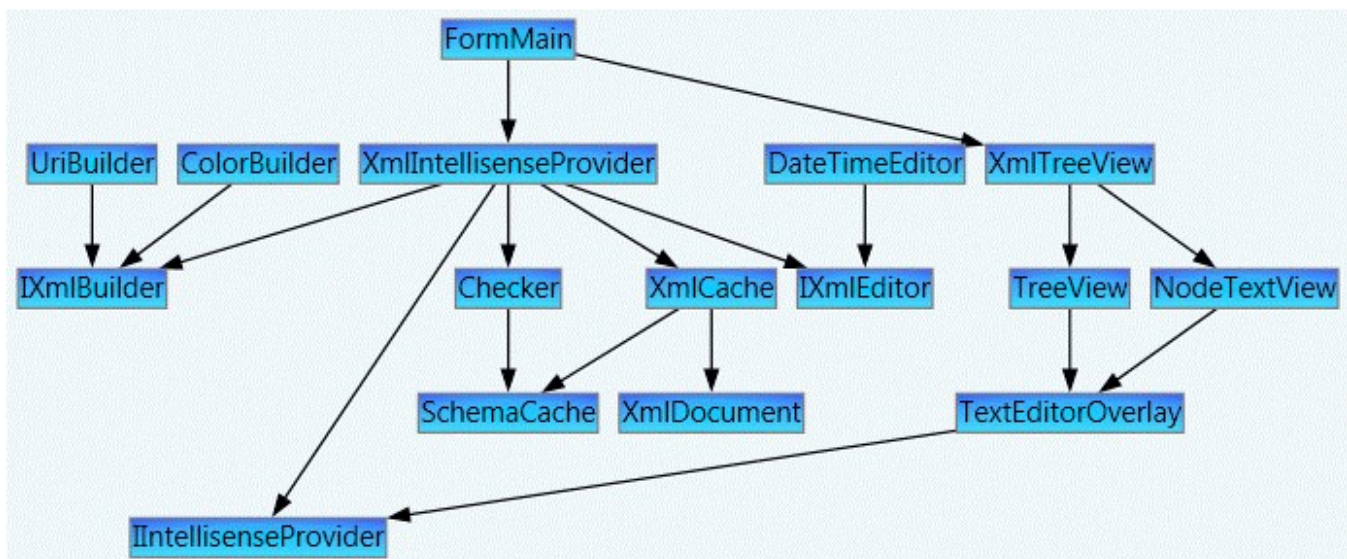
The biggest new feature is IntelliSense, which is driven by XML Schema information provided via the SchemaCache. For example, if your element or attribute is defined by an XSD simpleType and this simpleType contains a list of enumeration facets, then you will get a drop-down like this:





**Figure 4. Drop-down list values**

The way this works is that the Checker runs after each edit operation to validate the document and report errors in the TaskList. This process also puts `System.Xml.Schema.XmlSchemaType` information on each element and attribute in the `XmlDocument`; then, when editing the value of that node, the `TextEditorOverlay` uses the `XmlIntelliSenseProvider` to get back a list of possible values. In the above example it returns the values from the `simpleType` enumeration facets. For element name IntelliSense in the tree view, the `XmlIntelliSenseProvider` invokes the Checker again, captures `GetExpectedParticles` and `GetExpectedAttributes` on the `System.Xml.Schema.XmlSchemaValidator`, and uses that to provide IntelliSense.



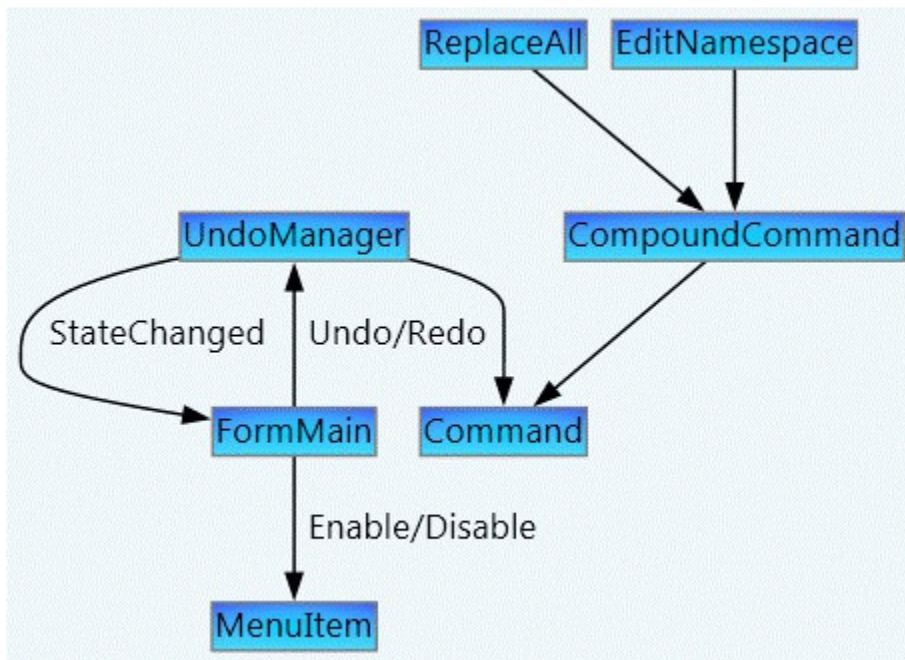
**Figure 5. IntelliSense in tree view**

The `TextEditorOverlay` also supports custom editors like the `DateTimeEditor` or the `UriBuilder` or `ColorBuilder`. There are two types of custom editors: `IXmlEditors`, which are inline editors that replace the default `TextBox`, and `IXmlBuidlers`, which are popup dialogs like the `OpenFileDialog` or `ColorDialog`. The type of editor is derived from the schema type information — "`xs:date`", "`xs:time`", "`xs:datetime`" results in the `DateTimeEditor`, and "`xs:anyURI`" results

in the UriBuilder. You can also annotate the schema with a custom "vs:builder" attribute in the "http://schemas.microsoft.com/Visual-Studio-IntelliSense" namespace. See the Help content for more information.

## Infinite Undo/Redo

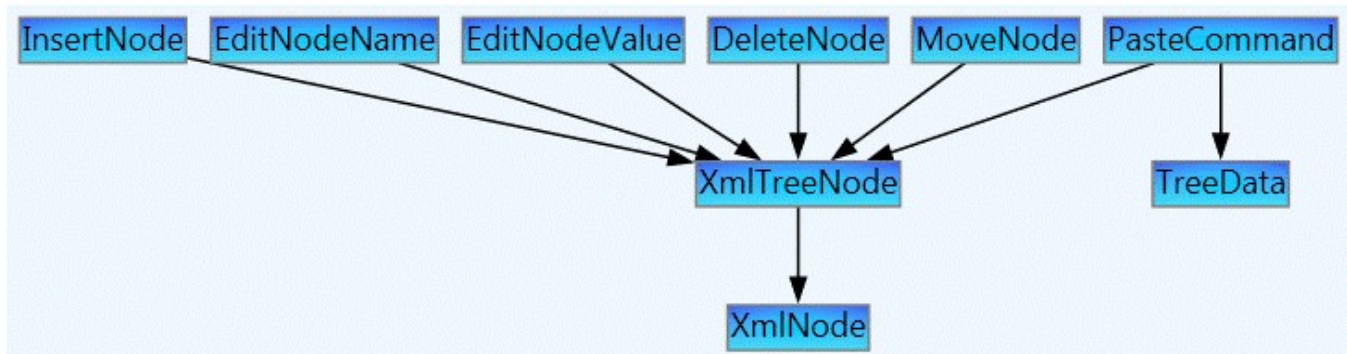
To implement undo/redo I followed a common design pattern of Command objects with Undo and Redo methods. The UndoManager collects these in a list. Then the state of the UndoManager controls the enabled/disabled state of the Undo/Redo Menuitems. When the user selects the Undo menu item, the Undo method is called on the active command, and that command is pushed onto the Redo stack.



**Figure 6. Undo/Redo in tree view**

Some operations in the editor cause many edits in the tree including the replace-all operation and editing the value of a namespace attribute. (When you change the value of a namespace attribute, every XmlNode bound to that namespace needs to be reconstructed with a new namespace URI, which can obviously affect a lot of nodes in the tree!) So, to make these operations one atomic undo operation, there is a CompoundCommand object that contains a list of smaller edit commands, and this CompoundCommand is put into the UndoManager.

Other simpler command objects include the following, which all operate on XmlTreeNode and XmlNode objects:

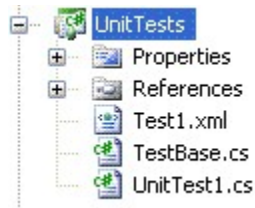


### Figure 7. Command objects in tree view

The PasteCommand is special because it takes random XML text off the clipboard and parses it in context of the currently selected element in the tree, inheriting the namespaces in scope. The helper class TreeData uses the special XmlTextReader constructor that takes an XmlParserContext as input.

## Unit Testing

I had to do a good job of testing the new XML Notepad, and I was looking for an excuse to use the new Visual Studio 2005 [UnitTest projects](#). The UnitTest runs from the TestManager under the new Test menu from within Visual Studio, launching XML Notepad and executing the 15 test methods I've written.



### Figure 8. UnitTests

When the test completes, you can then right-click on the Test Results window and select "Code Coverage Results". This brings up a summary of how many blocks were covered in each function. You can double-click the row in the list to bring up a color-coded source code view showing exactly which code has been covered. This made it really easy for me to get the code coverage up to about 85 percent.

The only trick is that you don't get code coverage when you run the tests under the debugger, and the UnitTest project creates a file next to your solution called "localtestrun.testrunconfig" and "XmlNotepad.vsmদি," which you should not lose. If you do, then code coverage also will not work. Other than that, I have to say this new UnitTest stuff is one of the coolest new features in Visual Studio 2005.

## Conclusion

I hope you enjoy the all new XML Notepad. Feedback and suggestions are welcome, so just send e-mail to [wdxtools@microsoft.com](mailto:wdxtools@microsoft.com).