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Getting Started

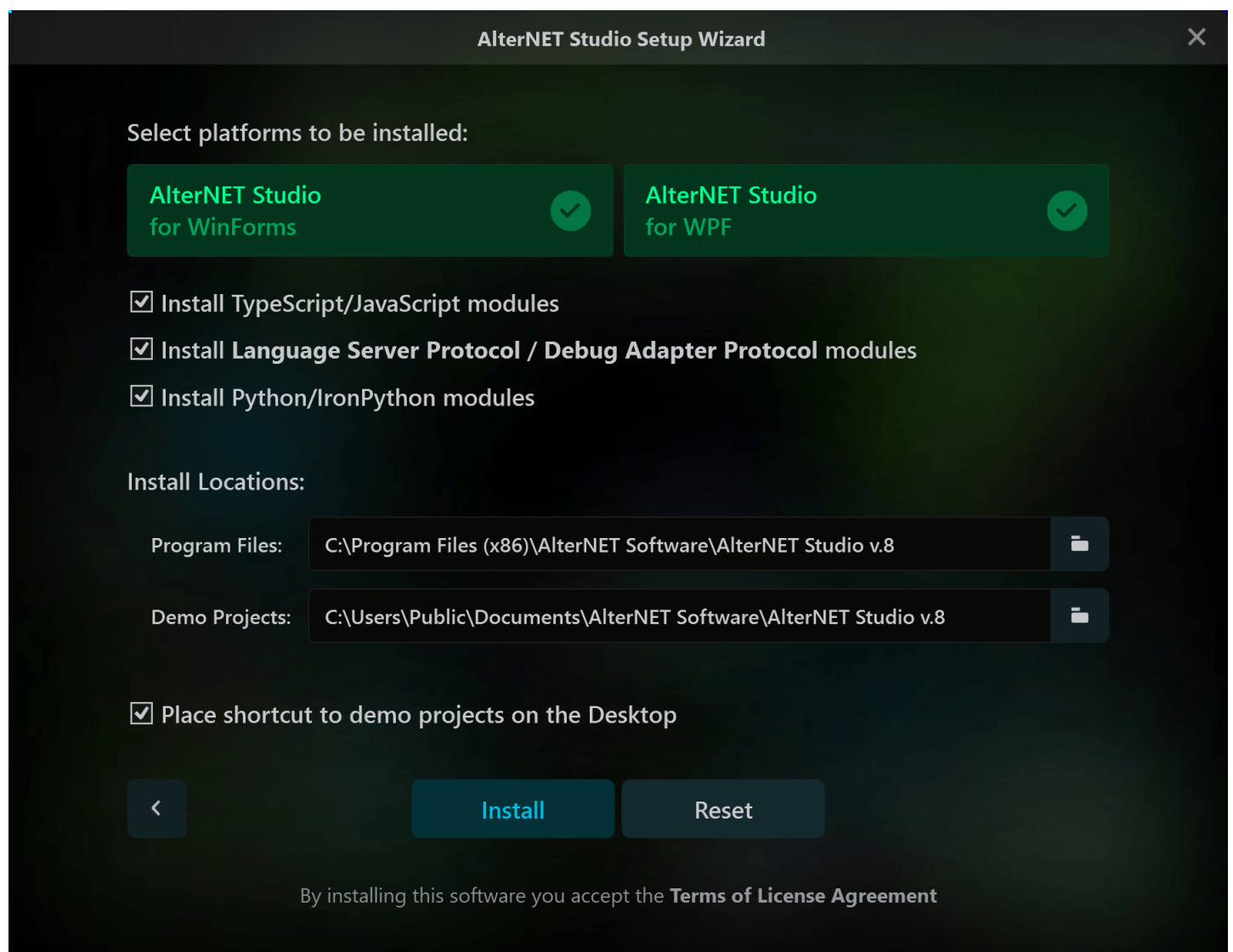
AlterNET Studio allows you to extend WinForms and WPF .NET applications with code editing, scripting, and user interface designing capabilities.

Installation

AlterNET Studio requires .NET Framework 4.6.2+ and Visual Studio 2019 or 2022 to be installed on the target machine.

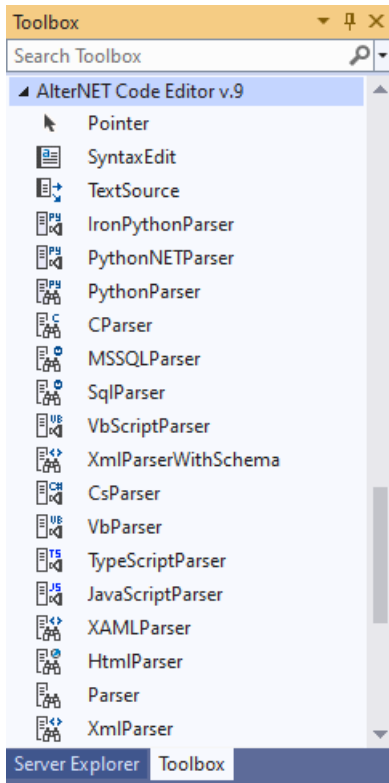
By default, the AlterNET Studio installation program installs AlterNET Studio binary files to Program Files (x86)\AlterNET Software\AlterNET Studio\Bin\ folder and example projects with source code in \Users\Public\Documents\AlterNET Software\AlterNET Studio folder. These settings can be changed if you select Customize in the installation wizard.

Advanced installation options include platform selection (WinForms, WPF, or both) and the Python/IronPython, TypeScript/JavaScript, and LangServer/DAP features.



The installation program registers Visual Studio extensions and places controls and components on the AlterNET Code Editor, AlterNET Scripter, and AlterNET Form Designer tabs in the Visual Studio toolbox.

- [Code Editor](#)
- [Scripter](#)
- [Form Designer](#)



Other versions of .NET Framework, .NET 6.0, .NET 7.0 and .NET 8.0 are supported via NuGet packages. A complete list of NuGet packages can be found here:

<https://alternetsoft.com/download#nuget>

If you have a previous major version of AlterNET Studio and decide to install the new one side-by-side, you will have two sets of Visual Studio Extensions and two sets of tabs, each one clearly displaying the version number.

Demo and QuickStart projects

Once the product is installed, you can explore demos and quick-start projects by compiling Alternet.Studio.AllDemos solutions or accessing these demos through the Demo Explorer tool, which is added to the Windows Start menu.

AlterNET Software Demo Explorer

Studio for C#/Visual Basic

WinForms

AlterNET Studio

Code Editor

Syntax Editor

Form Designer

QuickStart Projects

WPF

Studio for Python

WinForms

WPF

Studio for IronPython

WinForms

WPF

Studio for TypeScript

WinForms

WPF

Studio for LSP/DAP

WinForms

WPF

AlterNET Studio

Run

Open Project

This demo shows how all products can be integrated in one solution - from designing visual interface using Form Designer, to writing application logic in powerful Code Editor and executing and debugging this code with Scripter.

More Information:

AlterNET Studio allows you to extend your WinForms and WPF .NET application with code editing, scripting and user interface designing capabilities. It provides a set of component libraries that enables users of your applications to write scripts in C# and Visual Basic, programming languages to extend your application with custom functionality; run and debug these scripts with a fully-featured debugging engine and design visual user interfaces with graphical Form Designer.

AlterNET Studio 9.5

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Core Components

AlterNET Studio includes the following core components:

Code Editor

AlterNET Code Editor is a component library that brings efficient code editing functionality to .NET applications. It provides code editing capabilities such as syntax highlighting, IntelliSense (code completion), code outlining, visual indicators for bookmarks, line styles, syntax errors, and more.

AlterNET Code Editor matches most of the features of Visual Studio code editor and is primarily designed for C#, Visual Basic, TypeScript, JavaScript, Python, and XML text editing.

Scripter

AlterNET Scripter is a component library designed to integrate C#/Visual Basic, TypeScript/JavaScript, and IronPython scripts into the .NET applications. It allows extending functionality of the application logic without recompiling and redeploying the application.

AlterNET Scripter provides a framework to compile and execute user-defined scripts along with a set of debugging tools enabling application developers to make application objects available to the scripts so they can write user-defined scenarios for these applications.

Form Designer

AlterNET Form Designer is a component library providing a quick and convenient way to create graphical user interfaces. It allows for placing controls on the design surfaces, setting their initial properties, and writing event handlers for their events.

AlterNET Form Designer includes WinForms and WPF designers, both supporting designing visual interfaces, serializing design content, and running the forms being designed.

Integrating AlterNET Studio components.

AlterNET Code Editor, Scripter, and Form Designer can work together in applications that require text editing, scripting, or UI designing functionality. Code Editor is designed for C#, Visual Basic, TypeScript, JavaScript, Python and XML code editing and can be used in conjunction with Form Designer and Scripter packages to provide code editing functionality for code-behind files, writing event handlers and script editing.

Refer to our AlterNET Studio demo project to see how [Code Editor](#), [Scripter](#), and [Form Designer](#) work together.

Licensing

AlterNET Studio requires a valid license to be installed for developing .NET applications that use its components. Evaluation-license is supplied upon AlterNET Studio installation and when consuming NuGet packages; these licenses are based on LICX files technology provided by Microsoft and are valid for 30 days since first use.

Upon ordering a paid version of our product, a customer is sent a License key and will be able to activate it on the target computer. This key will support several activations but is not transferable between development machines.

In specific scenarios, such as using our software inside a protected environment, multiple build servers, or Azure Pipeline, we can provide a node-unlocked license, which can be copied to the specific folder on a development PC or a build server (ProgramData\AlternetSoft\Licenses by default). The location of the folder we scan for licenses can be changed by setting the following environment variable on your Windows system: ALTERNET_STUDIO_LICENSE_DIRECTORY. It is particularly useful in the case of Azure Pipeline, where access to the above folder is restricted.

Once you drag AlterNET Studio controls or components from the toolbox, such as `<xref:Alternet.Editor.SyntaxEdit>`, `<xref:Alternet.Editor.Wpf.TextEditor>`, `<xref:Alternet.FormDesigner.WinForms.FormDesignerControl>`, or `<xref:Alternet.Scripter.ScriptRun>` on your form, the LICX file will be added to your project under the Properties folder with the content like this:

```
Alternet.Editor.SyntaxEdit, Alternet.Editor.v9, Version=9.0.0.0, Culture=neutral, PublicKeyToken=8032721e70924a63
```

```
Alternet.Scripter.ScriptRun, Alternet.Scripter.v9, Version=9.0.0.0, Culture=neutral, PublicKeyToken=8032721e70924a63
```

```
Alternet.FormDesigner.WinForms, Alternet.FormDesigner.v9, Version=9.0.0.0, Culture=neutral,
PublicKeyToken=8032721e70924a63
```

In case these components are created from the code, a LICX file with the above content should be added to your project. It also can be copied from our demo projects if needed.

The design-time license is checked when you work with this component at design time or when the project is compiled, and the evaluation screen reminding you about the evaluation mode and the number of days left for your evaluation will appear once in a while. If the project compiled with an evaluation version of licensed components is run outside the Microsoft Visual Studio debugger, a screen suggesting that the application was created with an evaluation version of AlterNET Studio will be displayed. Once a paid license is activated using the LicenseActivation tool, this nag screen will no longer appear.

When the evaluation period expires, you will still be able to compile and run your application from within Visual Studio. However, applications created with an expired license will not be run in standalone mode.

Below is more information about the Microsoft license compiler and some discussions related to the intent and purpose of LICX files, using them with source code control systems, etc.

[https://msdn.microsoft.com/en-us/library/ha0k3c9f\(v=vs.110\).aspx](https://msdn.microsoft.com/en-us/library/ha0k3c9f(v=vs.110).aspx)

<http://stackoverflow.com/questions/5628969/how-licenses-licx-file-is-used>

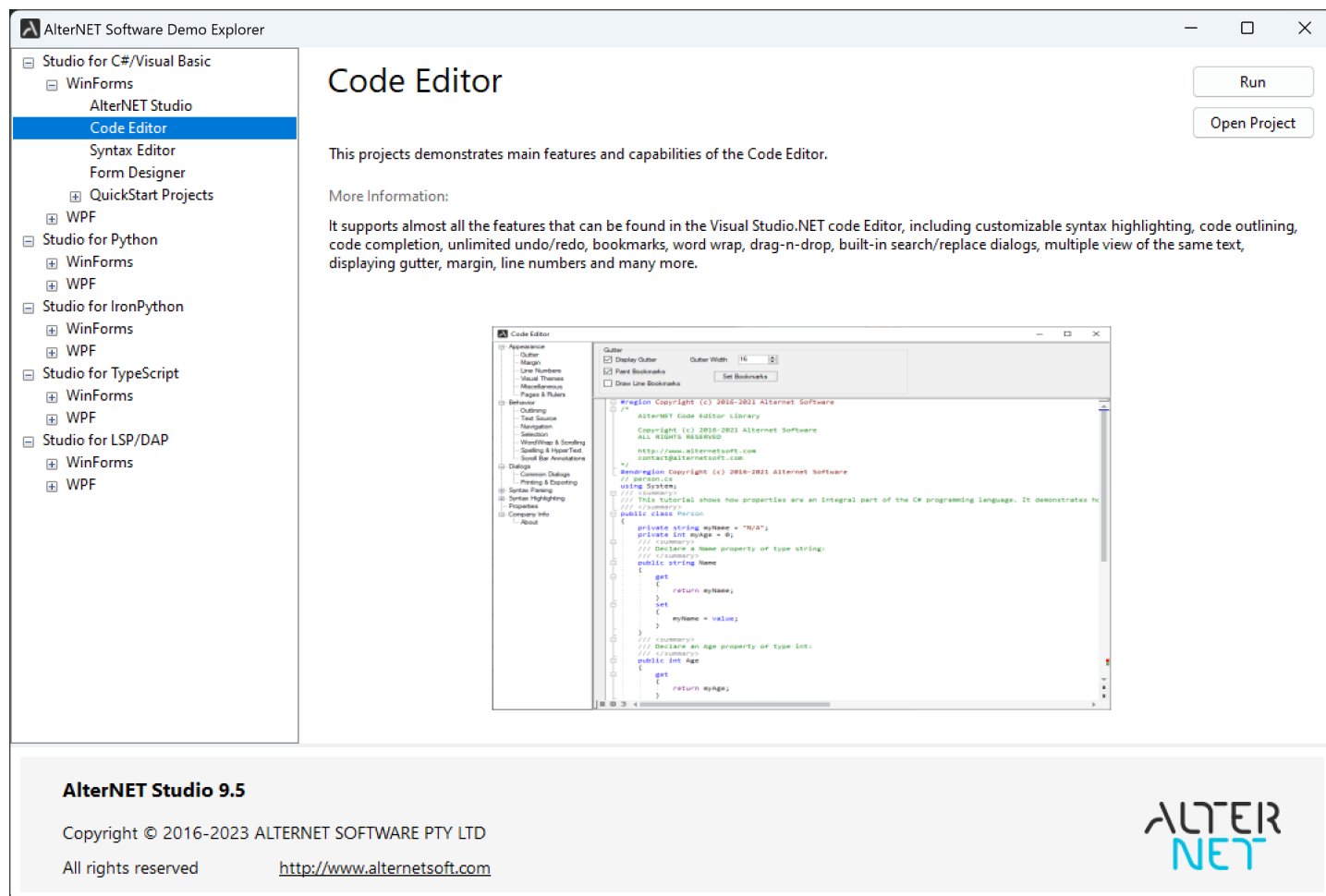
<http://stackoverflow.com/questions/51363/how-does-the-licenses-licx-based-net-component-licensing-model-work>

Code Editor Overview

AlterNET Code Editor is a .NET component library that brings efficient code editing functionality into your WinForms and WPF .NET applications. It provides code editing capabilities such as syntax highlighting, code completion and outlining, visual indicators for bookmarks, line styles, syntax errors, and more.

The main components in the package are `<xref:Alternet.Editor.SyntaxEdit>` for WinForms and `<xref:Alternet.Editor.Wpf.TextEditor>` for WPF. These controls provide text editing functionality and support almost all the features that can be found in the Visual Studio.NET code Editor, including customizable syntax highlighting, code outlining, code completion, unlimited undo/redo, bookmarks, word wrap, drag-n-drop, built-in search/replace dialogs, multiple views of the same text, displaying gutter, margin, line numbers and many more.

Code Editor includes a set of quick-start projects, each designed to highlight the component's specific features.



Below is a brief overview of these projects:

Scroll Bar Annotations - Shows how text edit control can display markers about current line, syntax errors, bookmarks, modified lines and search results on the vertical scrollbar area.

Syntax Highlighting - Shows how text edit control can highlight syntax when working with different programming languages.

Code Completion - Shows how to display code completion while you type, either by getting code completion information from the parser or programmatically.

Code Outlining - Shows how to use outlining; either provided by parser, or programmatically.

Selection - Shows how to use different options to control text selection appearance and behavior in the text editor.

Undo/Redo - Shows how to use various options to control undo/redo behavior.

Search and Replace - Shows how to use built-in Search and Replace dialogs and implement search across multiple documents.

Gutter - Shows how to control the appearance of the gutter area and display various indicators on it.

Bookmarks - Shows how to set and navigate through numbered and though-loop bookmarks and how to set bookmarks navigation across multiple documents.

Word Warp - Shows how to configure text edit control to wrap words at the right edge of the visible area or a given position.

Line Styles - Shows how to display line indicators on the text editor control area and associated images on the gutter.

Print and Preview - Shows how to print and preview text editor control content and set different printing options.

Code Snippets - Shows how to display and use predefined code templates to speed up entering frequently used fragments of code.

Multiple Views and Split View - Shows how to configure text editor windows to display and edit the same text content.

Margin - Shows how to use various options controlling the appearance and behavior of the Margin line and UserMargin area next to the gutter.

HyperText - Shows how to highlight hyperlinks in the text.

Page Layout - Shows how to configure text edit control to display its content as if it is positioned on the printed page.

Miscellaneous - Shows how to display white-space symbols and background images, as well as highlight matching brackets.

Customize - Shows an example of an options dialog that allows changing display settings of the text edit control.

Roslyn-Based Parsing - Shows how to link text edit control to Microsoft Roslyn-based parsers that perform full syntax and semantic analysis of the C# or Visual Basic code and provide features like code completion, code outlining and syntax/semantic error highlighting.

TypeScript Parsing - Shows how to link text edit control to Microsoft TypeScript-based parsers that perform full syntax and semantic analysis of the TypeScript or JavaScript code and provide features like code completion, code outlining, and syntax/semantic error highlighting.

Advanced Syntax Parsing - Shows how to link text edit control to parsers that perform syntax analysis for a set of programming languages and provide features like code completion, code outlining, and syntax error highlighting.

Snippet Parsers - Shows how to implement C# or Visual Basic syntax and semantic analysis for sub-set of the code, like class or method body.

SQL DOM Parser - Shows how to implement syntax analysis for Microsoft SQL.

XAML Parser - Shows how to implement syntax analysis for XAML.

Lsp-based parsers (C/C++, Java, Python, Lua, XML, and PowerShell) - Shows how to implement syntax analysis for these languages using native servers.

Lsp Multiple Files - Shows how to combine multiple LSP documents into a single workspace.

Python Parsing - Shows how to implement syntax analysis for Python and IronPython.

Creating your first project

The first thing to do after creating a new WinForms or WPF application is to place the `<xref:Alternet.Editor.SyntaxEdit>` or `<xref:Alternet.Editor.Wpf.TextEditor>` controls. These controls are the central components in the package, and in many cases, they are the only ones that need to be placed on the form. These controls look similar to the standard multi-line text box, except for having a gray band on the left of its client area, used to display line numbers, bookmarks, and other visual indicators.

The following example demonstrates how to load text into the editor and save it. Use the LoadFile method to load text from the file. The first parameter specifies the name of the file to be loaded into the control. The optional second parameter specifies encoding.

```
edit.LoadFile(openFileDialog1.FileName);
```

Saving of the text is performed similarly:

```
edit.SaveFile(saveFileDialog1.FileName);
```

It is possible to load text from streams instead of files, by substituting the previous two functions by [<xref:Alternet.Editor.SyntaxEdit.LoadStream*>](#) and [<xref:Alternet.Editor.SyntaxEdit.SaveStream*>](#).

Working with text

The Code Editor package includes non-visual components: [<xref:Alternet.Editor.TextSource.TextSource>](#) (or [<xref:Alternet.Editor.Wpf.TextSource>](#) for WPF applications). For WindowsForms applications TextSource is accessible through the Microsoft Visual Studio toolbox. The [<xref:Alternet.Editor.SyntaxEdit>](#) and [<xref:Alternet.Editor.Wpf.TextEditor>](#) controls do not store the text being edited. This task is offloaded to the TextSource components, which provide methods to manipulate the text content. Text edit controls can have TextSource explicitly assigned and use an internally created one in case it's not set. It gives a clear separation between visualization and data layers. Also, it makes it possible to implement features like multiple views of the same text by assigning a single [<xref:Alternet.Editor.TextSource.TextSource>](#) to several text editors. Visually, these editors can be placed in a single window separated by a splitter control or multiple windows. Most TextSource components' methods are also available via the edit controls.

Code Editor matches most of the Visual Studio code editor features, such as Selection, Code Completion, Code Outlining, Search/Replace, Navigation and Undo, and many more.

Editing features

Code Editor provides an extended set of methods and properties for text modifications and navigating within the text content. Most of these methods are called implicitly when the user edits the text in the edit control or presses the arrows and PageUp, PageDown, End, or Home keys. The most commonly used methods and properties are listed below:

- [<xref:Alternet.Editor.SyntaxEdit.Position>](#) - gets or sets the current position (Column, Row) within the text.
 - [<xref:Alternet.Editor.SyntaxEdit.NewLine*>](#) - inserts new line at the current position and number of spaces or tabs according to the indentation options.
 - [<xref:Alternet.Editor.SyntaxEdit.Insert*>](#) - inserts string at the current position.
 - [<xref:Alternet.Editor.SyntaxEdit.DeleteRight*>](#) - deletes a number of characters to the right of the current position.
 - [<xref:Alternet.Editor.SyntaxEdit.DeleteLeft*>](#) - deletes a number of characters to the right of the current position.
 - [<xref:Alternet.Editor.SyntaxEdit.BreakLine*>](#) - inserts a line break at the given position.
 - [<xref:Alternet.Editor.SyntaxEdit.UnBreakLine*>](#) - joins two lines at the end of a current line.
 - [<xref:Alternet.Editor.SyntaxEdit.MoveCharLeft*>](#) - moves the current position to one character left.
 - [<xref:Alternet.Editor.SyntaxEdit.MoveCharRight*>](#) - moves the current position to one character right.
 - [<xref:Alternet.Editor.SyntaxEdit.MoveLineDown*>](#) - moves the current position to one line below.
 - [<xref:Alternet.Editor.SyntaxEdit.MoveLineUp*>](#) - moves the current position to one line above.
- . * [<xref:Alternet.Editor.SyntaxEdit.MoveFileBegin*>](#) - moves the current position to the beginning of the text.
- . * [<xref:Alternet.Editor.SyntaxEdit.MoveFileEnd*>](#) - moves the current position to the end of the text.

All such modifications are translated to the underlying [<xref:Alternet.Editor.TextSource.TextSource>](#) component, which also maintains the list of all edits so a user can undo them.

Selection

Just like almost any text editor, the [<xref:Alternet.Editor.SyntaxEdit>](#) supports a concept of text selection and a wide range of operations on it. All the selection-related aspects are controlled via the [<xref:Alternet.Editor.SyntaxEdit.Selection>](#) property. Selections can be of two types: traditional stream-type selection and block-type selection. The latter can be created by navigating the text with the navigation keys and holding *Shift* and *Alt* keys together.

[<xref:Alternet.Editor.ISelection.BackColor>](#) and [<xref:Alternet.Editor.ISelection.ForeColor>](#) define the background and the foreground colors used to mark the currently selected text. [Selection.InActiveBackColor](#) and [Selection.InActiveForeColor](#) are used when the editor is out of focus.

The [<xref:Alternet.Editor.ISelection.Options>](#) controls different aspects of the behavior of selections.

- [<xref:Alternet.Editor.SelectionOptions.DisableSelection>](#) completely disables selection support in the editor.
- [<xref:Alternet.Editor.SelectionOptions.DisableDragging>](#) disables drag-n-drop operations on the selection.
- [<xref:Alternet.Editor.SelectionOptions.SelectBeyondEol>](#) allows selection in the virtual space (if the

NavigateOptions.BeyondEol is enabled)

- `<xref:Alternet.Editor.SelectionOptions.UseColors>` instructs the editor to use the same foreground colors for selected text as the ones used for unselected text (i.e., any syntax highlighting will be visible). Note for this to be useful; the section background color must be in contrast with all possible foreground colors.
- `<xref:Alternet.Editor.SelectionOptions.HideSelection>` causes the selection to become invisible when the editor loses focus.
- `<xref:Alternet.Editor.SelectionOptions.SelectLineOnDbClick>` allows the user to select the entire line by double-clicking on it.
- `<xref:Alternet.Editor.SelectionOptions.DeselectOnCopy>` causes the selection to be removed after the user performs copy selection to clipboard operation.
- `<xref:Alternet.Editor.SelectionOptions.PersistentBlocks>` causes the selection to be retained after the user has finished making it and has started other navigation.
- `<xref:Alternet.Editor.SelectionOptions.OverwriteBlocks>` causes the new input to overwrite the currently selected text.
- `<xref:Alternet.Editor.SelectionOptions.SmartFormat>` allows formatting blocks when pasting according to the rules defined by the syntax parser.
- `<xref:Alternet.Editor.SelectionOptions.WordSelect>` causes whole words to be selected rather than individual characters when using mouse selection.
- `<xref:Alternet.Editor.SelectionOptions.DrawBorder>` causes Edit control to draw border around selection
- `<xref:Alternet.Editor.SelectionOptions.SelectLineOnTripleClick>` allows selecting the whole line rather than a single word by triple clicking the mouse
- `<xref:Alternet.Editor.SelectionOptions.DeselectOnDbClick>` causes selection to be cleared by mouse dblclick.
- `<xref:Alternet.Editor.SelectionOptions.ConvertToSpacesOnPaste>` specifies that selection should convert all tabs to spaces in the text being pasted when the `Lines.UseSpaces` is on.
- `<xref:Alternet.Editor.SelectionOptions.RtfClipboard>` causes the selection to copy its content in text and RTF formats.
- `<xref:Alternet.Editor.SelectionOptions.ClearOnDrag>` causes selected text to be cleared after dragging from an external source
- `<xref:Alternet.Editor.SelectionOptions.CopyLineWhenEmpty>` allows copying whole line when selection is empty
- `<xref:Alternet.Editor.SelectionOptions.DisableCodeSnippetOnTab>` - disables code snippets insertion when pressing Tab key.
- `<xref:Alternet.Editor.SelectionOptions.SelectWordOnCtrlClick>` causes the word under the cursor to be selected when a user holds the Ctrl key
- `<xref:Alternet.Editor.SelectionOptions.ExtendedBlockMode>` causes text being typed to be inserted into all selected lines within the rectangular block.

It is possible to programmatically select text by setting `<xref:Alternet.Editor.ISelection.SelectionStart>` and `<xref:Alternet.Editor.ISelection.SelectionLength>` properties, or with the help of `<xref:Alternet.Editor.ISelection.SetSelection*>` method.

The selected text can be retrieved or set via the `<xref:Alternet.Editor.ISelection.SelectedText>` property.

A developer can perform various operations on the current selection. Some of them are:

- `<xref:Alternet.Editor.ISelection.IsEmpty>` checks whether there is any text selected.

- `<xref:Alternet.Editor.ISelection.SetSelection*>` selects the specified rectangular area.
- `<xref:Alternet.Editor.ISelection.SelectAll>` selects the whole document.
- `<xref:Alternet.Editor.ISelection.Cut>/<xref:Alternet.Editor.ISelection.Copy>/<xref:Alternet.Editor.ISelection.Paste>` performs standard operations like copying text to the clipboard, cutting text to the clipboard and pasting text from the clipboard.
- `<xref:Alternet.Editor.ISelection.IsPosInSelection*>` checks if the specified position lies within selection.
- `<xref:Alternet.Editor.ISelection.Clear>` clears selection (this does not affect the text itself).
- `<xref:Alternet.Editor.ISelection.Move*>` moves or copies the currently selected text to a new location.
- `<xref:Alternet.Editor.ISelection.SmartFormat>` formats the selected text according to the rules defined by the syntax parser.
- `<xref:Alternet.Editor.ISelection.LowerCase>/<xref:Alternet.Editor.ISelection.UpperCase>/<xref:Alternet.Editor.ISelection.Capitalize>` change the case of the currently selected text.
- `<xref:Alternet.Editor.ISelection.UnIndent>/<xref:Alternet.Editor.ISelection.UnIndent>` change the indent of the currently selected text.

In fact, if some action can be performed by the user, it can also be performed programmatically:

```
if(!edit.Selection.IsEmpty)
edit.Selection.SelectedText =
"(" + edit.Selection.SelectedText + ")";
```

This code encloses the currently selected text in brackets.

Searching and Replacing

Among the operations that can be performed on the text, there are operations of searching and replacing text strings. Unlike the standard multi-line text editor, which does not implement such functionality, the `<xref:Alternet.Editor.SyntaxEdit>` control comes with built-in support for them. It's ready to use out-of-the-box: when the user presses the Ctrl+F key combination, the search dialog box appears:



The text-replace dialog can be activated by pressing Ctrl+H. Besides using the UI to control the process, all the operations can be executed programmatically by calling the corresponding methods of the `<xref:Alternet.Editor.SyntaxEdit>`.

For example, to find some string, you could use the following code:

```
edit.Find("some string");
```

Or, with regular expressions:

```
edit.Find(" ", SearchOptions.RegularExpressions, new
System.Text.RegularExpressions.Regex("a.?z"));
```

To activate the Search Dialog:

```
edit.DisplaySearchDialog();
```

Moreover, the Search and Replace dialog box functionality is not hardwired: you can replace the dialog box with your own by implementing the `<xref:Alternet.Editor.Dialogs.ISearchDialog>` interface, and assigning it to the editor by setting its `SearchDialog` property. The built-in dialog can serve as a good example and a starting point.

If you need to perform the Search and Replace operation without any user interaction, you can use the `ReplaceAll` method.

i.e.:

```
edit.ReplaceAll("bad", "good", SearchOptions.WholeWordsOnly |  
SearchOptions.EntireScope, out count);
```

After this, every occurrence of a "bad" word in the entire text will be replaced by a "good" word.

Note that this would move the cursor position to the place where the last replacement has been made, so if you need it to be unnoticeable for the user, you need to enclose this call in the code which saves and restores the current cursor position:

```
System.Drawing.Point pos;  
pos = edit.Position;  
edit.ReplaceAll("bad", "good", SearchOptions.WholeWordsOnly |  
SearchOptions.EntireScope, out count);  
edit.Position = pos;
```

Search/Replace function can work across multiple documents. To allow the search to find text in multiple editors, you will need to set `SearchManager.Shared` to `true` and provide a list of editors to perform a search in its `InitSearch` event handlers and return/navigate to the appropriate editor in `GetSearch` event handler:

```
SearchManager.SharedSearch.Shared = true;  
SearchManager.SharedSearch.InitSearch +=  
    new InitSearchEvent(DoInitSearch);  
SearchManager.SharedSearch.GetSearch +=  
    new GetSearchEvent(DoGetSearch);  
  
private void DoInitSearch(object sender, InitSearchEventArgs e)  
{  
    e.Search = GetActiveSyntaxEdit() as ISearch;  
    foreach (var edit in editors.Values)  
    {  
        edit.SearchGlobal = true;  
        e.SearchList.Add(edit.Source.FileName);  
    }  
}  
  
private void DoGetSearch(object sender, GetSearchEventArgs e)  
{  
    foreach (var edit in editors.Values)  
    {  
        if (edit.Source.FileName == e.FileName)  
        {  
            e.Search = edit as ISearch;  
            break;  
        }  
    }  
}
```

Scroll Bars and Split View

The appearance and behavior of scrollbars are controlled by the `<xref:Alternet.Editor.SyntaxEdit.Scrolling>` property.

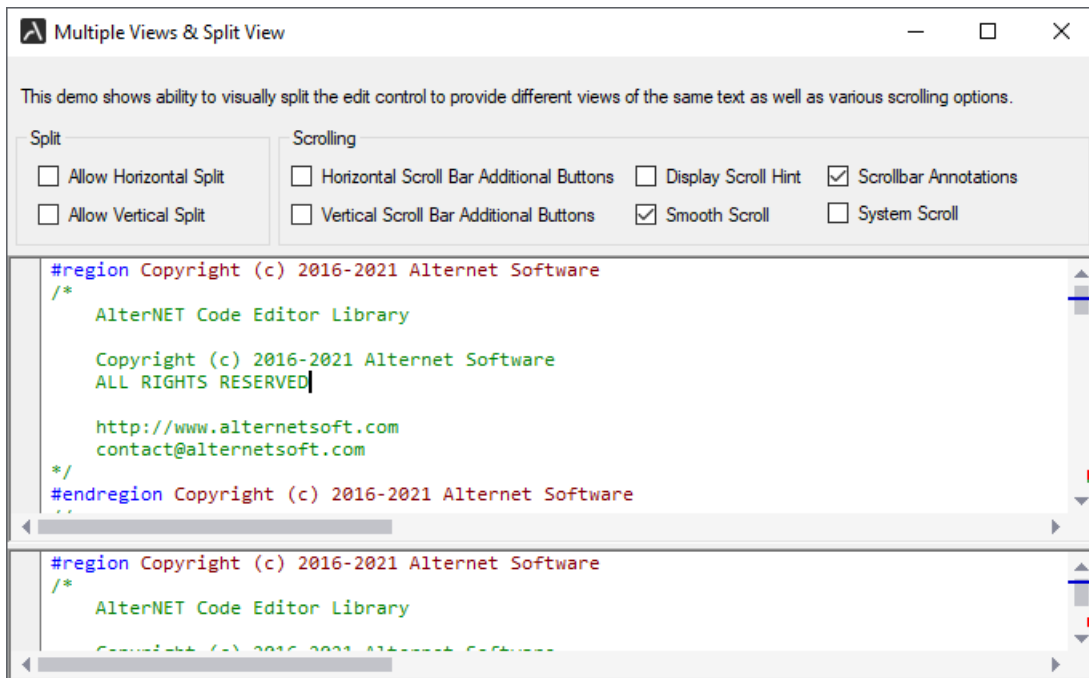
The `<xref:Alternet.Editor.IScrolling.ScrollBars>` property determines which scrollbars and under what conditions appear on the `<xref:Alternet.Editor.SyntaxEdit>`. It can take one of the following values:

- `<xref:System.Windows.Forms.RichTextBoxScrollBars.None>` - neither horizontal, nor vertical scrollbar ever appear
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.Horizontal>` - horizontal scrollbar appears if necessary; vertical one never appears
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.Vertical>` - vertical scrollbar appears if necessary; horizontal one never appears
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.Both>` - both horizontal and vertical scrollbars appear if necessary
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.ForcedHorizontal>` - horizontal scrollbar is always visible; vertical one never appears
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.ForcedVertical>` - vertical scrollbar is always visible; horizontal one never appears
- `<xref:System.Windows.Forms.RichTextBoxScrollBars.ForcedBoth>` - both horizontal and vertical scrollbars are always visible

The behavior of the scrollbars is controlled by *ScrollingOptions*.

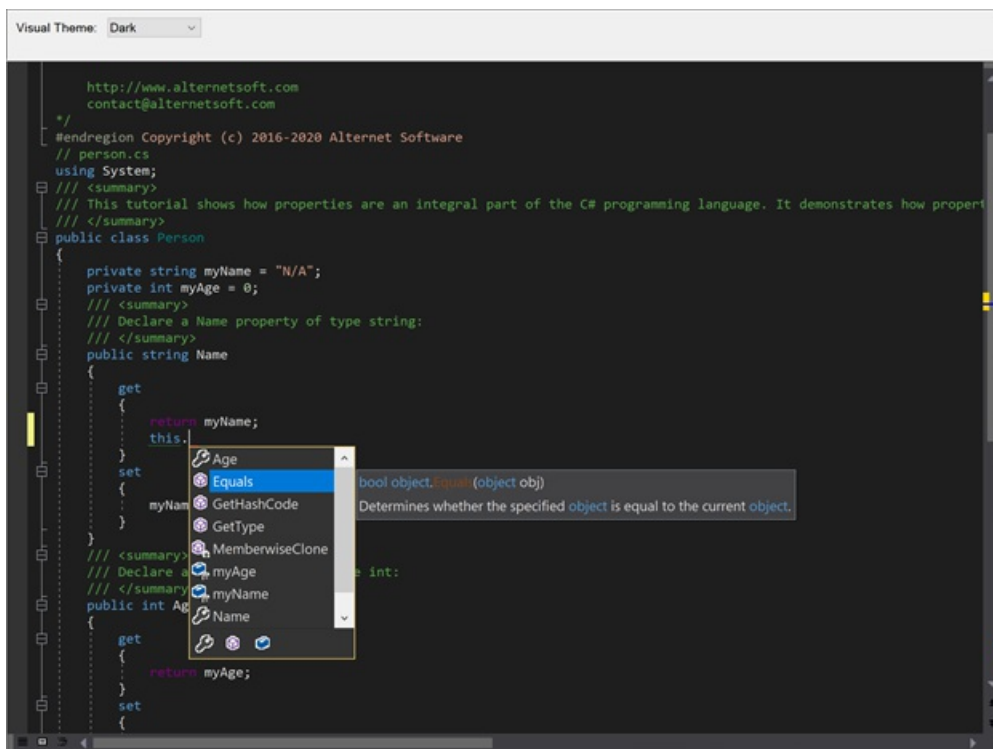
You can also use *ScrollingOptions* to allow `<xref:Alternet.Editor.SyntaxEdit>` to split its content. Note that `<xref:Alternet.Editor.SyntaxEdit>`'s *Dock* must be set to *DockStyle.Fill*. Otherwise, this feature will not work. Splitters are displayed in the left-bottom corner for vertical splitting and the right-top corner for horizontal splitting.

- `<xref:Alternet.Editor.ScrollingOptions.SmoothScroll>` - if set, the editor's content is updated as the user drags the scrollbar. Otherwise, the content is updated after the user releases the scrollbar thumb. Disabling this option may improve performance on slow machines.
- `<xref:Alternet.Editor.ScrollingOptions.ShowScrollHint>` - if set, a hint window showing the new number of the topmost line, is displayed whenever the user drags the scrollbar.
- `<xref:Alternet.Editor.ScrollingOptions.UseScrollDelta>` - if set, editor window content is scrolled by several characters when caret becomes invisible rather than one character
- `<xref:Alternet.Editor.ScrollingOptions.SystemScrollbars>` - if set, system scroll bars are displayed; otherwise, custom scrollbars are used.
- `<xref:Alternet.Editor.ScrollingOptions.FlatScrollbars>` - if set, scroll bars are displayed in flat style. This option works only if *SystemScrollBars* is on.
- `<xref:Alternet.Editor.ScrollingOptions.AllowSplitHorz>` - allows displaying horizontal splitting buttons in the scroll area. This option works if *SystemScrollBars* is off and the control has the *Dock* property set to *DockStyle.Fill*.
- `<xref:Alternet.Editor.ScrollingOptions.AllowSplitVert>` - allows displaying a vertical splitting button in the scroll area. This option works if *SystemScrollBars* is off and the control has the *Dock* property set to *DockStyle.Fill*.
- `<xref:Alternet.Editor.ScrollingOptions.HorzButtons>` - allows displaying additional buttons in the horizontal scrolling area. This option works only if *SystemScrollBars* is off.
- `<xref:Alternet.Editor.ScrollingOptions.VertButtons>` - allows displaying additional buttons in the vertical scrolling area. This option works only if *SystemScrollBars* is off.
- `<xref:Alternet.Editor.ScrollingOptions.VerticalScrollBarAnnotations>` - allows displaying scroll bar annotations that show special items, such as line modifications, syntax errors, search results bookmarks, and the caret position, throughout the entire document within the scroll bar. Individual annotation kinds are controlled by `<xref:Alternet.Editor.IScrolling.Annotations>` property.



Visual Themes

Visual themes allow changing the appearance of all graphical elements in the editor by setting `<xref:Alternet.Editor.SyntaxEdit.VisualThemeType>` or `<xref:Alternet.Editor.SyntaxEdit.VisualTheme>` type properties. Light and Dark visual themes are included, and custom appearance can be configured via a custom visual theme.



Gutter

The gutter is the area to the left of the text, the purpose of which is to display miscellaneous indicators for the corresponding lines of text. These indicators include bookmark indicators, line wrapping indicators, line style icons, line numbers, outlining buttons, and line modification markers.

```

7 namespace HelloWorld
8 {
9     static class Program
10    {
11        /// <summary>
12        /// The main entry point for the application.
13        /// </summary>
14        [STAThread]
15        static void Main()
16        {
17            Application.EnableVisualStyles();
18            Application.SetCompatibleTextRenderingDefault(false);
19            Application.Run(new Form1());
20        }
21    }
22 }

```

All the images displayed in the gutter are contained in the gutters image list. The following code gives an example of how to add a custom icon to this list from another image list (for example, the one dropped on the form during design time):

```
edit.Gutter.Images.Images.Add(imageList1.Images[0]);
```

The mechanism of the line styles icons allows you to define how the editor will display certain lines of the text.

The most common use for this is the indication of breakpoint lines and of the current execution point.

For example, the following code defines the style to be used for breakpoints.

```
style_id = edit.LineStyles.AddLineStyle("breakpoint",
Color.White, Color.Red, Color.Gray, 11, LineStyleOptions.BeyondEol);
```

(Note in the current version, image # 11 corresponds to the built-in breakpoint indicator image, and #12 corresponds to the current execution point image.

Later on, some lines of the text can be assigned the style:

```
edit.Source.LineStyles.SetLineStyle(line_no, style_id);
```

(Note that here and in the other places of this document, line numbers start at 0.)

Note: Every line can have at most one style at any given time. If you need to remove line style for some particular line, call:

```
edit.Source.LineStyles.RemoveLineStyle(line_no);
```

For [<xref:Alternet.Editor.SyntaxEdit>](#) control appearance of the gutter is controlled by the following properties: [<xref:Alternet.Editor.IGutter.Width>](#), [<xref:Alternet.Editor.IGutter.BrushColor>](#), [<xref:Alternet.Editor.IGutter.PenColor>](#) and [<xref:Alternet.Editor.IGutter.Visible>](#). Width property specifies the width of the gutter area, [<xref:Alternet.Editor.IGutter.BrushColor>](#) specifies the background color of the gutter area, [<xref:Alternet.Editor.IGutter.PenColor>](#) specifies the color of the gutter line, and [<xref:Alternet.Editor.IGutter.Visible>](#) indicates whether or not to draw the gutter. Note that the gutter can adjust its width if line numbers or outlining is on and painted on the gutter. [<xref:Alternet.Editor.SyntaxEdit>](#) allows drawing line numbers to indicate the position of the visible lines inside the document visually. To enable line numbers, you need to set [<xref:Alternet.Editor.GutterOptions.PaintLineNumbers>](#) to true. Turning [<xref:Alternet.Editor.GutterOptions.PaintLinesOnGutter>](#) option enables drawing line numbers on the gutter area; turning it off causes line numbers to be painted immediately after the gutter area. The appearance of line numbers are controlled by the [<xref:Alternet.Editor.IGutter>](#)'s properties: [<xref:Alternet.Editor.IGutter.LineNumbersStart>](#), [<xref:Alternet.Editor.IGutter.LineNumbersForeColor>](#), [<xref:Alternet.Editor.IGutter.LineNumbersBackColor>](#), [<xref:Alternet.Editor.IGutter.LineNumbersAlignment>](#), [<xref:Alternet.Editor.IGutter.LineNumbersLeftIndent>](#) and [<xref:Alternet.Editor.IGutter.LineNumbersRightIndent>](#), which are intuitively understandable.

Like Microsoft Visual Studio editor, [<xref:Alternet.Editor.SyntaxEdit>](#) provides the ability to track modified lines visually. To enable this feature, you need to turn [<xref:Alternet.Editor.GutterOptions.PaintLineModifiers>](#) on. When LineModifiers are on, they

indicate lines that were changed since the last saving. New changes are marked with Yellow color; changes that were done before the last saving are marked with Lime color. Colors can be customized using `<xref:Altenet.Editor.IGutter.LineModifierChangedColor>` and `<xref:Altenet.Editor.IGutter.LineModifierSavedColor>` properties.

Reaction to mouse clicks and double-clicks on the gutter area can be implemented by assigning handlers to the `<xref:Altenet.Editor.SyntaxEdit.GutterClick>` and `<xref:Altenet.Editor.SyntaxEdit.GutterDbClick>` events.

Bookmarks

Just as with often-used books, the process of navigating the text can be made more efficient by using bookmarks. Two kinds of bookmarks are supported by the `<xref:Altenet.Editor.SyntaxEdit>`: plain and numbered. The former can be toggled for the current line using the `Ctrl+K Ctrl+K` key combination sequence and can be navigated in a cyclical manner using the `Ctrl+K Ctrl+N` (next bookmark) or `Ctrl+K Ctrl+P` (previous bookmark). The numbered bookmarks have a different flavor: there can be up to ten bookmarks, each having a number associated with it.



Toggling the numbered bookmark is performed using the `Ctrl+K Ctrl+#`, and navigation to the specific bookmark is performed by pressing the `Ctrl+#` key combination (where # is any of the digits from 0 to 9). There can be only one plain bookmark in any line. Numbered bookmarks do not have such a limitation. However, only the indicator for the first bookmark in the line will be displayed in the gutter area if `<xref:Altenet.Editor.GutterOptions.PaintBookMarks>` is set to true.

Like most other things in the editor, bookmarks can be manipulated programmatically. Note that the list of bookmarks belongs to the text source, so multiple views of the same source share the same set of bookmarks.

The following code snippet sets the plain bookmark at the current position:

```
System.Drawing.Point pos = edit.Position;
edit.Source.BookMarks.SetBookMark(pos, int.MaxValue);
```

To set the numbered bookmark, replace `int.MaxValue` by the bookmark number (0..9).

To clear all the bookmarks set in the text source, call the `<xref:Altenet.Editor.TextSource.IBookMarks.ClearAllBookMarks>` method:

```
edit.Source.BookMarks.ClearAllBookMarks();
```

Navigating to the location defined by a particular bookmark can be performed as follows:

```
edit.Source.BookMarks.GotoBookMark(index);
```

Code Editor supports named bookmarks with descriptions and hyperlinks. The user may see a description in a tooltip window when moving the cursor over the bookmark and launching the browser with the specified URL when clicking on the bookmark. Such bookmarks can be set using the following code:

```
edit.Source.BookMarks.SetBookMark(edit.Position, 0,
"Bookmark1", "This is Named Bookmark", "www.altenetsoft.net");
```

If you need to have custom images, you can change the bookmark indicator images by assigning a custom image list:


```
edit.Gutter.BookMarkImageIndex =
edit.Gutter.Images.Images.Count;
edit.Gutter.Images.Images.Add(imageList1.Images[0]);
```

(This code uses the first image from the *imageList1*, which you could, for example, create by just dropping a new Image List from the toolbox on the form. For more examples of working with the gutter, refer to the corresponding section of this manual.)

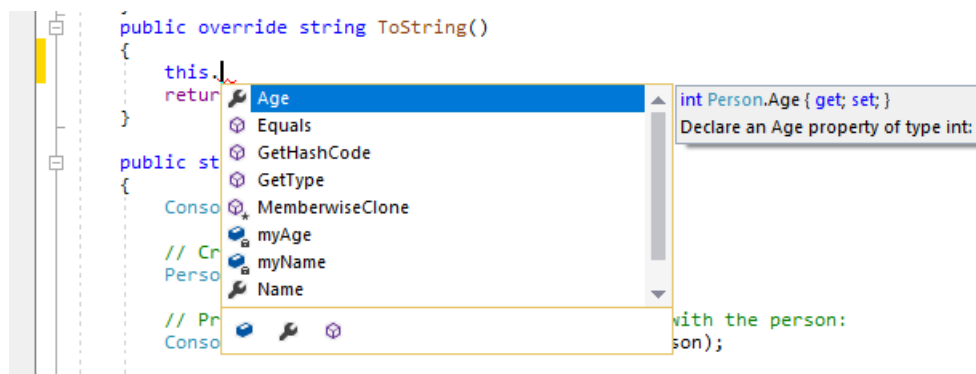
You can configure bookmarks navigation to work across multiple documents. These documents should be added to the BookMarkManager class, and every document should have the FileName property assigned.

```
BookMarkManager.Register(edit.Source);
BookMarkManager.SharedBookMarks.Activate += new
EventHandler<ActivateEventArgs>(DoActivate);
private void DoActivate(object sender, ActivateEventArgs e)
{
    foreach (var edit in editors.Values)
    {
        if (edit.Source.FileName == e.FileName)
        {
            ActivateEditorTab(editor);
            break;
        }
    }
}
```

In this mode, all bookmarks will be stored in a global list inside BookmarkManager instead of every individual SyntaxEdit control allowing global navigation through them.

Code Completion (Intellisense)

Although the primary purpose of an editor is to be a convenient tool for the user to enter the text, quite often, guidance from the editor can significantly improve the effectiveness of the work process. When editing a text which has some structure (i.e., a computer program in some language), there are often well-defined sets of input possibilities in certain contexts. For example, for many programming languages, the sequence "someobject." should be followed by one of the existing field names. To assist the user in such situations, the text editor can activate a popup list containing all the methods that can be accessed from the current scope.



If there is a partial word immediately to the left of the current cursor position, the first entry that starts with that word is highlighted. The user can then continue typing up until the method he meant is selected or use the up and down arrow keys to navigate the list and then insert the complete method name by pressing the Enter key.

Automatic Code Completion Invocation

In most cases, the Code Completion list and Signature Help for method parameters are provided by the parser alongside the list of characters, such as period "." or open parens "(", which invoke code completion automatically as user types. The task of code completion is to have the list of available choices appear automatically as user types. For example, after a user types "someobject."

the list of class members for that object is expected to appear, and after they type "somemethod(" the tooltip showing the list of parameters for that function is expected to appear. It can be customized to show those popups only if the user stops inputting for some short delay after typing the activating symbol ("." or "(").

The automatic code completion is implemented by Roslyn C# and Visual Basic parsers, TypeScript/JavaScript parsers, and Advanced C#, J#, Visual Basic, VBScript, JavaScript, C, XML, and Python parsers.

For example, automatic code completion is attempted after typing a period ('.') following a member (member access expression), typing an open brace ('{') following a member (invocation expression or object creation expression), typing a period ('.') inside *using* section, typing less sign ('<') inside XML comments, etc. This feature is implemented as close as possible to the Visual Studio .NET editor, so it works intuitively. On top of that, Roslyn-based parsers are configured to invoke code completion when the user starts typing identifiers.

When these parsers are used, you still can control some aspects of code completion, for example delay before code completion window appears, using the `<xref:Altenet.Editor.SyntaxEdit.NeedCodeCompletion>` event, which will be discussed later. Moreover, for advanced parsers you can register your own types and objects, namespaces and assemblies for code completion using the `CompletionRepository` property of `<xref:Altenet.Syntax.SyntaxParser>`.

To make types from most commonly used assemblies such as `System`, `System.Drawing`, and `System.Windows.Forms` to be available for code completion, you can call the following method

```
csParser1.Repository.RegisterDefaultAssemblies();
```

If you need to provide code completion for assemblies declared in other assemblies, you need to register these assemblies this way:

```
csParser1.Repository.RegisterAssembly("System.Xml");
```

You may need to register types for code completion that are not declared in the assembly, but present in the form of source code somewhere else.

For Roslyn-based parsers you can rely on underlying solution/project/document object model:

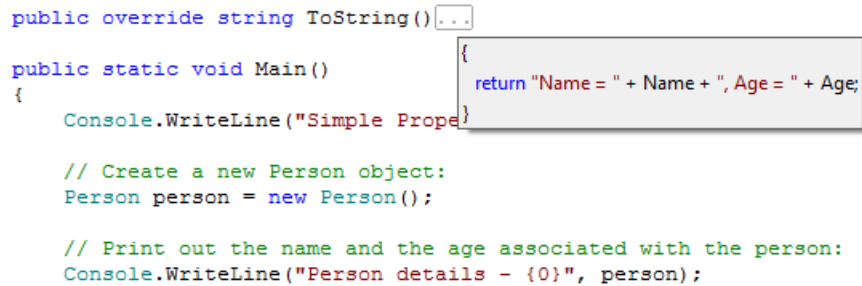
```
csParser1.Repository.RegisterCodeFiles(new string[] { "MyFile.cs" });
```

For one of advanced parsers you need first to create `<xref:Altenet.Syntax.SyntaxParser>`, load this file into the `<xref:Altenet.Syntax.Parser.Strings>` object, and then add parsed `<xref:Altenet.Syntax.SyntaxTree>` to the code completion repository. The following code demonstrates how it can be accomplished:

```
ISyntaxParser parser = new Altenet.Syntax.Parsers.Advanced.CsParser();
parser.Strings = new TextStrings();
parser.Strings.LoadFile("MyFile.cs")
parser.ReparseText();
csParser1.CompletionRepository.RegisterSyntaxTree(parser.SyntaxTree);
```

Code Outlining

The `<xref:Altenet.Editor.SyntaxEdit>` control supports outlining, a text navigation feature that can make navigation of large structured texts more effective. The essence of *outlining* lies in defining sections of the text as structural units that, once collapsed, can be visually replaced by a shorter representation, i.e., by an ellipsis ("..."). During the text navigation, the user can dynamically switch between the collapsed and complete representation of any particular section. Sections can be nested.



```

public override string ToString()...
public static void Main()
{
    Console.WriteLine("Simple Propert...

    // Create a new Person object:
    Person person = new Person();

    // Print out the name and the age associated with the person:
    Console.WriteLine("Person details - {0}", person);
}
return "Name = " + Name + ", Age = " + Age;

```

The section can be expanded by clicking on the "+" button, double-clicking the proxy text, or pressing the Ctrl+M Ctrl+M key sequence (in the default key mapping). The section can be collapsed by clicking on the "-" button or pressing the Ctrl+M Ctrl+M key sequence. All the sections can be collapsed or expanded at once using the Ctrl+M Ctrl+L key sequence.

Outlining is the property of the `<xref:Altneret.Editor.SyntaxEdit>` control itself, not of the `<xref:Altneret.Editor.TextSource.TextSource>`. Thus it is possible to have two views of the same text, one with outlining and another without or even to have completely different structural parts defined.

All the aspects of the *outlining* are controlled via the `<xref:Altneret.Editor.SyntaxEdit.Outlining>` property of the `<xref:Altneret.Editor.SyntaxEdit>`. The *outlining* can be enabled or disabled using the `<xref:Altneret.Editor.IOutlining.AllowOutlining>` property either in design time or at runtime. The look of the outlining is controlled by the `<xref:Altneret.Editor.IOutlining.OutlineColor>` and `<xref:Altneret.Editor.IOutlining.OutlineOptions>` properties.

There are two approaches to defining outline sections.

Direct Definition of Outline Sections

Outline sections can be explicitly defined by calling the appropriate methods of the `<xref:Altneret.Editor.SyntaxEdit.Outlining>` property, i.e.:

```
edit.Outlining.Outline(new Point(0, 0), new Point(int.MaxValue, 0), 0, "...").Visible = false;
```

This code snippet defines the section of the first level consisting of the entire first line of the text, using ellipsis ("...") as the proxy text and being in a collapsed state.

While this approach is simple, it has one significant drawback: if sections representing structural units are defined by the content of the text, which a user can edit, sections have to be constantly kept in sync with the text, which can be a non-trivial task.

Automatic Definition of Outline Sections Using the Syntax Parser

The syntax parsing framework has to be employed to provide automatic code outlining. This approach may seem to be more complex at first look; however, it provides consistent results. To implement this approach, a class descending from the `<xref:Altneret.Syntax.SyntaxParser>` class needs to be defined, and the `<xref:Altneret.Syntax.SyntaxParser.Outline*>` method needs to be implemented. This method will be frequently called by the `<xref:Altneret.Editor.SyntaxEdit>` whenever the text changes, so to provide the user with a smooth editing experience, the implementation should be relatively fast.

Code Editor includes parsers that support automatic outlining for *C#, Visual Basic, J#, JavaScript, VBScript, Ansi-C, SQL, HTML, XML, and Python* languages.

The following example demonstrates how to implement the parser marks every line starting from the sharp ("#") sign as a separate outline section.

```
private void InitializeComponent()
{
    ...
    this.parser1 = new XParser();
    ...
}
public class XParser: SyntaxParser
{
    public XParser()
    {
        Options = SyntaxOptions.Outline;
    }
    public override int Outline(IList<IRange> Ranges)
    {
        Ranges.Clear();
        for(int i = 0; i < Strings.Count; i++)
        {
            if(Strings[i].ToString().StartsWith("#"))
            {
                Ranges.Add(new OutlineRange(
                    new Point(0, i),
                    new Point(int.MaxValue, i),
                    0, "...", false));
            }
        }
        return Ranges.Count;
    }
}
```

Code Editor Extended Features (WPF)

Code Editor provides advanced text editing functionality, such as customizable keyboard mapping, HyperText handling, spell-checking integration, printing and exporting, macro recording and playback, and miscellaneous display features.

Keyboard Mapping

While the `<xref:Altnet.Editor.Wpf.TextEditor>` closely mimics the key-mapping common to most of Microsoft's products. It is entirely customizable: you can add or change the behavior of specific keys or even define an entirely different key-mapping.

To assign an action to some key combination, use the following code:

```
private void edit_Action()  
{  
    ...  
}  
...  
edit.KeyList.Add(Keys.W | Keys.Control | Keys.Alt, new  
KeyEvent(edit_Action));
```

This code would make the `Ctrl+Alt+W` key combination execute the `edit_Action` method.

Or to pass some object to the key handler:

```
private void edit_Action(object o)  
{  
    ...  
}  
...  
edit.KeyList.Add(Keys.W | Keys.Control | Keys.Alt, new  
KeyEventEx(edit_Action), some_object);
```

To remove some key handler, regardless of whether you have added it yourself or it is the default one, call:

```
edit.KeyList.Remove(Keys.A | Keys.Control);
```

The code described before is used to manage the key handling in the default state. In fact, the key handling is slightly more complex than that: the `<xref:Altnet.Editor.Wpf.TextEditor>`'s key handling mechanism can be in different states other than the default one. Every state has its own key mapping table. Key mapping for bookmark operations can be a good example: after the user presses the `Ctrl+K` key combination, combinations `Ctrl+K`, `Ctrl+N`, `Ctrl+P`, `Ctrl+L` (the list is incomplete) obtain the new meaning. If a key combination is pressed for which there is no assignment in some non-default state, then the state is changed to default, and the combination is evaluated in the new context. `<xref:Altnet.Editor.Wpf.TextEditor>` defines four different non-default states, but you can implement your own:

```
edit.KeyList.Add(Keys.W | Keys.Control, null, 0, 5);  
edit.KeyList.Add(Keys.Tab, new KeyEvent(edit_Action), 5, 5);
```

This code creates a state that is activated by pressing the `Ctrl+W` key combination, in which the `Tab` key causes the `edit_Action` to be executed. The state is changed back to default when the user presses some key other than the `Tab` key. Until now, we have only examined the cases where you add some new functionality or suppress some existing one. There also might be a case when you want to use an entirely different key mapping, for example, to simulate some other environment your users are familiar with. To accomplish this, it is necessary to completely clear the current key mapping and then assign every function performed by the editor to some key. Note that this means every function: even such trivial things as cursor navigation and insertion of a new line, are performed according to the key mapping.

For example, the following code assigns the editor's key-mapping to a single action defined: "Select All", which is assigned to the

Ctrl+X key combination.

```
edit.KeyList.Clear();
edit.KeyList.Add(Keys.X | Keys.Control,
((EventHandlers)edit.KeyList.Handlers)SelectAllEvent));
```

URL handling

The `<xref:Alternet.Editor.Wpf.TextEditor>` can be set up to handle pieces of text that look like some kind of URL by setting the `<xref:Alternet.Editor.Wpf.IEditHyperText.HighlightHyperText>` property to true. The handling consists of highlighting those text pieces and processing clicks on them. By default, clicking the URL causes the operating system default action to be performed (i.e., launching a browser or an email client). However, you can override this behavior by assigning the `<xref:Alternet.Editor.Wpf.TextEditor.JumpToUrl>` event handler.

```
private void edit_JumpToUrl(object sender, UrlJumpEventArgs e)
{
    if(is_our_url(e.Text))
    {
        process_url(e.Text);
        e.Handled = true;
    }
}
```

Spellchecker Interface

The `<xref:Alternet.Editor.Wpf.TextEditor>` supports the spell-as-you-type spell checker integration. To enable spelling for the editor, set its `<xref:Alternet.Editor.Wpf.IEditSpelling.CheckSpelling>` property to true and assign the `WordSpell` event handler.

The following artificial example considers any word longer than three characters to be correct:

```
private void edit_WordSpell(object sender, WordSpellEventArgs e)
{
    e.Correct = e.Text.Length > 3;
}
...
this.edit.WordSpell += new WordSpellEvent(this.edit_WordSpell);
```

Incorrect words are displayed with the wiggly underline (the default color is red, but it can be changed using the `<xref:Alternet.Editor.Wpf.IEditSpelling.SpellColor>` property). In real-life scenarios, you need to use some third-party software/dictionary to check the text. Another alternative is using a word-list file. Many of them, including Public Domain or free ones, can be found on the Internet. Refer to a Miscellaneous quick start project, which has one of these dictionaries.

Another helpful feature supported by `<xref:Alternet.Editor.Wpf.TextEditor>` is `AutoCorrect`, allowing you to auto-correct words when typing. To enable this feature, you need to set the `AutoCorrection` property to true and handle the `AutoCorrect` event to provide replacements for words that were typed incorrectly.

Printing and Exporting

`<xref:Alternet.Editor.Wpf.TextEditor>` includes support for printing, print previewing, and exporting to RTF and HTML.

Exporting can be performed as simply as this:

```
edit.SaveFile(FileName, new RtfExport());
```

Printing tasks are performed and configured via the `Printing` property of the `<xref:Alternet.Editor.Wpf.TextEditor>`.

For example, to show the print preview dialog, call:

```
edit.Printing.ExecutePrintPreviewDialog();
```

<xref:Alternet.Editor.Wpf.TextEditor> control supports adding user-defined information while printing.

To add some text to the footer:

```
edit.Printing.Footer.CenterText = "draft";
```

Text in headers and footers can contain substitution tags. The standard ones are: [page], [pages], [date], [time] and [username].

Macro Recording and PlayBack

<xref:Alternet.Editor.Wpf.TextEditor> has macro recording and playback capabilities. It allows recording sequences of keyboard commands and playing them later. Note that mouse input is not recorded.

This feature enables you to store a set of frequently used editing commands. Set *MacroRecording* property to start/finish macro recording. Use the *PlayBack* method to repeat the stored command sequence.

White-space Display

It is sometimes desirable for the user to see the codes that influence the text's layout and are usually invisible. These codes are space, tab, end-of-line, and the end-of-file (not really a code) and are often collectively referred to as white space. The *TextEditor* has the option to display them and control their appearance.

```
using System;
/// <summary>
/// This tutorial shows how properties are an integral part of the C# ...
programming language. It demonstrates how properties are declared and used.
/// </summary>
class Person
{
    private string myName = "N/A";
    private int myAge = 0;
```

The display of the white space is enabled using the <xref:Alternet.Editor.Wpf.IWhiteSpace.Visible> property. The color used to display white-space codes is determined by the <xref:Alternet.Editor.Wpf.IWhiteSpace.SymbolColor> property, and the characters used to display those codes are determined by *EofSymbol*, *EolSymbol*, *SpaceSymbol*, and *TabSymbol* properties.

Line Separator

It is possible to have lines of the editor to be separated by thin horizontal lines and to have the current line highlighted. This behavior is controlled by the <xref:Alternet.Editor.Wpf.TextEditor.LineSeparator> property.

The following options are available:

- <xref:Alternet.Editor.Wpf.SeparatorOptions.HighlightCurrentLine> specifies that the current line in the editor will be highlighted using the *HighlightColor* for the background.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.HideHighlighting> specifies that the highlighting of the current line should be hidden when the editor loses focus.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateLines> specifies that a thin horizontal line of *LineColor* should be drawn between each line of text.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateWrapLines> specifies that each visual line of text produced as a result of word-wrap should be separated in the same manner as separate lines (works only if the *SeparateLines* option is also specified).
- <xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateContent> specifies that a line separator will be drawn between sections

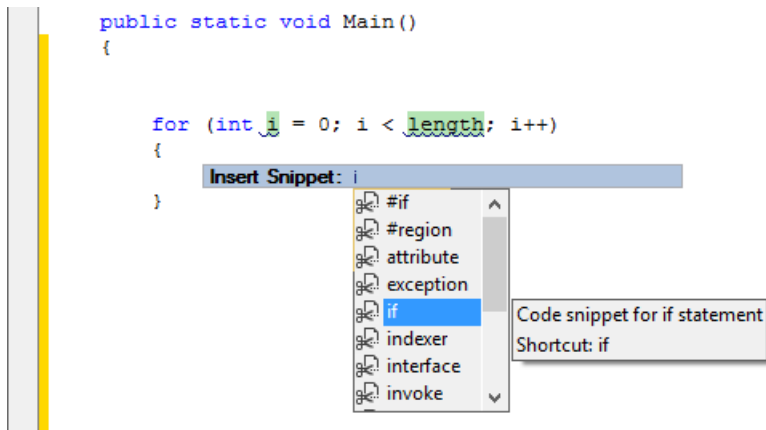
of the code (for example, between methods) if `TextEditor` control is associated with `SyntaxParser` supporting this feature.

Code snippets

The code snippets are the next code completion provider, allowing to insertion of frequently used fragments of code. Code snippets can be inserted into the editor by pressing the `Tab` key after the snippet shortcut or by executing the code snippet popup window with `Ctrl + K + X` key sequence, or activated programmatically by calling the `CodeSnippets` method of the `<xref:Alternet.Editor.Wpf.TextEditor>`.

The purpose of the code snippets is to permit the user to quickly enter one of the predefined fragments of text. If the code snippet has fields declared, the editor allows modifying their values, causing updating field values inside the whole snippet.

The following picture illustrates the usage of the code snippets.



Hidden and Read-Only Lines

`<xref:Alternet.Editor.Wpf.TextEditor>` control can mark certain lines to be read-only or hide them, so the user can't see them. This can be achieved by using `<xref:Alternet.Editor.Wpf.TextSource.SetLineHidden*>` and `<xref:Alternet.Editor.Wpf.TextSource.SetLineReadOnly*>` methods. For hidden lines to take effect, the `<xref:Alternet.Editor.Wpf.DisplayStrings.AllowHiddenLines>` property needs to be set to `true`. Read-only lines can be made visually different from editable lines by setting `<xref:Alternet.Editor.Wpf.TextEditor.ReadOnlyBackColor>` property. Sometimes it's required to mark certain lines to be both hidden and read-only. This way, they can not be deleted if the user selects the outer block containing them and tries to delete it.

```
using System;
public class MyClass1
{
    public string MyFunc()
    {
        Console.WriteLine("Simple Properties");

        // Create a new Form object:
        System.Windows.Forms.Form form1 = new System.Windows.Forms.Form(

        // Print out the name and the text associated with the form:
        Console.WriteLine("Form details - {0}", form1);

        // Set some values on the form object:
        form1.Name = "Form1";
    }
}
```

Structure Guidelines

`<xref:Alternet.Editor.Wpf.TextEditor>` control can display dashed lines between syntax blocks for some parsers (Roslyn-based, TypeScript, and some advanced parsers), helping the user to better understand the structure of the document being edited. This behavior is controlled by a `Parser` and can be switched off by the `StructureGuidelines` parser option.


```
public static void Main()
{
    Console.WriteLine("Simple Properties");

    // Create a new Person object:
    Person person = new Person();

    // Print out the name and the age associated with the person:
    Console.WriteLine("Person details - {0}", person);

    // Set some values on the person object:
    person.Name = "Joe";
    person.Age = 99;
    Console.WriteLine("Person details - {0}", person);

    // Increment the Age property:
    person.Age += 1;
}
```

Minimap

A Minimap (code outline) gives you a high-level overview of your source code, which is useful for quick navigation and code understanding. A file's minimap is shown on the right side of the editor. You can click the shaded area to quickly jump to different sections of your file.

```
13 using System;
14 /// <summary>
15 /// This tutorial shows how properties are an integral part of the C# programming
16 /// </summary>
17 public class Person
18 {
19     private string myName = "N/A";
20     private int myAge = 0;
21     /// <summary>
22     /// Declare a Name property of type string:
23     /// </summary>
24     public string Name
25     {
26         get
27         {
28             #region
29             return myName;
30         }
31         set
32         {
33             myName = value;
34         }
35     }
36     public int Age
37     {
38         get
39         {
40             return myAge;
41         }
42         set
43         {
44             myAge = value;
45         }
46     }
47     public override string ToString()
48     {
49         return "Name = " + Name + ", Age = " + Age;
50     }
51     public static void Main()
52     {
53         Console.WriteLine("Simple Property");
54         // Create a new Person object:
55         Person person = new Person();
56         // Print out the name and the age
57         Console.WriteLine("Person details");
58         // Set some values on the person
59         person.Name = "Joe";
60         person.Age = 99;
61         Console.WriteLine("Person details");
62     }
63 }
```

Code Editor Basic Features (WPF)

Code Editor matches most of the Visual Studio code editor features, such as Selection, Code Completion, Code Outlining, Search/Replace, Navigation and Undo, and many more.

Editing features

Code Editor provides an extended set of methods and properties for text modifications and navigating within the text content. Most of these methods are called implicitly when the user edits the text in the edit control or presses the arrows and PageUp, PageDown, End, or Home keys. The most commonly used methods and properties are listed below:

- `<xref:Altenet.Editor.Wpf.TextEditor.Position>` - gets or sets the current position (Column, Row) within the text.
- `<xref:Altenet.Editor.Wpf.TextSource.NewLine*>` - inserts new line at the current position and number of spaces or tabs according to the indentation options.
- `<xref:Altenet.Editor.Wpf.TextSource.Insert*>` - inserts string at the current position.
- `<xref:Altenet.Editor.Wpf.TextSource.DeleteRight*>` - deletes a number of characters to the right of the current position.
- `<xref:Altenet.Editor.Wpf.TextSource.DeleteLeft*>` - deletes a number of characters to the right of the current position.
- `<xref:Altenet.Editor.Wpf.TextSource.BreakLine*>` - inserts a line break at the given position.
- `<xref:Altenet.Editor.Wpf.TextSource.UnBreakLine*>` - joins two lines at the end of a current line.
- `<xref:Altenet.Editor.Wpf.TextEditor.MoveCharLeft*>` - moves the current position to one character left.
- `<xref:Altenet.Editor.Wpf.TextEditor.MoveCharRight*>` - moves the current position to one character right.
- `<xref:Altenet.Editor.Wpf.TextEditor.MoveLineDown*>` - moves the current position to one line below.
- `<xref:Altenet.Editor.Wpf.TextEditor.MoveLineUp*>` - moves the current position to one line above.

. * `<xref:Altenet.Editor.Wpf.TextEditor.MoveFileBegin*>` - moves the current position to the beginning of the text.

. * `<xref:Altenet.Editor.Wpf.TextEditor.MoveFileEnd*>` - moves the current position to the end of the text.

All such modifications are translated to the underlying `<xref:Altenet.Editor.Wpf.TextSource>` component, which also maintains the list of all edits so the user can undo them.

Selection

Just like almost any text editor, the `<xref:Altenet.Editor.Wpf.TextEditor>` supports a concept of text selection and a wide range of operations on it. All the selection-related aspects are controlled via the `<xref:Altenet.Editor.Wpf.TextEditor.Selection>` property. Selections can be of two types: traditional stream-type selection and block-type selection. The latter can be created by navigating the text with navigation keys holding *Shift* and *Alt* keys held together.

`<xref:Altenet.Editor.Wpf.TextEditor.SelectionBrush>` and `<xref:Altenet.Editor.Wpf.TextEditor.SelectionForeColor>` define the background and the foreground colors used to mark the currently selected text. `Selection.InActiveBackColor` and `Selection.InActiveForeColor` are used when the editor is out of focus.

The `<xref:Altenet.Editor.Wpf.ISelection.Options>` controls different aspects of the behavior of selections.

- `<xref:Altenet.Editor.Wpf.SelectionOptions.DisableSelection>` completely disables selection support in the editor.
- `<xref:Altenet.Editor.Wpf.SelectionOptions.DisableDragging>` disables drag-n-drop operations on the selection.
- `<xref:Altenet.Editor.Wpf.SelectionOptions.SelectBeyondEol>` allows selection in the virtual space (if the

NavigateOptions.BeyondEol is enabled)

- `<xref:Alternet.Editor.Wpf.SelectionOptions.UseColors>` instructs the editor to use the same foreground colors for selected text as the ones used for unselected text (i.e., any syntax highlighting will be visible). Note for this to be useful. The section background color must be in contrast with all possible foreground colors.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.HideSelection>` causes the selection to become invisible when the editor loses focus.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.SelectLineOnDbClick>` allows the user to select the entire line by double-clicking on it.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.DeselectOnCopy>` causes the selection to be removed after the user performs copy selection to clipboard operation.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.PersistentBlocks>` causes the selection to be retained after the user has finished making it and has started other navigation.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.OverwriteBlocks>` causes the new input to overwrite the currently selected text.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.SmartFormat>` allows formatting blocks when pasting according to the rules defined by the syntax parser.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.WordSelect>` causes whole words to be selected rather than individual characters when using mouse selection.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.DrawBorder>` causes Edit control to draw a border around the selection
- `<xref:Alternet.Editor.Wpf.SelectionOptions.SelectLineOnTripleClick>` allows selecting whole line rather than a single word by triple clicking the mouse
- `<xref:Alternet.Editor.Wpf.SelectionOptions.DeselectOnDbClick>` causes the selection to be cleared by mouse dblclick.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.ConvertToSpacesOnPaste>` specifies that selection should convert all tabs to spaces in the pasted text when the `Lines.UseSpaces` is on.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.RtfClipboard>` causes the selection to copy its content in text and RTF formats.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.ClearOnDrag>` causes selected text to be cleared after dragging from an external source
- `<xref:Alternet.Editor.Wpf.SelectionOptions.CopyLineWhenEmpty>` allows copying whole lines when the selection is empty
- `<xref:Alternet.Editor.Wpf.SelectionOptions.DisableCodeSnippetOnTab>` - disables code snippets insertion when pressing the Tab key.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.SelectWordOnCtrlClick>` causes the word under the cursor to be selected when the user holds the Ctrl key.
- `<xref:Alternet.Editor.Wpf.SelectionOptions.ExtendedBlockMode>` causes text being typed to be inserted into all selected lines within the rectangular block.

It is possible to programmatically select text by setting `<xref:Alternet.Editor.Wpf.ISelection.SelectionStart>` and `<xref:Alternet.Editor.Wpf.ISelection.SelectionLength>` properties, or with the help of `<xref:Alternet.Editor.Wpf.ISelection.SetSelection*>` method.

The selected text can be retrieved or set via the `<xref:Alternet.Editor.ISelection.SelectedText>` property.

A developer can perform various operations on the current selection. Some of them are:

- `<xref:Altnet.Editor.Wpf.ISelection.IsEmpty>` checks whether there is any text selected.
- `<xref:Altnet.Editor.Wpf.ISelection.SetSelection*>` selects the specified rectangular area.
- `<xref:Altnet.Editor.Wpf.ISelection.SelectAll>` selects the whole document.
- `<xref:Altnet.Editor.Wpf.ISelection.Cut>/<xref:Altnet.Editor.Wpf.ISelection.Copy>/<xref:Altnet.Editor.Wpf.ISelection.Paste>` performs standard operations like copying text to the clipboard, cutting text to the clipboard and pasting text from the clipboard.
- `<xref:Altnet.Editor.Wpf.ISelection.IsPosInSelection*>` checks if the specified position lies within the selection.
- `<xref:Altnet.Editor.Wpf.ISelection.Clear>` clears selection (this does not affect the text itself).
- `<xref:Altnet.Editor.Wpf.ISelection.Move*>` moves or copies the currently selected text to a new location.
- `<xref:Altnet.Editor.Wpf.ISelection.SmartFormat>` formats the selected text according to the rules defined by the syntax parser.
- `<xref:Altnet.Editor.Wpf.ISelection.LowerCase>/<xref:Altnet.Editor.Wpf.ISelection.UpperCase>/<xref:Altnet.Editor.Wpf.ISelection.Capitalize>` change the case of the currently selected text.
- `<xref:Altnet.Editor.Wpf.ISelection.UnIndent>/<xref:Altnet.Editor.Wpf.ISelection.UnIndent>` change the indent of the currently selected text.

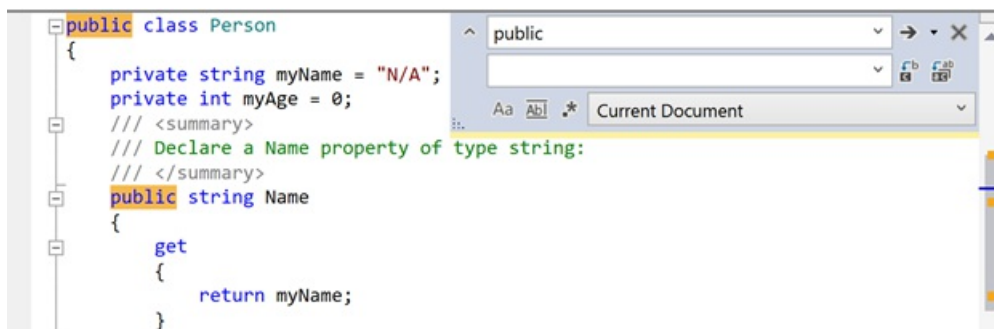
In fact, if some action can be performed by the user, it can also be performed programmatically:

```
if(!edit.Selection.IsEmpty)
edit.Selection.SelectedText =
"(" + edit.Selection.SelectedText + ")";
```

This code encloses the currently selected text in brackets.

Searching and Replacing

Among the operations that can be performed on the text are searching and replacing text strings. Unlike the standard multi-line text editor, which does not implement such functionality, the `<xref:Altnet.Editor.Wpf.TextEditor>` control comes with built-in support for them. It's ready to use out-of-the-box: when the user presses the Ctrl+F key combination, the search dialog box appears:



The text-replace dialog can be activated by pressing Ctrl+H. Besides using the UI to control the process, all the operations can be executed programmatically by calling the corresponding methods of the `<xref:Altnet.Editor.Wpf.TextEditor>`.

For example, to find some string, you could use the following code:

```
edit.Find("some string");
```

Or, with regular expressions:

```
edit.Find(" ", SearchOptions.RegularExpressions, new  
System.Text.RegularExpressions.Regex("a.?z"));
```

To activate the Search Dialog:

```
edit.DisplaySearchDialog();
```

Moreover, the Search and Replace dialog box functionality is not hardwired: you can replace the dialog box by implementing the `<xref:Altenet.Editor.Wpf.ISearchDialog>` interface, assigning it to the editor by setting its `SearchDialog` property. The built-in dialog can serve as a good example and a starting point.

If you need to perform the Search and Replace operation without any user interaction, you can use the `ReplaceAll` method.

I.e.:

```
edit.ReplaceAll("bad", "good", SearchOptions.WholeWordsOnly |  
SearchOptions.EntireScope, out count);
```

After this, every occurrence of a "bad" word in the entire text will be replaced by the "good".

Note that this would move the cursor position to the place where the last replacement has been made, so if you need it to be genuinely unnoticeable for the user, you need to enclose this call in the code which saves and restores the current cursor position:

```
System.Drawing.Point pos;  
pos = edit.Position;  
edit.ReplaceAll("bad", "good", SearchOptions.WholeWordsOnly |  
SearchOptions.EntireScope, out count);  
edit.Position = pos;
```

Search/Replace function can work across multiple documents. To allow the search to find text in multiple editors, you will need to set `SearchManager.Shared` to true and provide a list of editors to perform a search in its `InitSearch` event handlers and return/navigate to the appropriate editor in the `GetSearch` event handler:

```
SearchManager.SharedSearch.Shared = true;  
SearchManager.SharedSearch.InitSearch +=  
    new InitSearchEvent(DoInitSearch);  
SearchManager.SharedSearch.GetSearch +=  
    new GetSearchEvent(DoGetSearch);  
  
private void DoInitSearch(object sender, InitSearchEventArgs e)  
{  
    e.Search = GetActiveTextEditor() as ISearch;  
    foreach (var edit in editors.Values)  
    {  
        edit.SearchGlobal = true;  
        e.SearchList.Add(edit.Source.FileName);  
    }  
}  
  
private void DoGetSearch(object sender, GetSearchEventArgs e)  
{  
    foreach (var edit in editors.Values)  
    {  
        if (edit.Source.FileName == e.FileName)  
        {  
            e.Search = edit as ISearch;  
            break;  
        }  
    }  
}
```

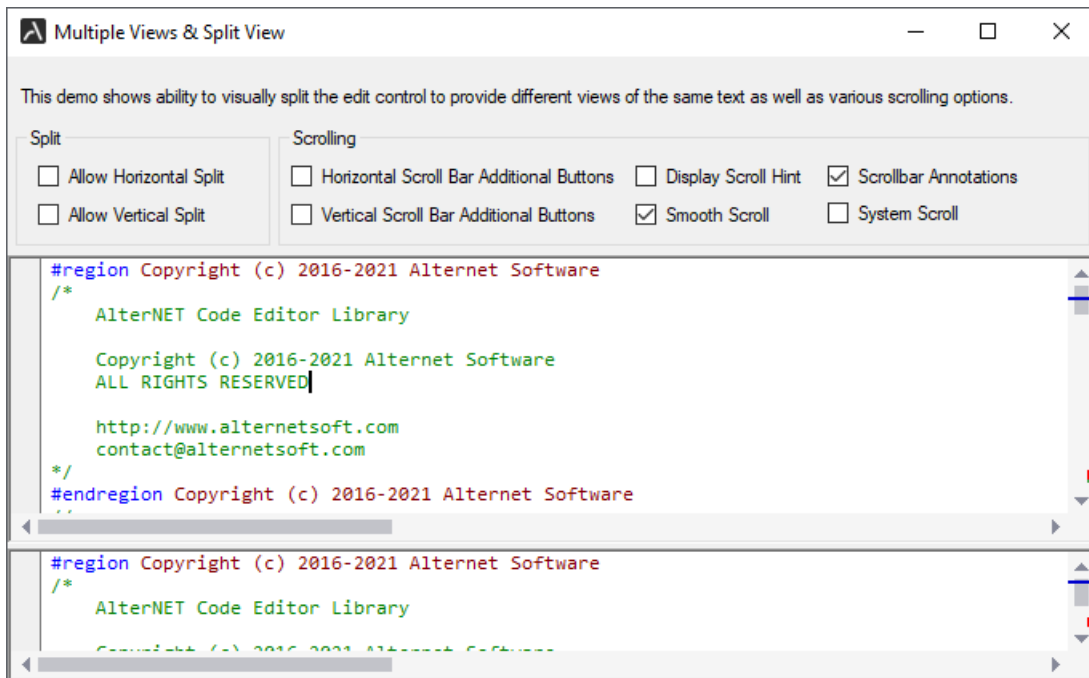
Scroll Bars and Split View

The appearance and behavior of scrollbars are controlled by the `<xref:Alternet.Editor.Wpf.TextEditor.Scrolling>` property.

The behavior of the scrollbars is controlled by *ScrollingOptions*.

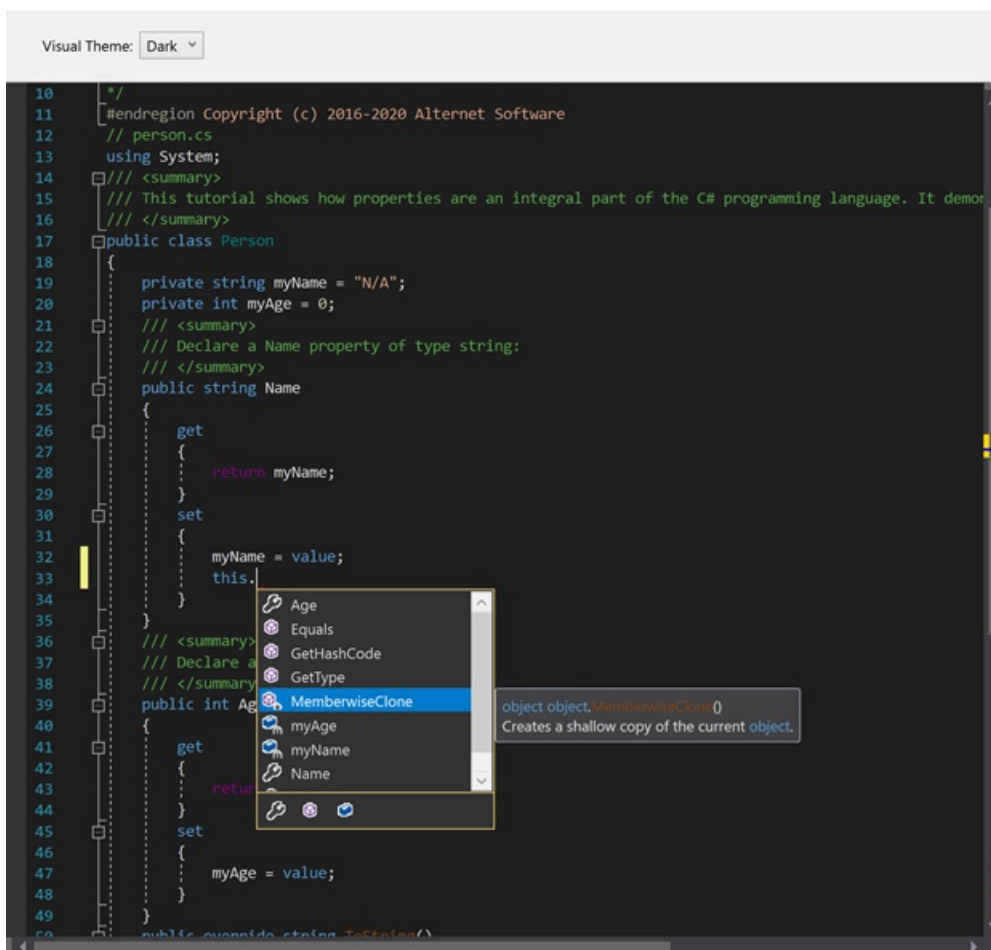
You can also use *ScrollingOptions* to allow `<xref:Alternet.Editor.Wpf.TextEditor>` to split its content by setting `<xref:Alternet.Editor.Wpf.TextEditor.AllowVerticalEditorSplit>` property. The splitter is displayed in the left-bottom corner allowing to split TextEditor's content vertically.

- `<xref:Alternet.Editor.Wpf.ScrollingOptions.SmoothScroll>` - if set, the display is updated as the user drags the scrollbar. Otherwise, the display is updated only when the user releases the scrollbar thumb. Disabling this option may improve performance on slow machines.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.ShowScrollHint>` - if set, a hint window showing the new number of the topmost line, is displayed whenever the user drags the scrollbar.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.UseScrollDelta>` - if set, editor window content is scrolled by several characters when caret becomes invisible rather than one character
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.SystemScrollbars>` - if set, system scroll bars are displayed; otherwise, custom scrollbars are used.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.FlatScrollbars>` - if set, scroll bars are displayed in flat style. This option works only if *SystemScrollBars* is on.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.AllowSplitHorz>` - allows displaying horizontal splitting buttons in the scroll area. This option works if *SystemScrollBars* is off and the control has the Dock property set to *DockStyle.Fill*.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.AllowSplitVert>` - allows displaying a vertical splitting button in the scroll area. This option works if *SystemScrollBars* is off and the control has the Dock property set to *DockStyle.Fill*.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.HorzButtons>` - allows displaying additional buttons in the horizontal scrolling area. This option works only if *SystemScrollBars* is off.
- `<xref:Alternet.Editor.Wpf.ScrollingOptions.VertButtons>` - allows displaying additional buttons in the vertical scrolling area. This option works only if *SystemScrollBars* is off.
- *VerticalScrollBarAnnotations* - allows displaying scroll bar annotations that show special items, such as line modifications, syntax errors, search results bookmarks, and the caret position, throughout the entire document within the scroll bar. Individual annotation kinds are controlled by `<xref:Alternet.Editor.Wpf.Scrolling.Annotations>` property.



Visual Themes

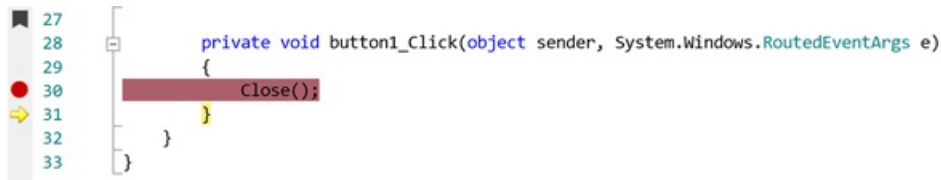
Visual themes allow changing the appearance of all graphical elements in the editor by setting `<xref:Alternet.Editor.Wpf.TextEditor.VisualThemeType>` or `<xref:Alternet.Editor.Wpf.TextEditor.VisualTheme>` type properties. Light and Dark visual themes are included, and custom appearance can be configured via a custom visual theme.



Gutter

The gutter is the area to the left of the text, which displays various indicators for the corresponding lines of text. These indicators include bookmark indicators, line wrapping indicators, line style icons, line numbers, outlining buttons, and line modification

markers.



All the images displayed in the gutter are contained in the gutters image list. The following code gives an example of how to add a custom icon to this list from another image list (for example, the one dropped on the form during design time):

```
edit.Gutter.Images.Images.Add(imageList1.Images[0]);
```

The mechanism of the line styles icons allows you to define how the editor will display certain lines of the text.

The most common use for this is the indication of breakpoint lines and the current execution point.

For example, the following code defines the style to be used for breakpoints.

```
style_id = edit.LineStyles.AddLineStyle("breakpoint",  
Color.White, Color.Red, Color.Gray, 11, LineStyleOptions.BeyondEol);
```

(Note in the current version, image # 11 corresponds to the built-in breakpoint indicator image, and #12 corresponds to the current execution point image.

Later on, some lines of the text can be assigned the style:

```
edit.Source.LineStyles.SetLineStyle(line_no, style_id);
```

(Note that here and in the other places of this document, line numbers start at 0.)

Note: Every line can have at most one style at any given time. If you need to remove line style for some particular line, call:

```
edit.Source.LineStyles.RemoveLineStyle(line_no);
```

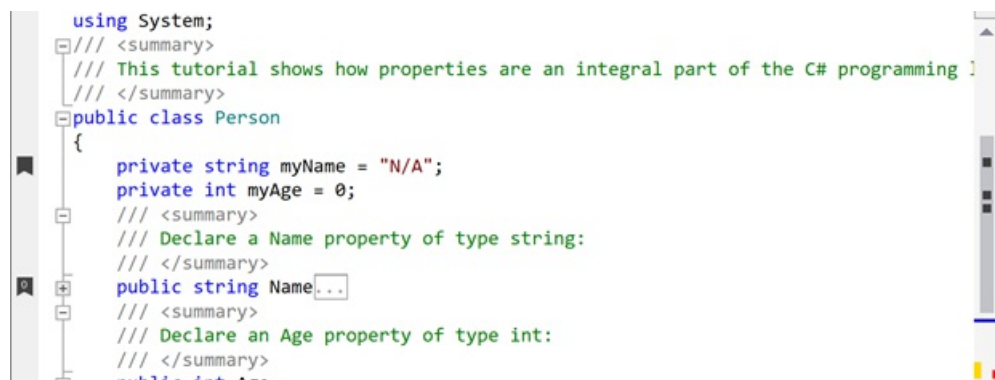
For [<xref:Alternet.Editor.Wpf.TextEditor>](#) control, the appearance of the gutter is controlled by the following properties: [<xref:Alternet.Editor.Wpf.IGutter.Width>](#), [<xref:Alternet.Editor.Wpf.IGutter.BrushColor>](#), [<xref:Alternet.Editor.Wpf.IGutter.PenColor>](#) and [<xref:Alternet.Editor.Wpf.IGutter.Visible>](#). Width property specifies the width of the gutter area, [<xref:Alternet.Editor.Wpf.IGutter.BrushColor>](#) specifies the background color of the gutter area, [<xref:Alternet.Editor.Wpf.IGutter.PenColor>](#) specifies the color of the gutter line, and [<xref:Alternet.Editor.Wpf.IGutter.Visible>](#) indicates whether or not to draw the gutter. Note that the gutter can adjust its width if line numbers or outlining is on and painted on the gutter. [<xref:Alternet.Editor.Wpf.TextEditor>](#) allows drawing line numbers to visually indicate position of the visible lines inside the document. To enable line numbers, you need to set [<xref:Alternet.Editor.Wpf.GutterOptions.PaintLineNumbers>](#) to true. Turning [<xref:Alternet.Editor.Wpf.GutterOptions.PaintLinesOnGutter>](#) option enables drawing line numbers on the gutter area; turning it off causes line numbers to be painted immediately after the gutter area. The appearance of line numbers is controlled by the [<xref:Alternet.Editor.Wpf.IGutter>](#)'s properties: [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersStart>](#), [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersForeColor>](#), [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersBackColor>](#), [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersAlignment>](#), [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersLeftIndent>](#) and [<xref:Alternet.Editor.Wpf.IGutter.LineNumbersRightIndent>](#), which are intuitively understandable.

Like Microsoft Visual Studio editor, [<xref:Alternet.Editor.Wpf.TextEditor>](#) provides the ability to visually track modified lines. To enable this feature, you need to turn [<xref:Alternet.Editor.Wpf.GutterOptions.PaintLineModifiers>](#) on. When LineModifiers are on, they indicate lines that were changed since the last saving. New changes are marked with Yellow color; changes that were done before the last saving are marked with Lime color. Colors can be customized using [<xref:Alternet.Editor.Wpf.IGutter.LineModifierChangedColor>](#) and [<xref:Alternet.Editor.Wpf.IGutter.LineModifierSavedColor>](#) properties.

Reaction to mouse clicks and double-clicks on the gutter area can be implemented by assigning handlers to the `<xref:Altenet.Editor.Wpf.TextEditor.GutterClick>` and `<xref:Altenet.Editor.Wpf.TextEditor.GutterDbClick>` events.

Bookmarks

Just as with often used reference books, the process of navigating the text can be made more efficient with the usage of bookmarks. Two kinds of bookmarks are supported by the `<xref:Altenet.Editor.Wpf.TextEditor>`: plain and numbered. The former can be toggled for the current line using the `Ctrl+K Ctrl+K` key combination sequence and can be navigated in a cyclical manner using the `Ctrl+K Ctrl+N` (next bookmark) or `Ctrl+K Ctrl+P` (previous bookmark). The numbered bookmarks have a different flavor: there can be up to ten bookmarks, each having a number associated with it.



Toggling the numbered bookmark is performed using the `Ctrl+K Ctrl+#`, and navigation to the specific bookmark is performed by pressing the `Ctrl+#` key combination (where # is any of the digits from 0 to 9). There can be only one plain bookmark in any line. Numbered bookmarks do not have such a limitation. However, only the indicator for the first bookmark in the line will be displayed in the gutter area if `<xref:Altenet.Editor.Wpf.GutterOptions.PaintBookMarks>` is set to true.

Like most other things in the editor, bookmarks can be manipulated programmatically. Note that the list of bookmarks belongs to the text source, so multiple views of the same source share the same set of bookmarks.

The following code snippet sets the plain bookmark at the current position:

```
System.Drawing.Point pos = edit.Position;
edit.Source.BookMarks.SetBookmark(pos, int.MaxValue);
```

To set the numbered bookmark, replace `int.MaxValue` by the bookmark number (0..9).

To clear all the bookmarks set in the text source, call the `<xref:Altenet.Editor.Wpf.IBookMarks.ClearAllBookMarks>` method:

```
edit.Source.BookMarks.ClearAllBookMarks();
```

Navigating to the location defined by a particular bookmark can be performed as follows:

```
edit.Source.BookMarks.GotoBookMark(index);
```

Code Editor supports named bookmarks with descriptions and hyperlinks. The user may see a description in a tooltip window when moving the cursor over the bookmark and launching the browser with the specified URL when clicking on the bookmark. Such bookmarks can be set using the following code:

```
edit.Source.BookMarks.SetBookmark(edit.Position, 0,
    "Bookmark1", "This is Named Bookmark", "www.altenetsoft.net");
```

If you need to have custom images, you can change the bookmark indicator images by assigning a custom image list:

```
edit.Gutter.BookMarkImageIndex =
edit.Gutter.Images.Images.Count;
edit.Gutter.Images.Images.Add(imageList1.Images[0]);
```

(This code uses the first image from the *imageList1*, which you could, for example, create by just dropping a new Image List from the toolbox on the form. For more examples of working with the gutter, refer to the corresponding section of this manual.)

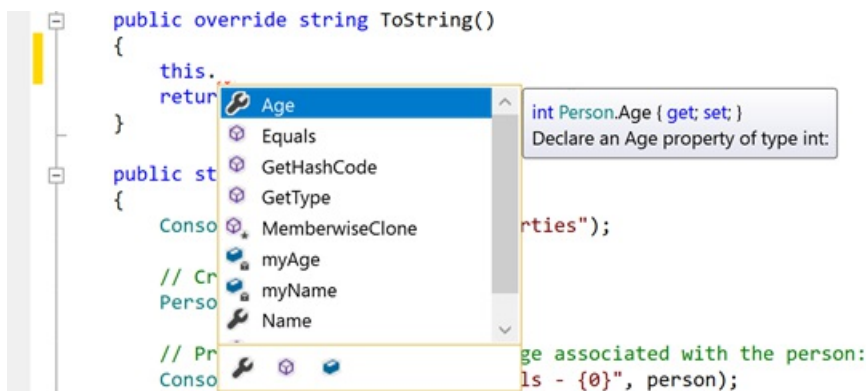
You can configure bookmarks navigation to work across multiple documents. These documents should be added to the BookMarkManager class, and every document should have the FileName property assigned.

```
BookMarkManager.Register(edit.Source);
BookMarkManager.SharedBookMarks.Activate += new
EventHandler<ActivateEventArgs>(DoActivate);
private void DoActivate(object sender, ActivateEventArgs e)
{
    foreach (var edit in editors.Values)
    {
        if (edit.Source.FileName == e.FileName)
        {
            ActivateEditorTab(editor);
            break;
        }
    }
}
```

In this mode, all bookmarks will be stored in a global list inside BookmarkManager instead of every individual TextEditor control allowing global navigation through them.

Code Completion (Intellisense)

Although the main purpose of an editor is to be a convenient tool for the user to enter the text, quite often, guidance from the editor can significantly improve the effectiveness of the work process. When editing a text with some structure (i.e., a computer program in some language), there are often well-defined input possibilities in certain contexts. For example, for many programming languages, the sequence "someobject." should be followed by one of the existing field names. To assist the user in such situations, the text editor can activate a popup list containing all the methods that can be accessed from the current scope.



If there is a partial word immediately to the left of the current cursor position, the first entry that starts with that word is highlighted. The user can then continue typing up until the method he meant is selected or use the up and down arrow keys to navigate the list and then insert the complete method name by pressing the Enter key.

Automatic Code Completion Invocation

In most cases, the Code Completion list and Signature Help for method parameters are provided by the parser alongside the list of characters, such as period "." or open parens "(", which invoke code completion automatically as user types. The task of code completion is to have the list of available choices appear automatically as user types. For example, after the user types

"someobject." the list of class members for that object is expected to appear, and after they type "somemethod(" the tooltip showing the list of parameters for that function is expected to appear. It can be customized to show those popups only if the user stops input for some short delay after typing the activating symbol ("." or "(").

The automatic code completion is implemented by Roslyn C# and Visual Basic parsers, TypeScript/JavaScript parsers, as well as by Advanced C#, J#, Visual Basic, VBScript, JavaScript, C, XML, and Python parsers.

For example, automatic code completion is attempted after typing a period ('.') following a member (member access expression), typing an open brace ('{') following a member (invocation expression or object creation expression), typing a period ('.') inside *using* section, typing less sign ('<') inside XML comments, etc. This feature is implemented as close as possible to the Visual Studio .NET editor, so it works in an intuitively understandable way. On top of that, Roslyn-based parsers are configured to invoke code completion when the user starts typing identifiers.

When these parsers are used, you still can control some aspects of code completion, for example, delay before the code completion window appears, using the `<xref:Alternet.Editor.Wpf.TextEditor.NeedCodeCompletion>` event, which will be discussed later. Moreover, for advanced parsers, you can register your types and objects, namespaces, and assemblies for code completion using the `CompletionRepository` property of `<xref:Alternet.Syntax.SyntaxParser>`.

To make types from the most commonly used assemblies such as `System`, `System.Drawing`, and `System.Windows.Forms` to be available for code completion, you can call the following method.

```
csParser1.Repository.RegisterDefaultAssemblies();
```

If you need to provide code completion for assemblies declared in other assemblies, you need to register these assemblies this way:

```
csParser1.Repository.RegisterAssembly("System.Xml");
```

You may need to register types for code completion that are not declared in the assembly but are present in the source code somewhere else.

For Roslyn-based parsers, you can rely on the underlying solution/project/document object model:

```
csParser1.Repository.RegisterCodeFiles(new string[] { "MyFile.cs" });
```

For one of advanced parsers you need to create `<xref:Alternet.Syntax.SyntaxParser>`, load this file into the `<xref:Alternet.Syntax.Parser.Strings>` object, and then add parsed `<xref:Alternet.Syntax.SyntaxTree>` to the code completion repository. The following code demonstrates how it can be accomplished:

```
ISyntaxParser parser = new Alternet.Syntax.Parsers.Advanced.CsParser();
parser.Strings = new TextStrings();
parser.Strings.LoadFile("MyFile.cs")
parser.ReparseText();
csParser1.CompletionRepository.RegisterSyntaxTree(parser.SyntaxTree);
```

Code Outlining

The `<xref:Alternet.Editor.Wpf.TextEditor>` control supports outlining, a text navigation feature that can make navigation of large structured texts more effective. The essence of *outlining* lies in defining sections of the text as structural units that, once collapsed, can be visually replaced by a shorter representation, i.e., by an ellipsis ("..."). During the text navigation, the user can dynamically switch between the collapsed and complete representation of any particular section. Sections can be nested.

```

public override string ToString()...
{
    return "Name = " + Name + ", Age = " + Age;
}

public static void Main()
{
    Console.WriteLine("Simple Properties");

    // Create a new Person object:
    Person person = new Person();

    // Print out the name and the age associated with the person:
    Console.WriteLine("Person details - {0}", person);
}

```

The section can be expanded by clicking on the "+" button, double-clicking the proxy text, or pressing the Ctrl+M Ctrl+M key sequence (in the default key mapping). The section can be collapsed by clicking on the "-" button or pressing the Ctrl+M Ctrl+M key sequence. All the sections can be globally collapsed or expanded using the Ctrl+M Ctrl+L key sequence.

Outlining is the property of the `<xref:Alternet.Editor.Wpf.TextEditor>` control itself, not of the `<xref:Alternet.Editor.Wpf.TextSource>`. Thus it is possible to have two views of the same text, one with outlining and another without, or even to have completely different structural parts defined.

All the aspects of the *outlining* are controlled via the `<xref:Alternet.Editor.Wpf.TextEditor.Outlining>` property of the `<xref:Alternet.Editor.Wpf.TextEditor>`. The *outlining* can be enabled or disabled using the `<xref:Alternet.Editor.Wpf.IOutlining.AllowOutlining>` property either in design time or at runtime. The look of the outlining is controlled by the `<xref:Alternet.Editor.Wpf.IOutlining.OutlineColor>` and `<xref:Alternet.Editor.Wpf.IOutlining.OutlineOptions>` properties.

There are two approaches to defining outline sections.

Direct Definition of Outline Sections

Outline sections can be explicitly defined by calling the appropriate methods of the `<xref:Alternet.Editor.Wpf.TextEditor.Outlining>` property, i.e.:

```
edit.Outlining.Outline(new Point(0, 0), new Point(int.MaxValue, 0), 0, "...").Visible = false;
```

This code snippet defines the first level section consisting of the entire first line of the text, using ellipsis ("...") as the proxy text and being in a collapsed state.

While this approach is simple, it has one significant drawback: if sections represent structural units defined by the content of the text, and the user can edit the text, sections have to be constantly kept in sync with the text, which can be a non-trivial task.

Automatic Definition of Outline Sections Using the Syntax Parser

To provide automatic code outlining, the syntax parsing framework has to be employed. This approach may seem to be more complex at first look; however, it provides consistent results. To implement this approach, a class descending from the `<xref:Alternet.Syntax.SyntaxParser>` class needs to be defined, and the `<xref:Alternet.Syntax.SyntaxParser.Outline*>` method needs to be implemented. This method will be frequently called by the `<xref:Alternet.Editor.Wpf.TextEditor>` whenever the text changes, to provide the user with a smooth editing experience, the implementation should be relatively fast.

Code Editor includes parsers that support automatic outlining for *C#, Visual Basic, J#, JavaScript, VBScript, Ansi-C, SQL, HTML, XML, and Python* languages.

The following example demonstrates how to implement a parser that marks every line starting from the sharp ("#") sign as a separate outline section.

```
private void InitializeComponent()
{
    ...
    this.parser1 = new XParser();
    ...
}
public class XParser: SyntaxParser
{
    public XParser()
    {
        Options = SyntaxOptions.Outline;
    }
    public override int Outline(IList<IRange> Ranges)
    {
        Ranges.Clear();
        for(int i = 0; i < Strings.Count; i++)
        {
            if(Strings[i].ToString().StartsWith("#"))
            {
                Ranges.Add(new OutlineRange(
                    new Point(0, i),
                    new Point(int.MaxValue, i),
                    0, "...", false));
            }
        }
        return Ranges.Count;
    }
}
```

Code Editor Extended Features (WPF)

Code Editor provides advanced text editing functionality such as customizable keyboard mapping, HyperText handling, spell-checking integration, printing and exporting, macro recording and playback and miscellaneous display features.

Keyboard Mapping

While the `<xref:Altenet.Editor.Wpf.TextEditor>` closely mimics the key-mapping common to most of Microsoft's products, it is completely customizable: you can add or change behavior of certain keys or even define an entirely different key-mapping.

To assign an action to some key combination, use the following code:

```
private void edit_Action()  
{  
    ...  
}  
...  
edit.KeyList.Add(Keys.W | Keys.Control | Keys.Alt, new  
    KeyEvent(edit_Action));
```

This would make the *Ctrl+Alt+W* key combination execute the *edit_Action* method.

Or, to pass some object to the key handler:

```
private void edit_Action(object o)  
{  
    ...  
}  
...  
edit.KeyList.Add(Keys.W | Keys.Control | Keys.Alt, new  
    KeyEventEx(edit_Action), some_object);
```

To remove some key handler, regardless of whether you have added it yourself, or it is the default one, call:

```
edit.KeyList.Remove(Keys.A | Keys.Control);
```

The code described before is used to manage the key handling in the default state. In fact, the key handling is slightly more complex than that: the `<xref:Altenet.Editor.Wpf.TextEditor>`'s key handling mechanism can be in different states, other than the default one. Every state has its own key mapping table. Key mapping for bookmark operations can serve as a good example: after the user presses the *Ctrl+K* key combination, combinations *Ctrl+K*, *Ctrl+N*, *Ctrl+P*, *Ctrl+L* (the list is incomplete) obtain the new meaning. If a key combination is pressed for which there is no assignment in some non-default state, then the state is changed to default, and the combination is evaluated in the new context. `<xref:Altenet.Editor.Wpf.TextEditor>` defines four different non-default states, but you can implement your own:

```
edit.KeyList.Add(Keys.W | Keys.Control, null, 0, 5);  
edit.KeyList.Add(Keys.Tab, new KeyEvent(edit_Action), 5, 5);
```

This code creates a state that is activated by pressing the *Ctrl+W* key combination, and in which the *Tab* key causes the *edit_Action* to be executed. The state is changed back to default when the user presses some key other than the *Tab*. Up until now we have only examined the cases where you add some new functionality, or suppress some existing one. There also might be a case, when you want to use an entirely different key mapping, for example, to simulate some other environment your users are familiar with. To accomplish this, it is necessary to completely clear the current key mapping, and then to assign every function performed by the editor to some key. Note, that this really means every function: even such trivial things as cursor navigation and insertion of a new line are performed according to the key mapping.

For example, the following code assigns the editor's key-mapping to a single action defined: "Select All", which is assigned to the

Ctrl+X key combination

```
edit.KeyList.Clear();
edit.KeyList.Add(Keys.X | Keys.Control,
((EventHandlers)edit.KeyList.Handlers)SelectAllEvent);
```

URL handling

The `<xref:Altnet.Editor.Wpf.TextEditor>` can be set up to handle pieces of text that look like some kind of an URL by setting the `<xref:Altnet.Editor.Wpf.IEditHyperText.HighlightHyperText>` property to true. The handling consists of highlighting those pieces of text, and of processing clicks on them. By default, clicking the URL causes the operating system default action to be performed (i.e. launching a browser or an email client), however, you can override this behavior by assigning the `<xref:Altnet.Editor.Wpf.TextEditor.JumpToUrl>` event handler.

```
private void edit_JumpToUrl(object sender, UrlJumpEventArgs e)
{
    if(is_our_url(e.Text))
    {
        process_url(e.Text);
        e.Handled = true;
    }
}
```

Spellchecker Interface

The `<xref:Altnet.Editor.Wpf.TextEditor>` supports the spell-as-you-type spell checker integration. To enable spelling for the editor, set its `<xref:Altnet.Editor.Wpf.IEditSpelling.CheckSpelling>` property to true and assign the `WordSpell` event handler.

The following artificial example considers any word longer than 3 characters to be correct:

```
private void edit_WordSpell(object sender, WordSpellEventArgs e)
{
    e.Correct = e.Text.Length > 3;
}
...
this.edit.WordSpell += new WordSpellEvent(this.edit_WordSpell);
```

Incorrect words are displayed with the wiggly underline (the default color is red, but it can be changed using the `<xref:Altnet.Editor.Wpf.IEditSpelling.SpellColor>` property). In real-life scenarios you would need to use some third-party software/dictionary to really check the text. Another alternative would be using some word-list file, many of them, including Public Domain or free ones, can be found on the Internet. Refer to a Miscellaneous quick start project, which has one of these dictionaries.

Another useful feature supported by `<xref:Altnet.Editor.Wpf.TextEditor>` is `AutoCorrect`, allowing you to auto correct words when typing. To enable this feature you need to set property `AutoCorrection` to true and handle the `AutoCorrect` event to provide replacements for words that were typed incorrectly.

Printing and Exporting

`<xref:Altnet.Editor.Wpf.TextEditor>` includes support for printing, print previewing, and exporting to RTF and HTML.

Exporting can be performed as simple as this:

```
edit.SaveFile(FileName, new RtfExport());
```

Printing tasks are performed and configured via the `Printing` property of the `<xref:Altnet.Editor.Wpf.TextEditor>`.

For example, to show the print preview dialog, call:

```
edit.Printing.ExecutePrintPreviewDialog();
```

<xref:Alternet.Editor.Wpf.TextEditor> control supports adding user-defined information while printing.

To add some text to the footer:

```
edit.Printing.Footer.CenterText = "draft";
```

Text in headers and footers can contain substitution tags. The standard ones are: [page], [pages], [date], [time] and [username].

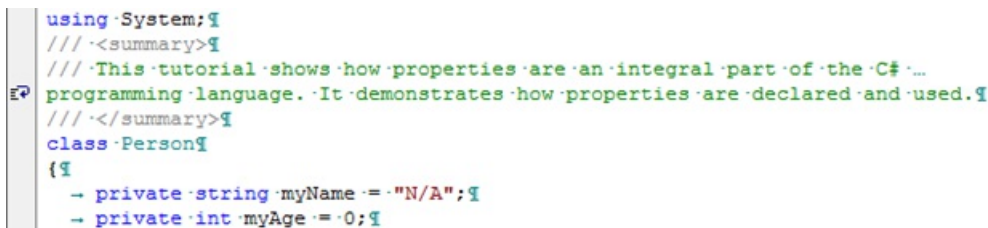
Macro Recording and PlayBack

<xref:Alternet.Editor.Wpf.TextEditor> has macro recording and playback capabilities. It allows recording sequences of keyboard commands and playing them later. Note that mouse input is not recorded.

This feature enables you to store a set of frequently used editing commands. Set *MacroRecording* property to start/finish macro recording. Use the PlayBack method to repeat the stored command sequence.

White-space Display

It is sometimes desirable for the user to see the codes which influence the layout of the text and are normally invisible themselves. These codes are space, tab, end-of-line, and the end-of-file (not really a code), and are often collectively referred to as the white-space. The TextEditor has the option to display them, and to control their appearance.



```
using System;
/// <summary>
/// This tutorial shows how properties are an integral part of the C# ...
programming language. It demonstrates how properties are declared and used.
/// </summary>
class Person
{
    private string myName = "N/A";
    private int myAge = 0;
```

The display of the white-space is enabled using the <xref:Alternet.Editor.Wpf.IWhiteSpace.Visible> property. The color used to display white-space codes is determined by the <xref:Alternet.Editor.Wpf.IWhiteSpace.SymbolColor> property, and the characters used to display those codes are determined by *EofSymbol*, *EolSymbol*, *SpaceSymbol*, and *TabSymbol* properties.

Line Separator

It is possible to have lines of the editor to be separated by thin horizontal lines, and to have the current line highlighted. This behavior is controlled by the <xref:Alternet.Editor.Wpf.TextEditor.LineSeparator> property.

The following options are available:

- <xref:Alternet.Editor.Wpf.SeparatorOptions.HighlightCurrentLine> specifies that the current line in the editor will be highlighted using the HighlightColor for background.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.HideHighlighting> specifies that the highlighting of the current line should be hidden when the editor loses focus.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateLines> specifies that a thin horizontal line of LineColor should be drawn between each line of text.
- <xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateWrapLines> specifies that each visual line of text produced as a result of word-wrap should be separated in the same manner as separate lines (works only if the SeparateLines option is also specified).

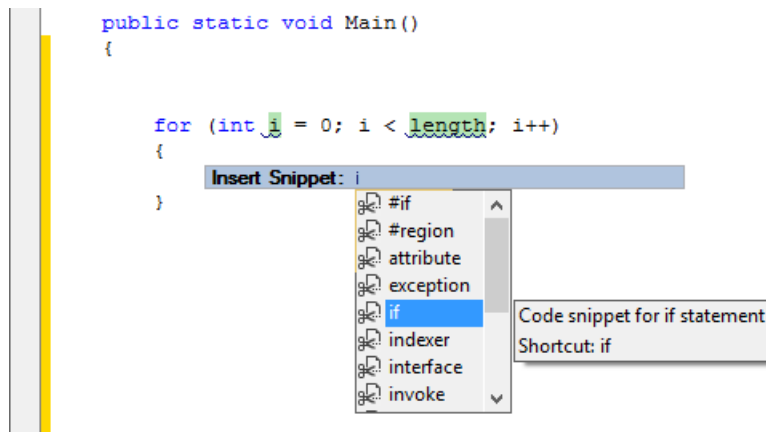
- `<xref:Alternet.Editor.Wpf.SeparatorOptions.SeparateContent>` specifies that line separator will be drawn between sections of the code (for example between methods), if `TextEditor` control is associated with `SyntaxParser` supporting this feature.

Code snippets

The code snippets are the next code completion provider, allowing to insert frequently used fragments of code. Code snippets can be inserted into the editor by pressing Tab key after snippet shortcut or by executing code snippet popup window with Ctrl + K + X key sequence, or activated programmatically, by calling the `CodeSnippets` method of the `<xref:Alternet.Editor.Wpf.TextEditor>`.

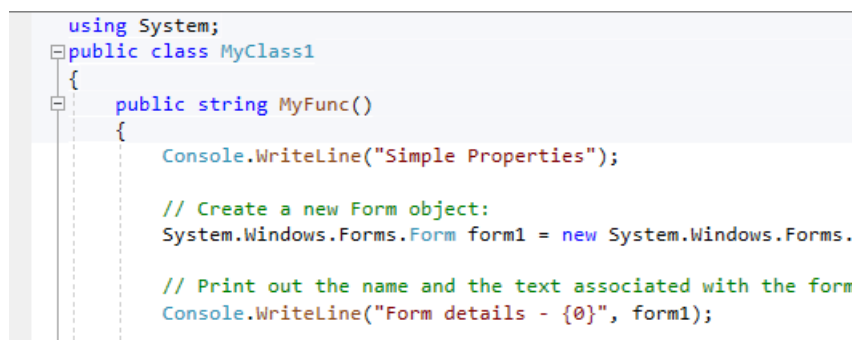
The purpose of the code snippets is to permit the user to quickly enter one of the predefined fragments of text. If the code snippet has fields declared, the editor allows modifying their values causing updating field values inside the whole snippet.

The following picture illustrates the usage of the code snippets.



Hidden and Read-Only Lines

`<xref:Alternet.Editor.Wpf.TextEditor>` control can mark certain lines to be readonly or hide them at all so the user can't see them. This can be achieved by using `<xref:Alternet.Editor.Wpf.TextSource.SetLineHidden*>` and `<xref:Alternet.Editor.Wpf.TextSource.SetLineReadOnly*>` methods. For hidden lines to take effect, the `<xref:Alternet.Editor.Wpf.DisplayStrings.AllowHiddenLines>` property needs to be set to true. Read-only lines can be made visually different from editable lines by setting `<xref:Alternet.Editor.Wpf.TextEditor.ReadOnlyBackColor>` property. Sometimes it's required to mark certain lines to be both hidden and readonly, this way they can not be deleted if the user selects the outer block containing them and tries to delete it.



Structure GuideLines

`<xref:Alternet.Editor.Wpf.TextEditor>` control can display dashed lines between syntax blocks for some parsers (Roslyn-based, TypeScript and some advanced parsers), helping the user to better understand the structure of the document being edited. This behavior is controlled by a Parser and can be switched off by the `StructureGuideLines` parser option.

```
/// </summary>
public int Age
{
    get
    {
        return myAge;
    }
    set
    {
        myAge = value;
    }
}
public override string ToString()
{
```

Minimap

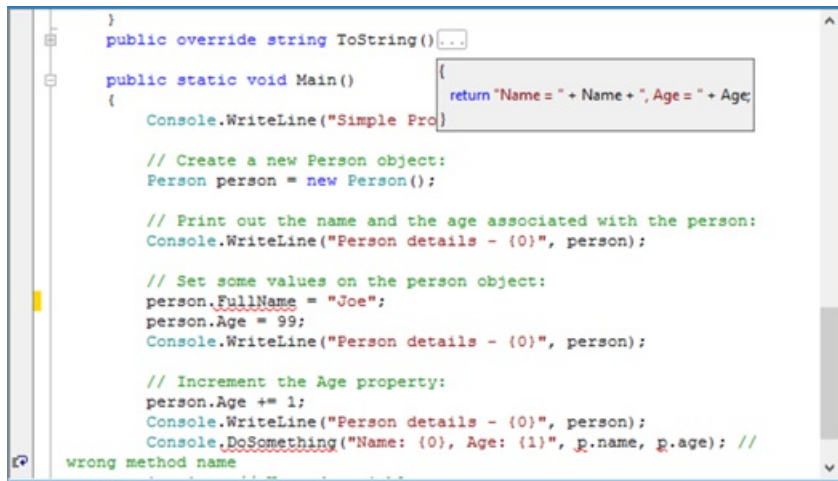
A Minimap (code outline) gives you a high-level overview of your source code, which is useful for quick navigation and code understanding. A file's minimap is shown on the right side of the editor. You can click the shaded area to quickly jump to different sections of your file.

```
/// </summary>
public class Person
{
    private string myName = "N/A";
    private int myAge = 0;
    /// <summary>
    /// Declare a Name property of t
    /// </summary>
    public string Name
    {
        get
        {
            return myName;
        }
        set
    }
}

public string Name
{
    get
    {
        return myName;
    }
}
```

Syntax Parsing

Text parsing is performed by one of the [<xref:Alternet.Syntax.Parser>](#) non-visual components. In the very basic version, it controls syntax highlighting. In the case of more advanced parsers, it enables additional features such as code completion, code outlining, code formatting, and syntax error underlining.



If there's no parser assigned, [<xref:Alternet.Editor.SyntaxEdit>](#) or [<xref:Alternet.Editor.Wpf.TextEditor>](#) does not perform any parsing-related functions. To be able to use those features, you need to create a [<xref:Alternet.Syntax.Parser>](#) component explicitly and assign it via the `Lexer` property of either these controls directly or their `TextSource`.

C#/VisualBasic (Roslyn) and TypeScript/JavaScript parsers

The package includes parsers based on Microsoft Code Compiler technology (Roslyn) and Microsoft TypeScript compiler.

These parsers provide full syntax and semantic model of the text edited by `SyntaxEdit` control. It enables additional features such as code completion, code outlining, code formatting, highlighting types in different colors, and underlying syntax and semantic errors and warnings to be identical to the ones found in the Microsoft Visual Studio editor.

LSP Parsers

LangServer-based parsers rely on external servers to provide features like auto complete, go to definition, find all references, and alike. The Code Editor package includes parsers based on this technology for C/C++, Java, Python, Lua XML, and PowerShell. There are two variations of each parser - one that relies on the Language server to be installed on the target machine and one that includes all required payload (such as clang libraries for c/c++ or embedded python distribution) in the form of embedded resources. Java embedded parser contains LSP-server files but not Java installation itself, which needs to be installed on target machines independently.

Advanced Parsers

The Code Editor package comes with several advanced parsers, each one designed to perform syntax highlighting for certain languages. Each of these parsers is derived from the [<xref:Alternet.Syntax.SyntaxParser>](#) class implementing [<xref:Alternet.Syntax.ISyntaxParser>](#) interface and performs syntax analysis of the text in a specific programming language to provide advanced code editing features discussed above. These parsers use hard-coded parsing algorithms instead of generic regular-expression-based rules, making them significantly faster than generic ones (these will be explained further). Currently, we have advanced parsers for the following languages: Python, C#, J#, Visual Basic.NET, Ansi-C, VBScript, JavaScript, HTML, SQL, T4, XML, and XAML. These parsers perform complete syntax parsing of the source code to build the syntax tree, which is used to implement all mentioned features. Please note that these parsers might not support full language specification, especially language constructs which were added to these programming languages recently.

Python and XAML parsers are implemented in their own namespaces/assemblies, [<xref:Alternet.Syntax.Parsers.Python>](#) and

<xref:Alternet.Syntax.Parsers.XAML> respectively.

For Python/IronPython, we have implemented a complete semantic analysis of the text, which builds a semantic model of the whole text displayed in the editor (and also processes included files). The semantic model is used by the Code Completion service to provide auto-completion and method parameters help. This approach was inspired by studying Microsoft Code Analysis ("Roslyn") implementation, which will be explained below.

Generic parsers

Writing your own parser to comply with a programming language specification is a non-trivial task, not to mention keeping it up to date with full language specifications as the language evolves. However, for a simple task of syntax highlighting, it's normally not required. To perform syntax highlighting, you can rely on a generic parsing engine, which uses finite-state automaton rules driven by regular expressions matching the parsed text. Although creating good syntax-highlighting rules for some complex languages can still be tricky, you will rarely, if ever, have to do it yourself. The Code Editor includes more than 30 ready-to-use syntax schemes for the most commonly used modern programming languages. In rare cases, you need to implement a parser for some custom language; one of these parsers can be a good starting point. Syntax schemes are stored on disk as .xml files, and the built-in visual design-time parser editor is provided to simplify the process of their creation. If you need most of these languages in your application, consider using one of the <xref:Alternet.Syntax.Parsers.Generic.SchemeParser> descendants, which contains appropriate language schemes in the form of an assembly resource.

Creating a new generic parser is described in the [Advanced Topics](#) section of the documentation.

TextMate parser

TextMate parser is based on the TextMate grammar that powers syntax highlighting and advanced text editing features of Visual Studio Code.

TextMate parser uses Oniguruma regex engine and includes grammar definitions for 40+ programming languages. On top of syntax highlighting, it supports features like indent-based outlining and structure guidelines, code snippets, and code completion for the symbols already found in the text.

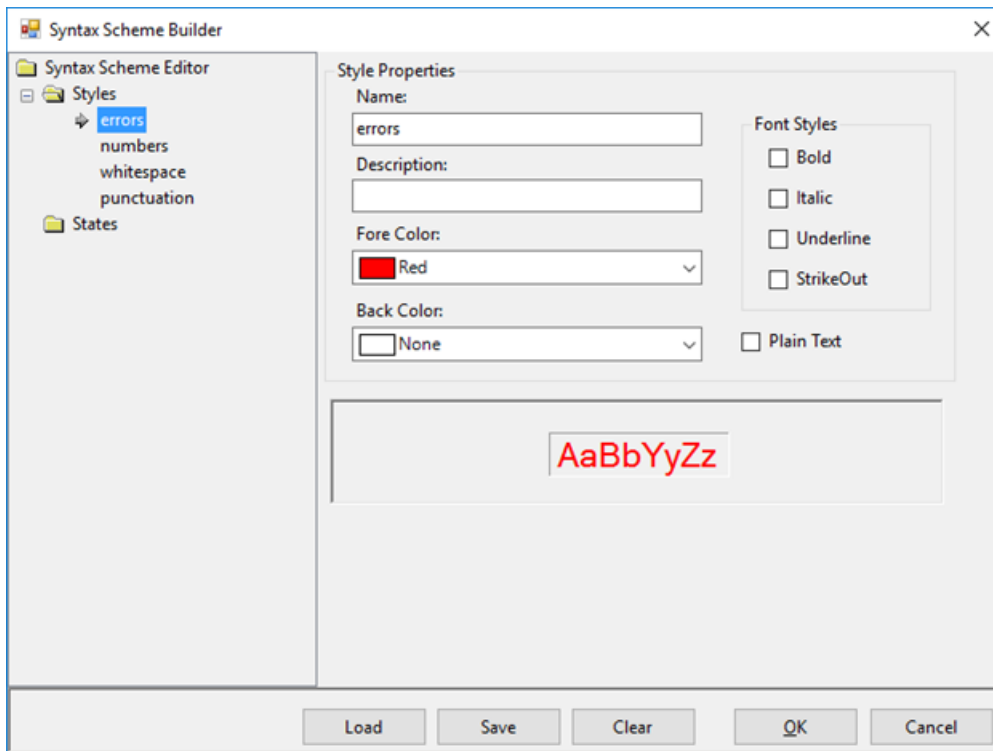
Creating own Generic Parser Schema

Although the Code Editor comes with a collection of parsers, creating a new one may sometimes be necessary. In this chapter, we will develop a new parser for some trivial fictitious language.

First, let us informally describe the language we are willing to parse. The valid text in this language consists of zero or more groups enclosed in curly brackets ("{" , "}"), each containing zero or more numbers separated by commas. We want to distinctly highlight punctuation symbols and numbers and report erroneous input.

The first step is to create a new *Parser* object by dropping it from the toolbox and assigning it to some <xref:Alternet.Editor.SyntaxEdit> by picking the newly created parser from the list of choices appearing for the *Lexer* property of the editor.

After having done this, we can start exploring the *SyntaxBuilder*. It is invoked by pressing the "..." button for the *Scheme* property of the *parser* object in the Properties window.



Now you should see the *SyntaxBuilder* dialog box appears. If you wanted to use some existing scheme, you would have pressed the *Load* button. However, this time we will create a new scheme from scratch. After completing it, you can press the *Save* button to make it possible to use this new scheme in other projects.

The next thing to do is to define syntax highlighting styles used in the scheme. This is accomplished by clicking the right mouse button on the *Styles* node to bring the context menu and choosing the *Add Style* command.

After creating a style, you should name it and define its visual attributes. For this example, we will need four styles: *number*, *punctuation*, *whitespace*, and *error*. Let us define numbers with olive color and italic text style, punctuation symbols to be blue, and syntax errors to have a red background and white foreground. The *whitespace* style is defined as having no distinct markup.

Note that when the editor is linked to the parser, it takes font styles to render text fragments from the parser's styles instead of using its own *FontStyle*. It applies to all parsers, not just generic ones.

Then we define the states of the parser. For our example language, there will be two states: *default* and *block*. States are defined similarly to styles by choosing the *Add State* command in the context menu when clicking on the *States* node. In turn, states contain syntax blocks created by the *Add Syntax Block* command from the context menu of a state.

A syntax parser is essentially a state machine driven by the text. Transition conditions are expressed in terms of regular expressions, which are checked against the parsed text at the current position up to the next end of the line. Expressions are tried in the syntax block definition order. The first successful match determines the syntax block. The text position is advanced by the length of the match, and the text is assigned the style specified for that syntax block. The matched text is additionally matched against the list of the reserved words associated with this syntax block. If a match occurs, the style defined by the *ResWord Style* is used instead of the one defined by the *Style* property. The state of the state machine is changed according to the *Leave State* property of the syntax block, which can specify any of the states, including the same state in which the syntax block resides, meaning no state transition is to take place.

The state machine for the language we are parsing is described in the following table and deserves some comments.

The *whitespace* syntax block is only necessary because of the presence of a match *all error* syntax block. In the more common case where no error highlighting is used, no style (the same as the *whitespace* style that we have defined) would be used for the text that does not match any syntax blocks. The *error* syntax block is the last in the sequence and matches a single character that any of the preceding rules has not matched. The *block* syntax block is matched when the opening curly bracket is met. The bracket itself is assigned the *punctuation* style, and the state machine changes its state into the *block* state (note that state name, style name, and syntax block style name coincidences are not required).

In the *block* state, the *whitespace*, and *error* syntax blocks serve the same purpose as in the *default* state. *Number* and *comma* syntax blocks cause numbers and commas to have the corresponding styles, and the *end* syntax block, which matches the closing curly bracket, causes the transition back to the default state.

State	Syntax Block	Regular Expression	Style	Leave State
Default				
	whitespace	\s+	whitespace	<i>default</i>
	block	\{	punctuation	block
	error	.	error	<i>default</i>
Block				
	whitespace	\s+	Whitespace	<i>block</i>
	number	\d+	Number	<i>block</i>
	comma	,	Punctuation	<i>block</i>
	End	\}	Punctuation	default
	Error	.	Error	<i>block</i>

Automatic Code Completion for arbitrary programming language

If there is no `<xref:Altnet.Syntax.SyntaxParser>` for your language, you can consider implementing automatic code completion using `<xref:Altnet.Editor.SyntaxEdit.NeedCodeCompletion>` event:

```
private void edit_NeedCodeCompletion(object sender, Altnet.Syntax.CodeCompletionArgs e)
{
    if ((e.CompletionType == CodeCompletionType.ListMembers) ||
        (e.CompletionType == CodeCompletionType.CompleteWord) ||
        ((e.CompletionType == CodeCompletionType.None) && (e.KeyChar == '.')))
    {
        // Look at Manual Code Completion, list members section
        ...
        e.Interval = (e.CompletionType != CodeCompletionType.None)
            ? 0 : 500;
    }
    if(e.CompletionType == CodeCompletionType.ParameterInfo ||
        e.CompletionType == CodeCompletionType.None &&
        e.KeyChar == '(')
    {
        // Look at Manual Code Completion, parameter info section
        ...
        e.Interval = (e.CompletionType != CodeCompletionType.None)
            ? 0 : 500;
    }
}
```

Depending on the kind of language you are working with, and whether you are using some complete library to work with that language or doing everything yourself, the actual information on symbols will be retrieved in different ways:

- if you are using some third-party library, look for something that resembles the name "Symbolic Information API" or like in the manual for that library;
- if you are developing your own language or at least your own engine for some existing language, you probably already know what exactly to do to acquire the information necessary for code completion to work;
- If you are working with the .NET family of languages, CLR Reflection API should be of use for this purpose. The sample program supplied with the package provides a good starting point for working with it.

Manual Code Completion

If you use Code Editor with a parser that does not fully support automatic code completion, you can still provide some guidance to the users as they type by implementing some of the code completion logic manually.

Global Settings

If the application contains more than one instance of the editor, it is often desired to share their UI settings and provide the user with a centralized facility to manage them. Code Editor is shipped with Customize quick start project that demonstrates how this can be accomplished.

It includes the *SyntaxSettings* class which is a holder for the following set of settings:

- The font used to display the text in the editor
- Syntax highlighting styles (i.e., foreground and background colors, font style)
- Whether the following features are enabled or not:
 - Show margin

- Show gutter
- URL highlighting
- Outlining
- Word wrapping
- Use of spaces instead of tabs for indents
- The width of the gutter area
- The position of the margin
- Tab-stop positions
- Navigation options
- Selection options
- Outline options
- Scrollbar options
- Color Themes

To the `GlobalSettings` class, its instance must be created, i.e.:

```
private SyntaxSettings GlobalSettings;  
...  
GlobalSettings = new SyntaxSettings();
```

The settings can be retrieved from some particular `<xref:Altenet.Editor.SyntaxEdit>` controls as follows:

```
GlobalSettings.LoadFromEdit(edit);
```

And then assigned to some other editor like this:

```
GlobalSettings.ApplyToEdit(edit);
```

Settings can be stored in the file:

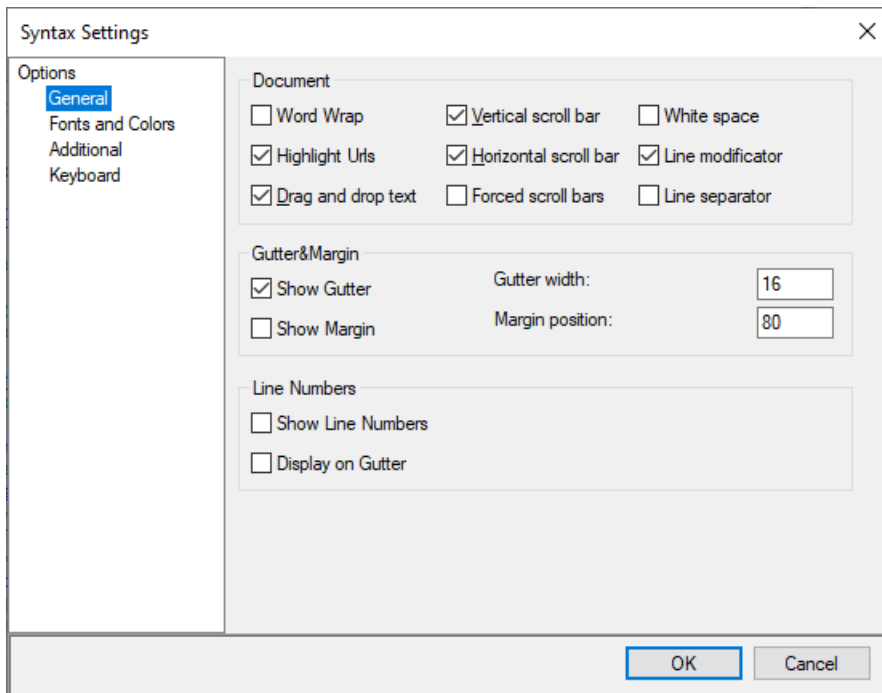
```
GlobalSettings.SaveFile("GlobalSettings.xml");
```

And later on, loaded from that file:

```
GlobalSettings.LoadFile("GlobalSettings.xml");
```

As the file's name suggests, settings are stored in XML format. Note that in the real application, you would check for the existence of that file, and also, this file should probably be located somewhere down the user's *Application Data* folder.

To make handling the global settings even easier, the *Customize* demo project includes an example settings dialog.



All you need to do to use it is to declare and construct its instance:

```
using Alternet.Editor.Dialogs;
using Alternet.Editor.Wpf.Dialogs; // for WPF edition
...
private DlgSyntaxSettings Options;
...
Options = new DlgSyntaxSettings();
```

And later on, when the user requests the editor settings dialog, perform something similar to the following:

```
Options.SyntaxSettings.Assign(GlobalSettings);
if(Options.ShowDialog() == DialogResult.OK)
{
    GlobalSettings.Assign(Options.SyntaxSettings);
    // for each syntaxEdit or TextEditor used in the application
    GlobalSettings.ApplyToEdit(edit);
}
```

Localization of dialogs

All string constants used in dialogs are localized to a few foreign languages. CodeEditor supports dialog localization to German, French, Spanish, Russian, and Ukrainian languages. The following code demonstrates how to switch to the German language:

```
Using Alternet.Common;
...
CultureInfo oldcInfo = Thread.CurrentThread.CurrentUICulture;
Thread.CurrentThread.CurrentUICulture = new CultureInfo("de");
try
{
    StringConsts.Localize();
}
finally
{
    Thread.CurrentThread.CurrentUICulture = oldcInfo;
}
```

Scripter Overview

AlterNET Scripter is a component library designed to integrate C#, Visual Basic, TypeScript, JavaScript, Python, and IronPython scripts into your WinForms and WPF .NET desktop applications. It allows extending the application logic by implementing custom functionality or automating custom tasks without recompiling and redeploying the application.

Script Execution

The main components that provide script-executing functionality for supported programming languages are:

<xref:Alternet.Scripter.ScriptRun> for C# and VisualBasic; <xref:Alternet.Scripter.Python.ScriptRun> for Python;

<xref:Altneret.Scripter.IronPython.ScriptRun> for IronPython and <xref:Altneret.Scripter.TypeScript.ScriptRun> for TypeScript and JavaScript. These components encapsulate the functionality of running standalone C#, Visual Basic, Python, IronPython, TypeScript, and JavaScript script files or projects with forms and resources; they allow referencing third-party assemblies and registering application-defined objects to be accessible in the scripts.

AlterNET Software Demo Explorer

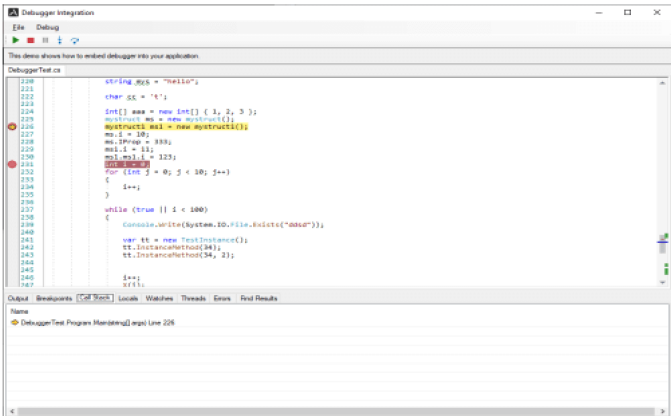
- Studio for C#/Visual Basic
 - WinForms
 - AlterNET Studio
 - Code Editor
 - Syntax Editor
 - Form Designer
 - QuickStart Projects
 - Editor
 - Scripter
 - Debugger
 - Debugger Integration**
 - Debug My Script
 - Debug Remote Script
 - Designer
 - WPF
- Studio for Python
 - WinForms
 - WPF
- Studio for IronPython
 - WinForms
 - WPF
- Studio for TypeScript
 - WinForms
 - WPF
- Studio for LSP/DAP
 - WinForms
 - WPF

Debugger Integration

This demo shows how script debugger control can be integrated into the application.

More Information:

Script Debugger includes ready-to-use Breakpoints, Call Stack, Output, Error List, Watches, Local Variables UI controls as well as Debugger Toolbar and Menu.



Run

Open Project

Script Debugging

The following components provide a fully-featured script debugging engine for the supported programming languages:

<xref:Altenet.Scripter.Debugger.ScriptDebugger> for C# and VisualBasic;

<xref:Alternet.Scripter.Debugger.Python.ScriptDebugger> for Python;

<xref:Alternet.Scripter.Debugger.IronPython.ScriptDebugger> for IronPython;

<xref:Altenet.Scripter.Debugger.TypeScript.ScriptDebugger> for TypeScript and JavaScript.

<xref:Alternet.Scripter.Debugger.Dap.ScriptDebugger> for debugger that relies on Debugger Adapter Protocol.

These debuggers support Start, Stop, Break and Continue commands, step-by-step execution, breakpoints, expression evaluation, viewing local variables and watches, stack tracing, and in the case of C#/VisualBasic, multiple thread debugging.

AlterNET Scripter includes a set of quick-start projects, each designed to highlight the component's specific features.

Below is a brief overview of these projects, most of them available for C#/Visual Basic, Python, IronPython, and TypeScript

AlterNET Studio - demonstrate how to run and debug script files and projects. Example files and projects are located in the demo\resources\debugger folders.

CallMethod - a set of quick-start projects for all supported languages which demonstrate how to execute script methods and pass application objects to the script.

CustomAssembly - demonstrates how to use external assemblies in the scripts

EvaluateExpression - shows how ScriptRun can evaluate expressions, which again can access some objects defined in the application

Object Reference - shows how application-defined objects can be accessed by name from the script.

Threading - shows how scripts can run asynchronously.

DebuggerIntegration - Shows how debugger logic can be integrated into the application to debug scripts (application-independent scripts in case of C#/Visual Basic).

For C#/Visual Basic only:

DebugMyScript - demonstrates how scripts executed by the application can be debugged by a separate Script Debugger tool.

DebugRemoteScript - Shows how debugger logic can be embedded in the application to debug scripts that access the application API indirectly.

Isolated script - Shows how to load a script in the separate AppDomain so that it can be unloaded afterward and execute methods in it.

For Debugger Adapter Protocol (DAP):

CppLlvmDapDebugger - Shows how debugger logic can be integrated into the application to debug standalone C++ projects.

PythonDapDebugger - Shows how debugger logic can be integrated in the application to debug standalone Python projects.

Creating your first project

To see C# scripting in action, place the `<xref:Alternet.Scripter.ScriptRun>` component on the form, and write the following code in the Button click event handler:

```
scriptRun1.ScriptSource.FromScriptCode("public class ScriptTest { public static void Main() {  
System.Windows.Forms.MessageBox.Show(\"Hello World \");} }");  
scriptRun1.ScriptSource.WithDefaultReferences();  
scriptRun1.Run();
```

The first line of the code populates the Script source, the second line adds references to the most common System assemblies, and the third runs the code.

C# and Visual Basic Script execution

The basic script execution workflow requires setting a script source, adding references to the assemblies used in the script; registering application-defined objects accessible to the script; compiling the script to a dynamically-linked library or standalone executable program, and running some method in that DLL or executing the program.

Setting up Script Source

All properties and methods required to set a script source are encapsulated in `<xref:Alternet.Scripter.ScriptRun.ScriptSource>` property of the `<xref:Alternet.Scripter.ScriptRun>` class; below are the essential ones:

`<xref:Alternet.Scripter.IScriptSource.Files>` - specifies a collection of source files to be compiled and executed;

`<xref:Alternet.Scripter.ScriptSource.ScriptCode>` - specifies source in a form of text string;

`<xref:Alternet.Scripter.ScriptSource.ProjectName>`, `<xref:Alternet.Scripter.ScriptSource.ProjectFileName>` and `<xref:Alternet.Scripter.IScriptSource.RootNamespace>` - contain project-related information if `ScriptSource` is loaded from the project.

`<xref:Alternet.Scripter.IScriptSource.Imports>` - contains global namespaces in case Visual Basic is used, so you do not need to specify them in the code;

`<xref:Alternet.Scripter.IScriptSource.Conditionals>` - contains lists conditional compilation symbols;

`<xref:Alternet.Scripter.IScriptSource.References>` - contains a list of assembly references for types used in the scripts; this can include reference to the calling application.

`<xref:Alternet.Scripter.IScriptSource.SearchPaths>` - contains search paths to look for the third-party references in case they're not supplied with a full path.

`<xref:Alternet.Scripter.IScriptSource.Resources>` - contains a list of RESX files with resources.

`<xref:Alternet.Scripter.IScriptSource.FromScriptFile*>` - loads Script Source from the single source file;

`<xref:Alternet.Scripter.IScriptSource.FromScriptCode*>` - loads script from code in the form of a text string;

`<xref:Alternet.Scripter.IScriptSource.FromExpression*>` - sets `ScriptSource` to the string expression.

`<xref:Alternet.Scripter.IScriptSource.FromScriptProject*>` - loads code from Visual Studio Project

Adding assembly references:

The assemblies where these types are declared need to be referenced so that the script can use their types.

The following code populates references with the most commonly used assemblies:

```
scriptRun1.ScriptSource.WithDefaultReferences();
```

For technology set to WinForms (which is the default option), it contains the following assemblies:

System, System.Drawing System.WindowsForms;

Note that this list is different in the case of .NET Core targets.

You can reference additional assemblies by adding them to the `References` property:

```
scriptRun1.ScriptSource.References.Add("System.Data");
```

This method accepts a full path; you can also add references to third-party assemblies if the script uses types from it.

Registering objects to be used in the script

Application objects accessible by the script need to be added to the GlobalItems collection, along with the object's name, which will be used in the script, and the object's type or the object itself.

Object value itself is only required during script execution; for script compilation, object name and type are sufficient.

<xref:Alternet.Scripter.ScriptRun> adds references to the assemblies, which contain types of the objects being added to <xref:Alternet.Scripter.ScriptRun.GlobalItems> automatically.

Note that <xref:Alternet.Scripter.ScriptRun.AssemblyKind> property needs to be set to Dynamically Linked Library for it to be loaded in the running application process and be able to access application-defined objects.

Below is a sample code that registers application-defined objects in the script.

```
public class MyItem
{
    public MyItem(string text)
    {
        this.Text = text;
    }
    public string Text;
}
scriptRun1.GlobalItems.Add(new ScriptGlobalItem("MyItem", obj: new MyItem("hello")))
```

Script Compilation and Execution

Once <xref:Alternet.Scripter.ScriptRun.ScriptSource> is set, next step is to Compile the script; this step is performed implicitly when the script runs the first time or when the Script source is changed (this includes changes of script files externally)

Script compilation engine is implemented by <xref:Alternet.Scripter.IScriptHost>; there are two implementations of <xref:Alternet.Scripter.IScriptHost> provided: a legacy engine based on <xref:Alternet.Scripter.CodeDOM.CodeDOMScriptHost> wrapper around command-line C# or Visual Basic compiler, and <xref:Alternet.Scripter.Roslyn.RoslynScriptHost> based on new Microsoft Roslyn Code compiler technology - the last one is used by default, and it allows some additional features such as referencing to another script source dynamically by using #load directive and gives more control on code parsing and compilation.

Scripts can be compiled into a dynamically-linked library or in a standalone executable; this is controlled by the <xref:Alternet.Scripter.ScriptRun.AssemblyKind> property. <xref:Alternet.Scripter.IScriptHost.GenerateModulesOnDisk> allows to control whether the assembly being compiled will reside in memory or on the disk; and <xref:Alternet.Scripter.IScriptHost.ModulesDirectoryPath> specifies the location of compiled assembly where compiled modules will be stored. Platform target (AnyCPU, AnyCpu32BitPreferred, x86, x64, or Auto) is controlled by Platform property (by default, it's set to Auto and takes the target platform from the application).

Once the compilation is executed, the Compiled property will be set to true in case compilation was successful, and <xref:Alternet.Scripter.IScriptHost>'s <xref:Alternet.Scripter.IScriptHost.ScriptAssembly> property will point to the assembly compiled from the script source. Otherwise <xref:Alternet.Scripter.IScriptHost>'s properties <xref:Alternet.Scripter.IScriptHost.CompileFailed> will be set to true and <xref:Alternet.Scripter.IScriptHost.CompilerErrors> will be populated with compiler errors. Please note, <xref:Alternet.Scripter.IScriptHost.CompilerErrors> may contain compiler warnings even in case of successful compilation.

Upon successful compilation, you can subsequently call <xref:Alternet.Scripter.ScriptRun.Run*>, <xref:Alternet.Scripter.ScriptRun.RunMethod*>, or their asynchronous variants: <xref:Alternet.Scripter.ScriptRun.RunAsync*> and <xref:Alternet.Scripter.ScriptRun.RunMethodAsync*>; in case of standalone executable

<xref:Alternet.Scripter.ScriptRun.RunProcess*> should be used instead.

Python and IronPython Script Execution and Debugging

Scripter contains components that implement python script compilation, execution, and debugging. These components are [<xref:Alternet.Scripter.Python.ScriptRun>](#) and [<xref:Alternet.Scripter.Debugger.Python.ScriptDebugger>](#) for Python and [<xref:Alternet.Scripter.IronPython.ScriptRun>](#) and [<xref:Alternet.Scripter.Debugger.IronPython.ScriptDebugger>](#)

These components are installed on the AlterNet Scripter.Python and AlterNet Scripter.IronPython tabs in Visual Studio.

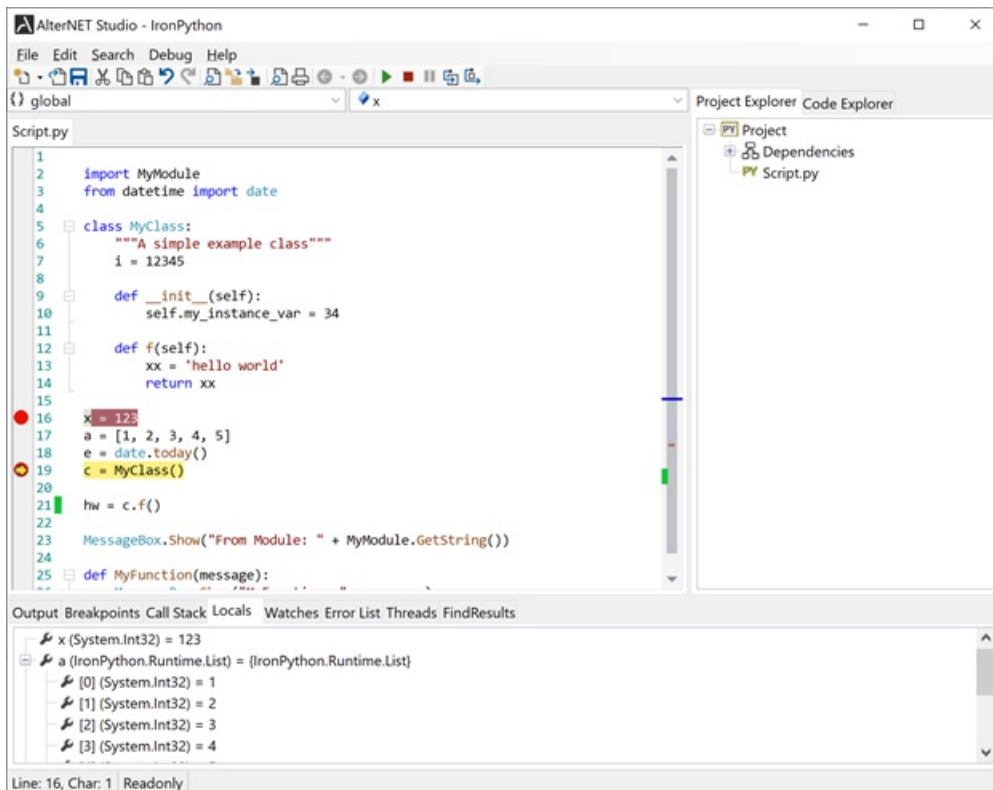
Script execution is based on the Python.NET and IronPython open-source scripting engines, allowing Python programmers seamlessly integrate python code with the .NET framework. These engines support executing Python code and accessing .NET types and objects of the host application from the script.

[<xref:Alternet.Scripter.Python.ScriptRun>](#) and [<xref:Alternet.Scripter.IronPython.ScriptRun>](#) provides a very similar interface to .NET [<xref:Alternet.Scripter.ScriptRun>](#); the former uses Python to execute Python scripts, while the latter creates in-memory .NET assembly out of Python code.

[<xref:Alternet.Scripter.Python.ScriptRun>](#) and [<xref:Alternet.Scripter.IronPython.ScriptRun>](#) can execute single files, Python projects (which can be loaded/saved to a .pyproj file), or evaluate Python expressions.

The main difference between Python.NET and IronPython scripting engines is that Python.NET supports up to Python 3.7 language specification and can use most third-party libraries like NumPy or Pandas that rely on Python/Cython code. In comparison, IronPython supports up to Python 2.7 language specification. It also provides multi-threading script execution capabilities, unlike Python.NET, which can not execute scripts in multiple threads simultaneously.

[<xref:Alternet.Scripter.Debugger.Python.ScriptDebugger>](#) and [<xref:Alternet.Scripter.Debugger.IronPython.ScriptDebugger>](#) are based on Microsoft.Scripting debugging engine; they allow incorporating debugging logic in the same application and do not have a limitation of .NET debugger, which requires a debugger and script to be debugged running in the separate application processes. It has most of the functionality that the .NET Script debugger provides, except for multi-threaded debugging.



TypeScript/JavaScript Script Execution and Debugging

Alongside component libraries for .NET and Python-based script compilation, execution, and debugging, we provide very similar components for TypeScript/JavaScript: [<xref:Alternet.Scripeter.TypeScript.ScriptRun>](#) and [<xref:Alternet.Scripeter.Debugger.TypeScript.ScriptDebugger>](#)

These components are installed on the AlterNet Scripeter.TypeScript tab in Visual Studio.

Script execution is based on Microsoft ClearScript, which provides the v8 high-performance open-source JavaScript engine. It supports executing JavaScript code and accessing .NET types and objects of the host application from the script.

[<xref:Alternet.Scripeter.TypeScript.ScriptRun>](#) provides a very similar interface to .NET [<xref:Alternet.Scripeter.ScriptRun>](#); the main difference is that it does not create .NET assembly and executes JavaScript code using the ClearScript engine.

The main difference in API is that, unlike .NET Script Runner, the collection of referenced objects, types and .NET assemblies is specified via [<xref:Alternet.Scripeter.TypeScript.IScriptHost.HostItemsConfiguration>](#) property; as opposed to [<xref:Alternet.Scripeter.ScriptRun.GlobalItems>](#)/[<xref:Alternet.Scripeter.IScriptSource.References>](#) properties; [<xref:Alternet.Scripeter.ScriptRun.RunMethod*>](#)/[<xref:Alternet.Scripeter.ScriptRun.RunMethodAsync*>](#) are replaced with [<xref:Alternet.Scripeter.TypeScript.ScriptRun.RunFunction*>](#)/[<xref:Alternet.Scripeter.TypeScript.ScriptRun.RunFunctionAsync*>](#).

The following code adds references to the most commonly used assemblies and registers RunButton to be accessible from the script:

```
```csharp scriptRun.ScriptHost.HostItemsConfiguration.AddSystemAssemblies().AddObject("RunButton", btNETFromScript);
```

[<xref:Alternet.Scripeter.TypeScript.ScriptRun>](#) can execute single files, typescript projects (which can be loaded/saved to a JSON file), or evaluate TypeScript/JavaScript expressions.

**\*\*Note\*\*** that order of TypeScript/JavaScript files in a project is important, as they get executed one by one.

TypeScript compilation service uses host configuration to automatically create all support files containing typescript definitions. The following line needs to be placed on top of the user's script to access .NET types and objects from the host configuration:

```
///
```

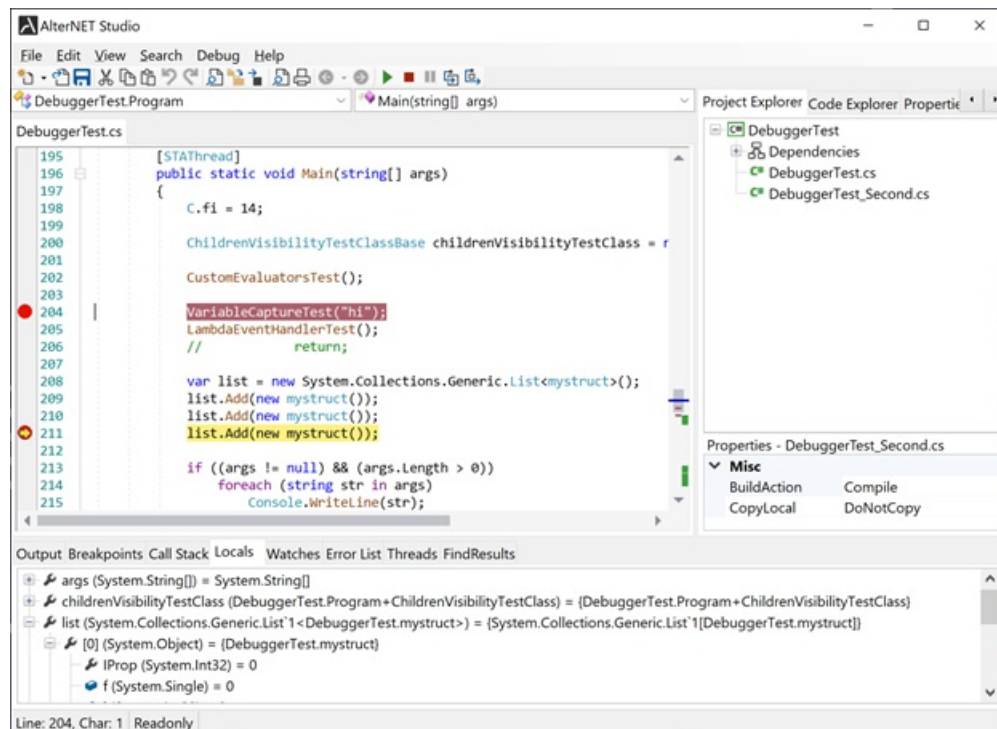
[<xref:Alternet.Scripeter.Debugger.TypeScript.ScriptDebugger>](#) is based on Google Chrome debugging development tools; it allows incorporating debugging logic in the same application and does not have the limitation of the .NET debugger, which requires a debugger and script to be debugged running in the separate application processes. It has most of the functionality that the .NET Script debugger provides, except for multi-threaded debugging and automatic retrieval/evaluation of local variables.

![TypeScriptDebugger](images/TypeScriptDebugger.png)



# Script Debugging

A lot of times, an application developer needs to allow users to debug the scripts they write. We provide tools to debug script code and a set of UI widgets to build custom debugging interfaces.



## C# and Visual Basic Script Debugging

Script Debugger engine is implemented in `<xref:Alternet.Scripter.Debugger>` assembly, and it is based on CLR debugging COM interfaces low-level API to debug .NET applications.

[https://msdn.microsoft.com/en-US/library/ms404484\(v=vs.110\).aspx](https://msdn.microsoft.com/en-US/library/ms404484(v=vs.110).aspx)

The main component of script debugging is the `<xref:Alternet.Scripter.Debugger.ScriptDebugger>` class. It provides all commonly used debugging features like step-by-step execution, stopping on breakpoints, examining local variables, expression evaluations, etc.

Below is a summary of `<xref:Alternet.Scripter.Debugger.ScriptDebugger>` most essential properties, methods, and events:

### Methods:

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.StartDebugging>` - starts executing the program from the entry point.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.AttachToProcessAsync*>` - Attaches to the already started process in which scripts are to be debugged.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.StopDebuggingAsync*>` - Stops the debugging session.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.Break>` - Causes the given process to pause its execution so that its current state can be analyzed.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.Continue>` - Continues given process to the next breakpoint or until the process finishes.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.StepInto>` - Executes one statement of code; steps into the following function call, if possible.

`<xref:Alternet.Scripter.Debugger.ScriptDebugger.StepOver>` - Executes one statement of code; steps over the following function

call, if possible.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.StepOut> - Executes remaining lines of the function; steps out of the currently executed function.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.ActivateThread\*> - Switches debugging to the specified thread.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.SwitchToStackFrame\*> - Switches debugging to the given stack frame.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.SetRunToPositionBreakpoint\*> - Causes the debugger to stop at the specified position.

Following methods may take a considerable amount of time. Therefore they're implemented asynchronously:

<xref:Alternet.Scripter.Debugger.ScriptDebugger.EvaluateExpressionAsync\*> - Evaluates expression in the current stack frame, with or without child properties.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.EvaluateCurrentExceptionAsync\*> - Evaluates the exception thrown by the debugger.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.GetStackFramesAsync\*> - Gets a list of method calls currently on a stack.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.GetThreadsAsync\*> - Gets a list of active threads.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.GetVariablesInScopeAsync\*> - Gets all local variables in the given stack frame.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.TrySetNextStatementAsync\*> - Sets the execution point to the specified line.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.GetExecutionPositionAsync\*> - Gets the current execution point.

#### Properties:

<xref:Alternet.Scripter.Debugger.ScriptDebugger.IsStarted> - Indicates whether the debug process has started.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.State> - Gets current debugger state.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.ScriptRun> - in case Debugger used to debug standalone executable, contains all information required to compile and run the script.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.GeneratedModulesPath> - Specifies a directory where assemblies for the scripts being debugged are located.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.Breakpoints> - Returns collection of debugger breakpoints.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.EventsSyncAction> - A function that could be provided by the application to sync raised debugger events if required (for example, perform Control.Invoke)

#### Events:

<xref:Alternet.Scripter.Debugger.ScriptDebugger.ActiveThreadChanged> - Occurs when the thread to be debugged changes.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.DebuggerErrorOccured> - Occurs when the debugger encounters an error during debugging session.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.DebuggingStarted> - Occurs when the debugging session is started.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.DebuggingStopped> - Occurs when the debugging session is stopped.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.ExecutionResumed> - Occurs when debugging is resumed after being paused.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.ExecutionStopped> - Occurs when debugging is paused.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.LogMessageReceived> - Occurs when a debug message is received.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.StackFrameSwitched> - Occurs when the debugger is switched to the stack frame.

<xref:Alternet.Scripter.Debugger.ScriptDebugger.StateChanged> - Occurs when debugging state is changed (when the debugger is started, stopped, or paused)

## .NET Script Debugging best practices

The main issue we've faced with debugging is that it's impossible to embed debugging logic in the same process where scripts are executed, as the debugger process will need to freeze itself when debugging. Refer to the following blog for more details:

<https://blogs.msdn.microsoft.com/jmstall/2005/11/05/you-cant-debug-yourself/>

Therefore we see two main options for script debugging to work:

1. Script is compiled as a dynamically linked library and is linked to the calling application (which is the most straightforward way for scripts to be able to access application-defined objects). In this case Script debugger must be a separate process that attaches to the primary application process and allows to debug script code in it. The script debugger can be made look like it belongs to the same application (which is outside of the scope of this tutorial), but it has to be in a separate process.

In this mode, Script Debugger does not compile or execute the script itself; instead, it relies on the primary application. It receives the application process id, source, and project file along with the name of the assembly to be debugged via command-line arguments; attaches to the application process and communicates with it by sending Start Debug or Stop Commands and receiving a list of compilation errors or script completion events.

Refer to DebugMyScript quickstart projects for more details.

Note that you cannot debug the main application under Visual Studio and have Script Debugger attached to it simultaneously, as Visual Studio will attach its own debugger.

Note that the target platform of the debugger and debuggee process need to be the same (for AlterNET Studio demo, it's set to AnyCPU).

1. Script to be compiled in the separate executable, and debugging logic is embedded in the application itself. This option requires either the script to be application-independent (which is not helpful if scripts are intended to extend application logic) or access application-defined objects via interprocess-communication. Please refer to our DebuggerIntegration/DebugRemoteScript quickstart projects for more details.

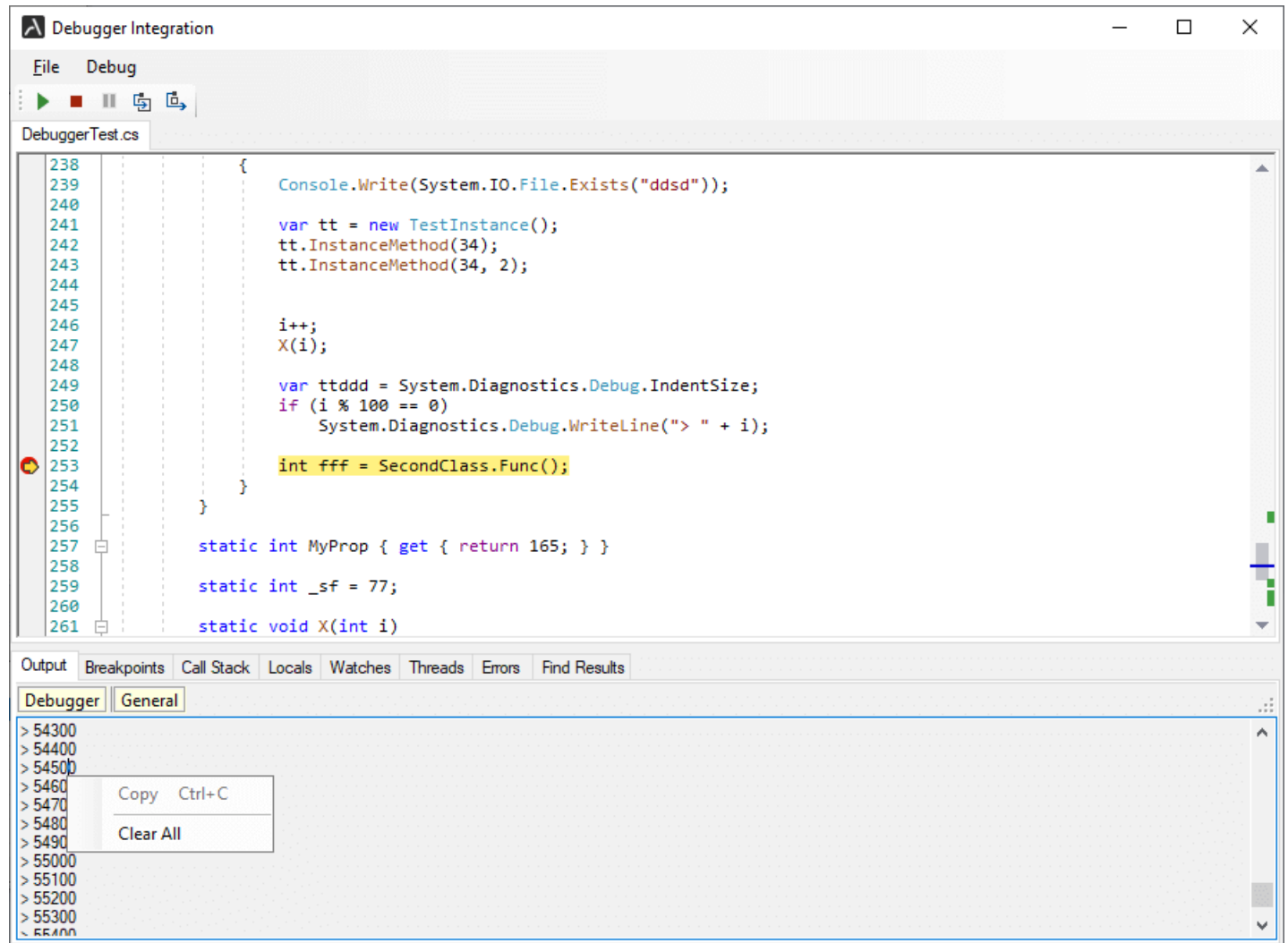
These limitations do not apply to Python, IronPython, and TypeScript script debuggers.

# Script Debugging Widgets

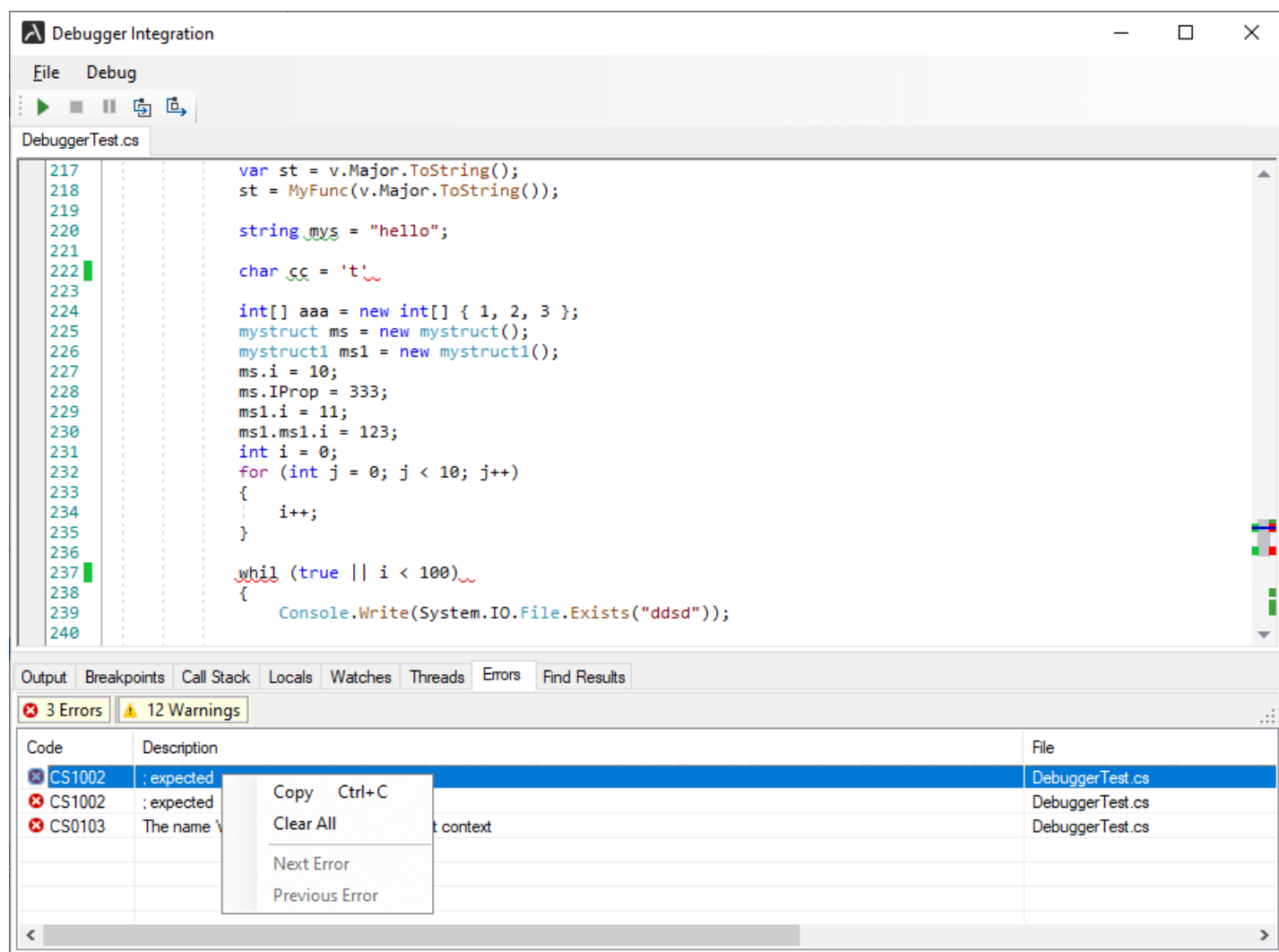
Scripter package includes a set of debugger widgets, toolbars, menus, and code editors available both for WinForms and WPF and can be linked to any Debugger components for C#/VisualBasic, Python/IronPython, TypeScript/JavaScript, and Debug Server Protocol-based debuggers.

These widgets include:

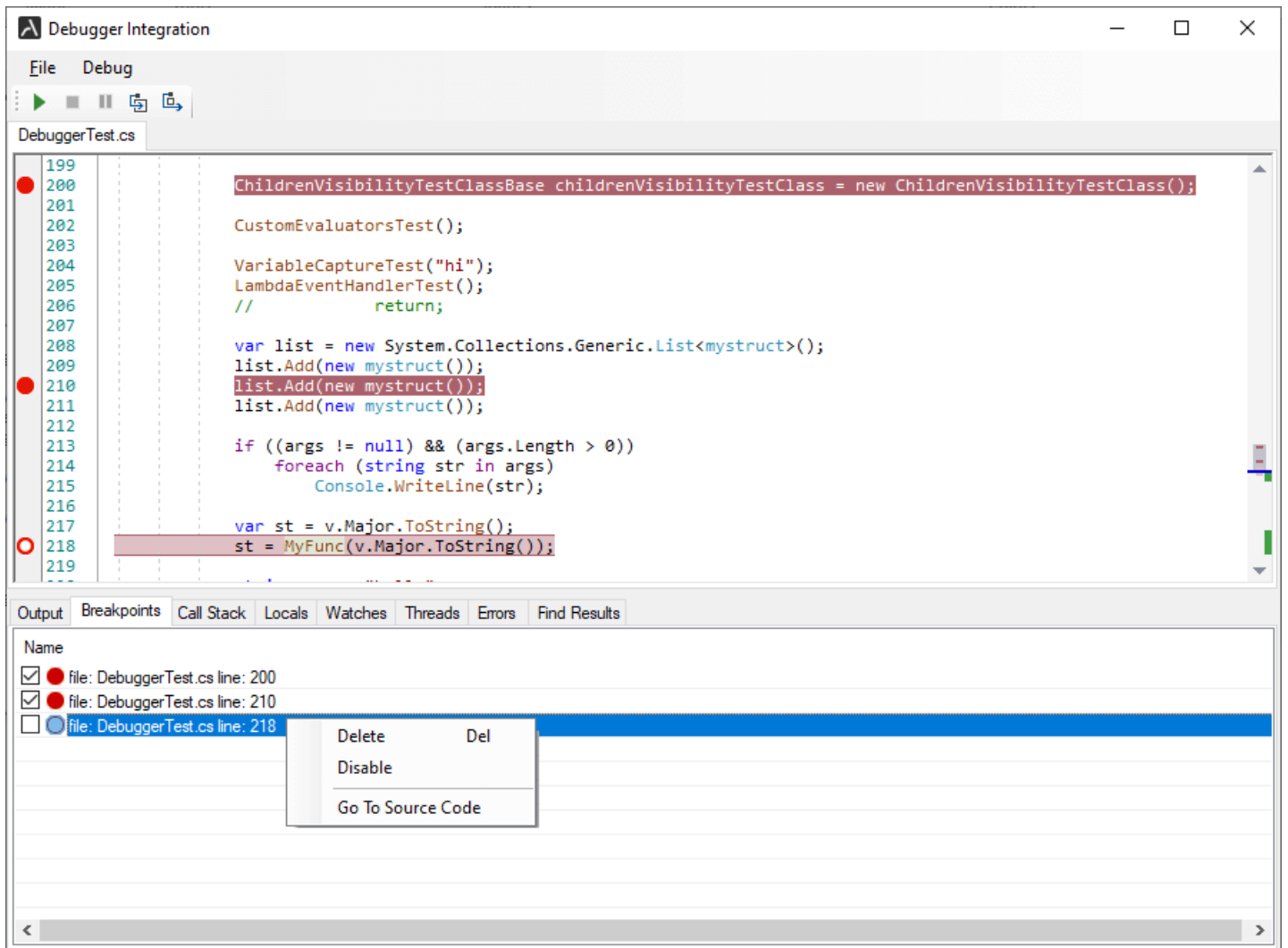
<xref:Altneret.Scripter.Debugger.UI.Output> (<xref:Altneret.Scripter.Debugger.UI.Wpf.Output>) - to log debugger events or application-specific messages.



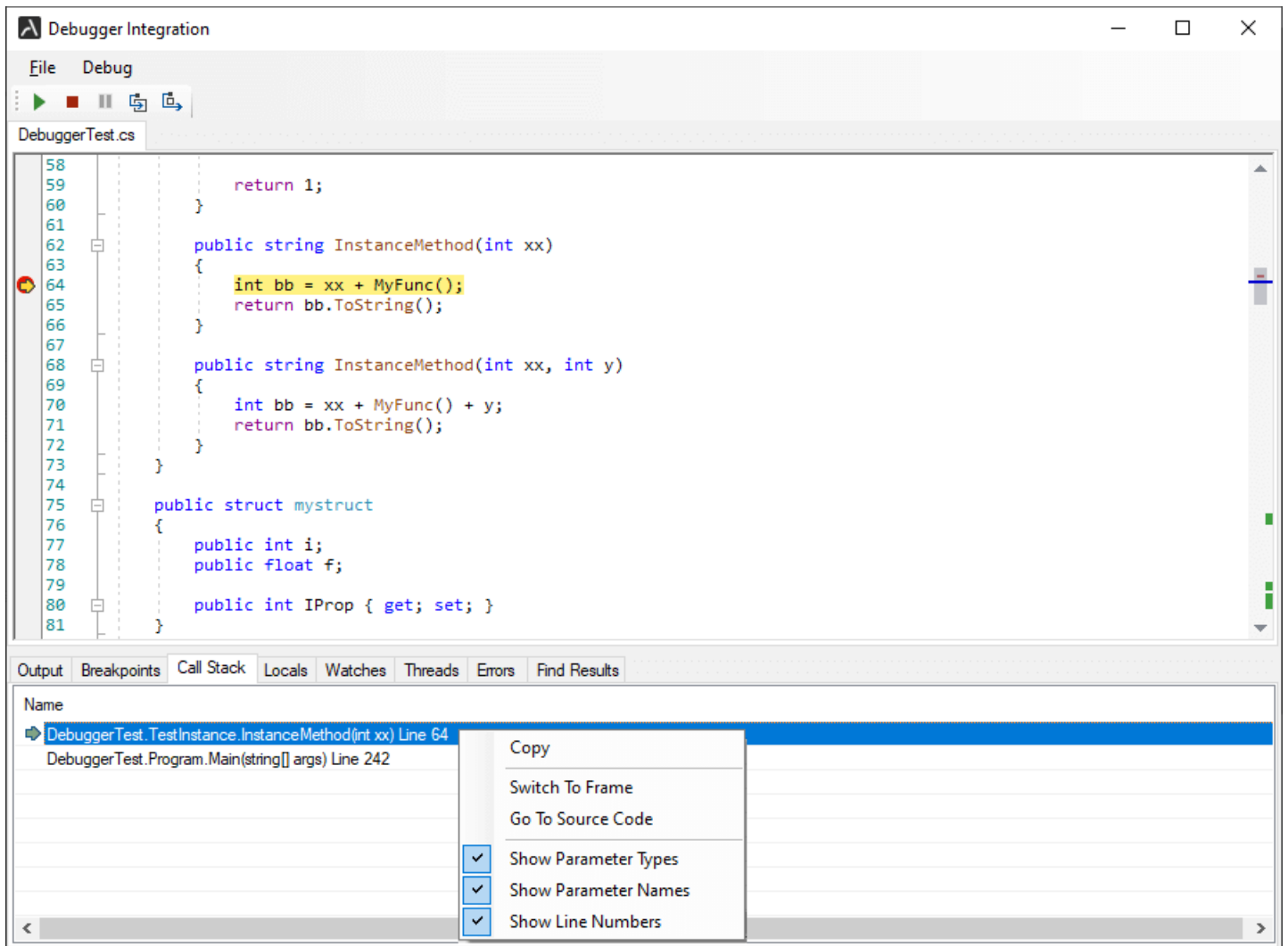
<xref:Altneret.Scripter.Debugger.UI.Errors> (<xref:Altneret.Scripter.Debugger.UI.Wpf.Errors>) - to display a list of compilation errors.



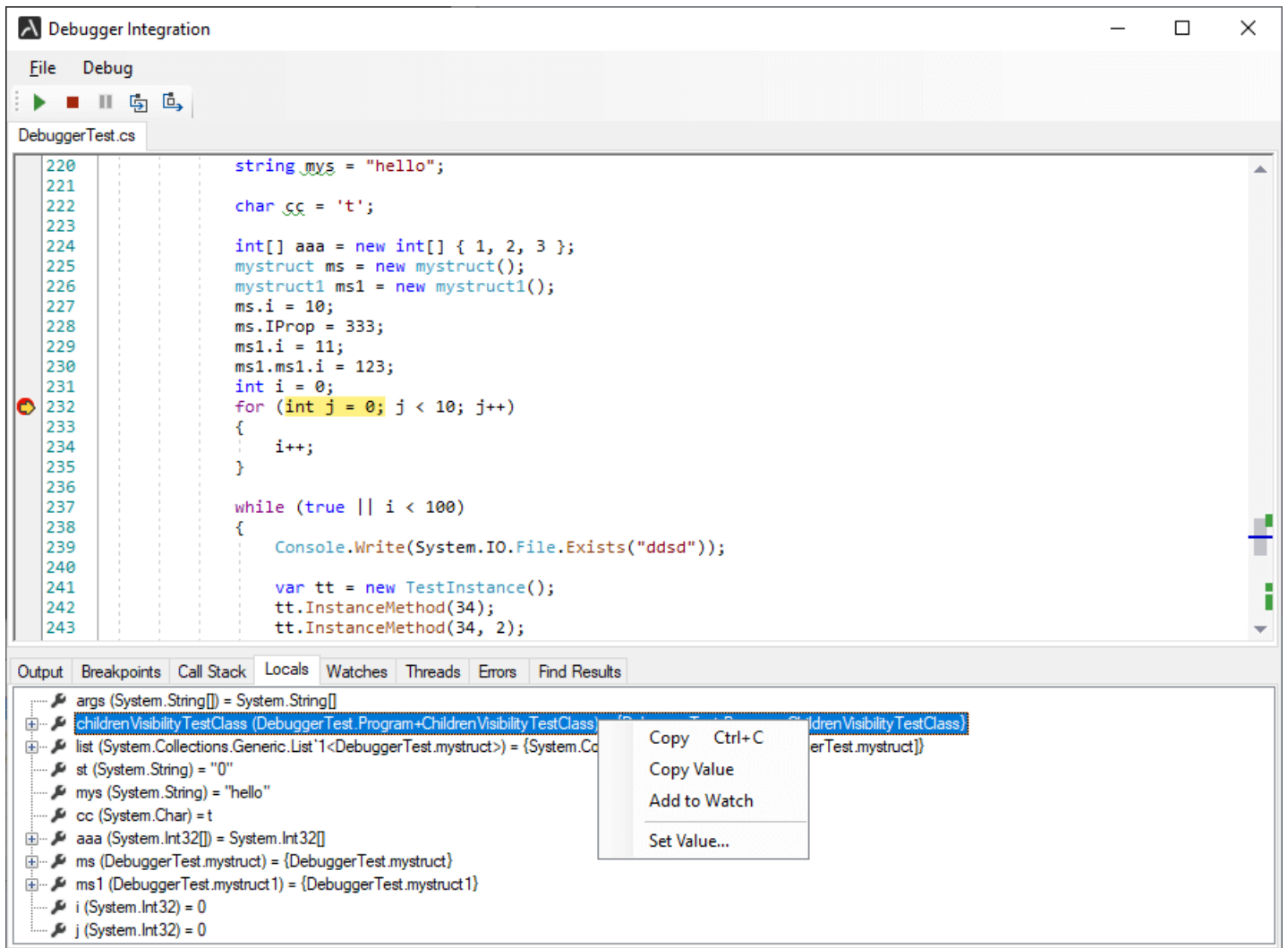
<xref:Alternet.Scripter.Debugger.UI.Breakpoints> (<xref:Alternet.Scripter.Debugger.UI.Wpf.Breakpoints>)- to display and navigate through the list of breakpoints set in the source;



<xref:Altenet.Scripter.Debugger.UI.CallStack> (<xref:Altenet.Scripter.Debugger.UI.Wpf.CallStack>)- to display and navigate through the list of method calls that are currently on the stack.

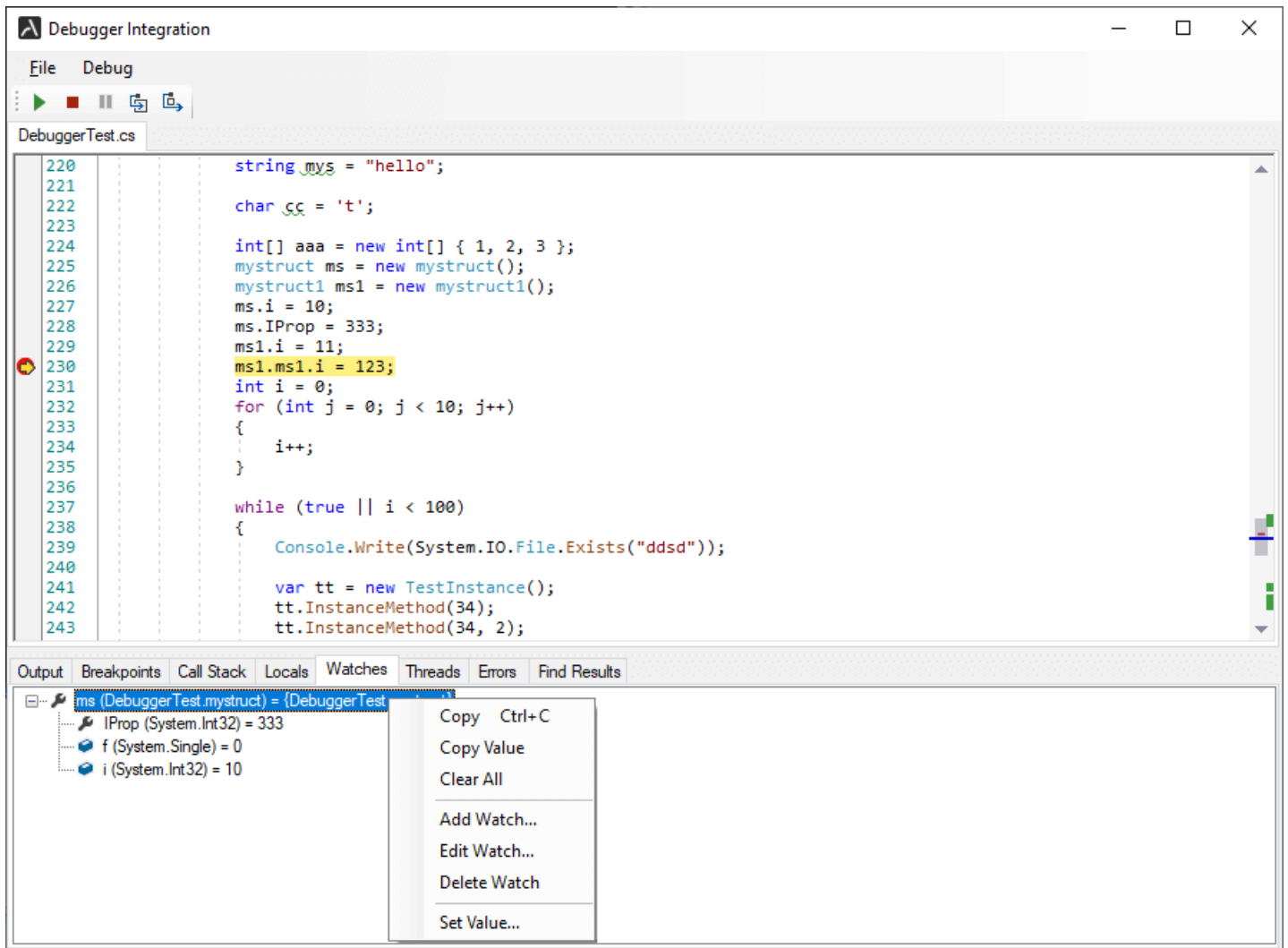


<xref:Alternet.Scripter.Debugger.UI.Locals> (<xref:Alternet.Scripter.Debugger.UI.Wpf.Locals>)- to examine values of local variables once debugging code step-by-step.



<xref:Alternet.Scripter.Debugger.UI.Watches> (<xref:Alternet.Scripter.Debugger.UI.Wpf.Watches>)- to examine values of watch expressions when debugging.





<xref:Altnet.Scripter.Debugger.UI.Threads> (<xref:Altnet.Scripter.Debugger.UI.Wpf.Threads>)- to display active threads and switch debugging between them.

Debugger Integration

File
Debug

Threads.cs

```

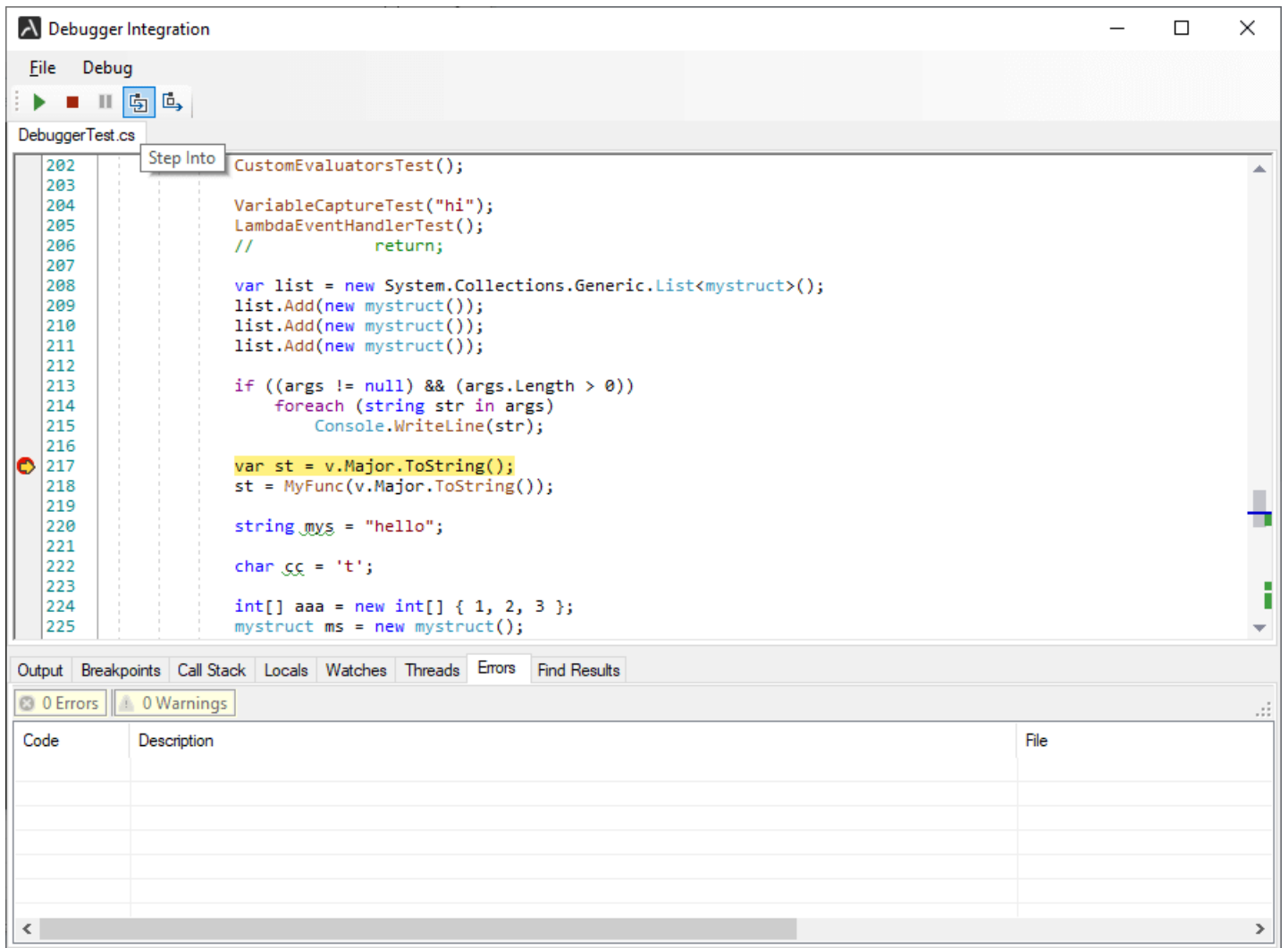
38
39
40 lock (consoleSync)
41 Console.WriteLine(value);
42 }
43 }
44
45 [STAThread]
46 public static void Main()
47 {
48 const int ProducerCount = 4;
49 const int ConsumerCount = 3;
50
51 for (int i = 0; i < ProducerCount; i++)
52 new Thread(ProducerThreadProc) { IsBackground = true }.Start();
53
54 for (int i = 0; i < ConsumerCount; i++)
55 new Thread(ConsumerThreadProc) { IsBackground = true }.Start();
56
57 Thread.Sleep(Timeout.Infinite);
58 }
59
60

```

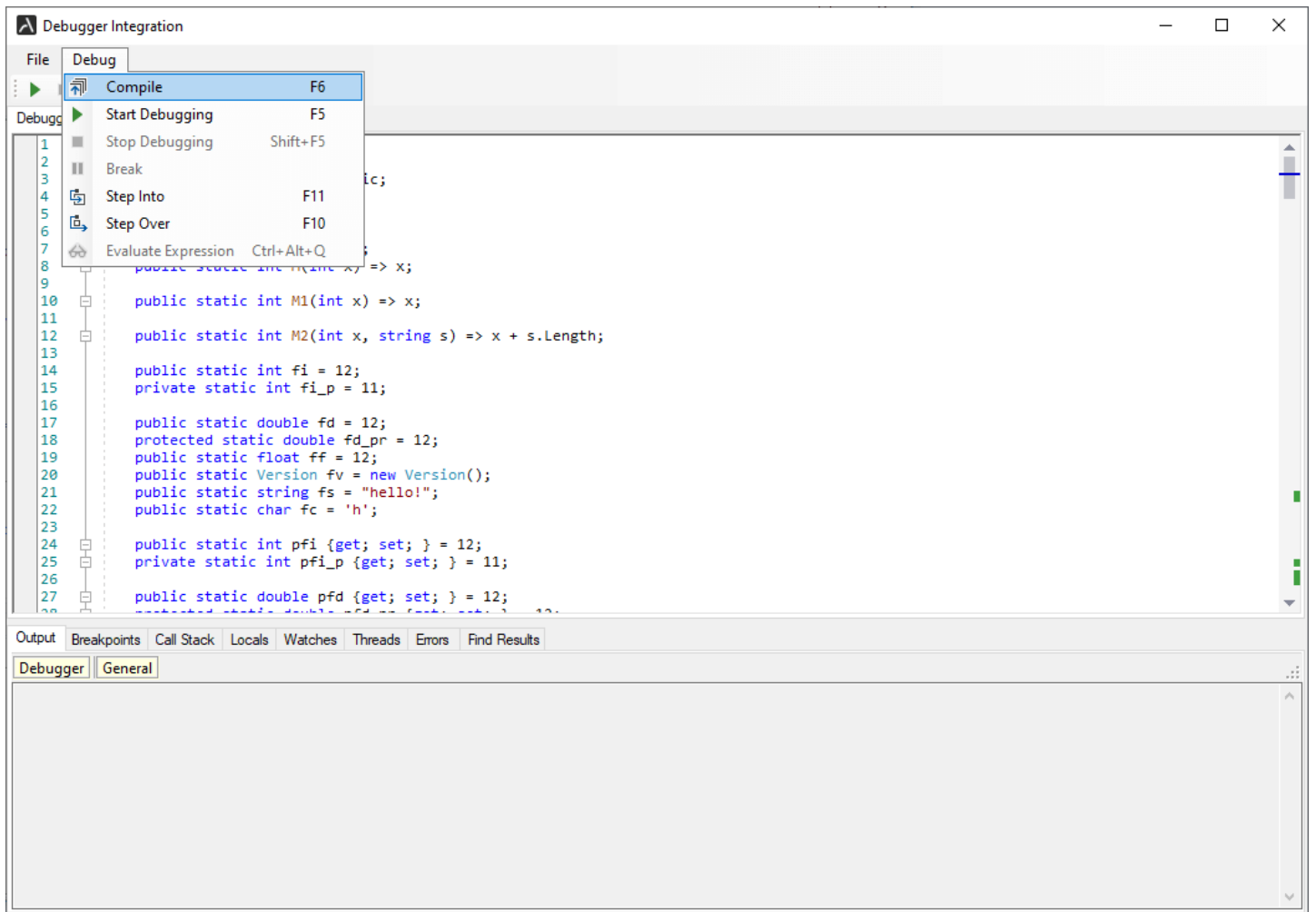
Output
Breakpoints
Call Stack
Locals
Watches
Threads
Errors
Find Results

Name	ID
<b>Threads.cs</b>	<b>20532</b>
Threads.cs	22460
Threads.cs	22128

<xref:Alternet.Scripter.Debugger.UI.DebuggerControlToolbar>  
 (<xref:Alternet.Scripter.Debugger.UI.Wpf.DebuggerControlToolbar>)- a toolbar with buttons executing  
 Run/Stop/StepInto/StepOver commands.



<xref:Alternet.Scripter.Debugger.UI.DebugMenu> (<xref:Alternet.Scripter.Debugger.UI.Wpf.DebugMenu>) - menu with menu items executing Run/Stop/StepInto/StepOver commands.



<xref:Alternet.Scripter.Integration.DebugCodeEdit> (<xref:Alternet.Scripter.Integration.Wpf.DebugCodeEdit>) code-editing controls designed to work with the Script debugger; these controls allow the user to set or remove breakpoints and evaluate expressions by hovering the mouse over the symbol during debugging.

Debugger Integration

File

Debug

DebuggerTest.cs

204

205

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VariableCaptureTest("hi");

LambdaEventHandlerTest();

// return;

var list = new System.Collections.Generic.List<mystruct>();

list.Add(new mystruct());

list.Add(new mystruct());

list.Add(new mystruct());

if ((args != null) && (args.Length > 0))

foreach (string str in args)

Console.WriteLine(str);

var st = v.Major.ToString();

st = MyFu int System.Version.Major

Gets the value of the major component of the version number for the current System.Version object.

string my = "hello";

char cc = 't';

int[] aaa = new int[] { 1, 2, 3 };

mystruct ms = new mystruct();

mystruct1 ms1 = new mystruct1();

ms.i = 10;

Output

Breakpoints

Call Stack

Locals

Watches

Threads

Errors

Find Results

Debugger

General

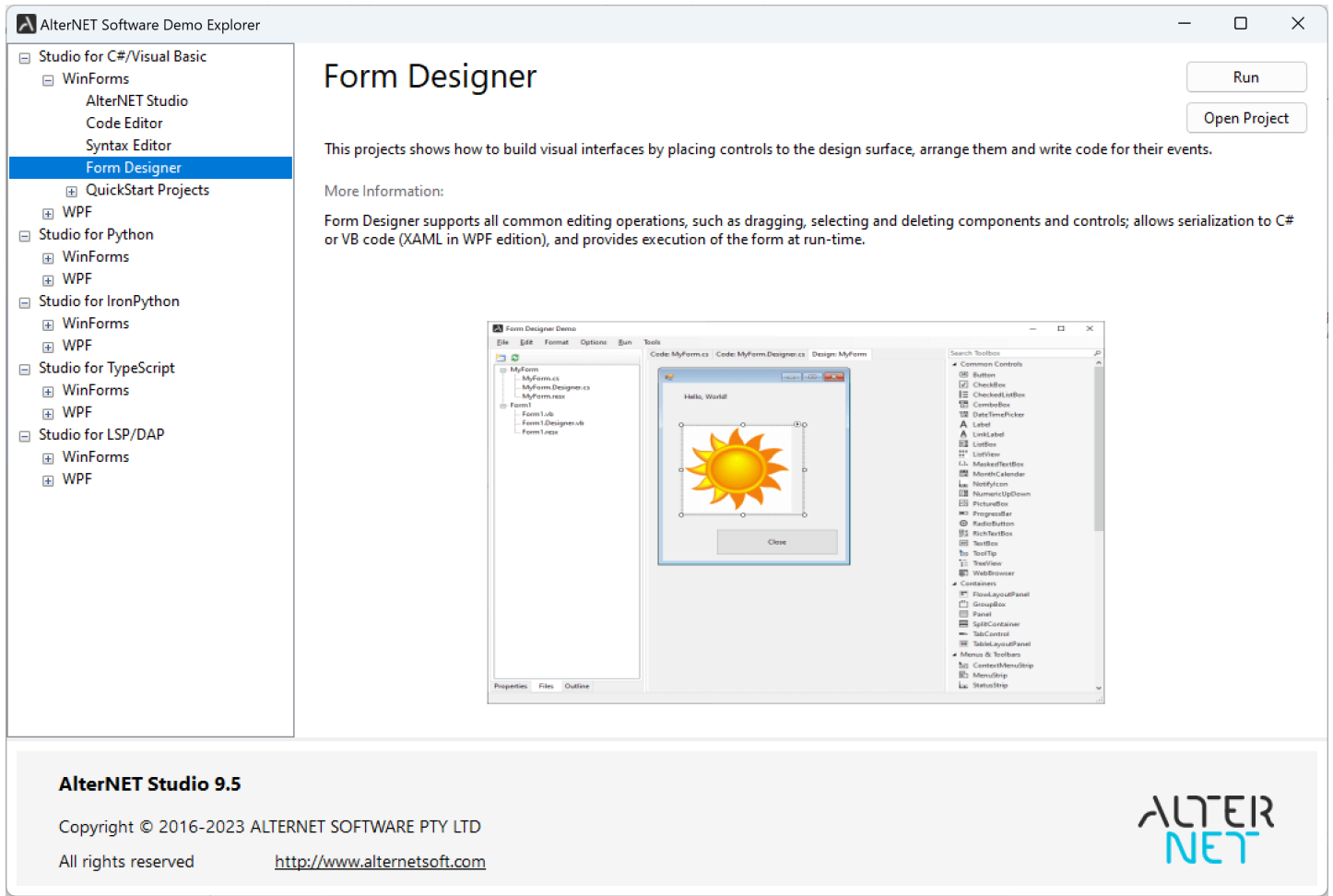
## Form Designer Overview

AlterNET Form Designer is a .NET component library providing a quick and convenient way to create visual user interfaces. It allows users to place controls on the design surface, set their initial properties, and write event handlers for their events.

The main components in the package are [<xref:Alternet.WinForms.FormDesignerControl>](#) for WinForms and [<xref:Alternet.Wpf.FormDesignerControl>](#) for WPF. These controls represent a design surface allowing users to add controls to a form, arrange them, and write code for their events.

Form Designer supports all common editing operations such as dragging, selecting, and deleting components and controls, changing their size and z-order, aligning them horizontally or vertically, copy and pasting controls. Like Visual Studio Form Designer, it serializes its content into C#/VisualBasic or TypeScript/JavaScript source code.

Form Designer includes a set of demos and quick start projects that show how to place controls from the toolbox, load and save forms being designed, write code in control's event handlers, and run these forms.



Below is a brief overview of these projects:

*FormDesigner* - This project shows how to build visual interfaces by placing controls on the design surface, arranging them, and writing code for their events.

*LoadAndSave* - demonstrates how to save/load forms being designed.

*DesignAndRun* - shows how to write event handlers code and run the form being designed.

*CustomizeToolbox* - shows how to rearrange toolbox tabs and install third-party assemblies on the toolbox.

## Creating your first project

The first thing to do after creating a new WinForms or WPF application is to place the

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl> or <xref:Alternet.FormDesigner.Wpf.FormDesignerControl> controls on your form. You would also need to place <xref:Alternet.FormDesigner.WinForms.ToolboxControl> or <xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl> controls and assign their FormDesignerControl property so you can drag and drop controls and components from it to the design surface.

When you run the application, you will see a new empty form with the design surface, where you can drag controls from the toolbox, resize, arrange them, etc.

If you'd like to examine and change the properties of the selected controls, you will need to place

<xref:Alternet.FormDesigner.WinForms.PropertyGridControl> or

<xref:Alternet.FormDesigner.Wpf.PropertyGrid.PropertyGridControl> controls, set their FormDesignerControl property, so it displays a component or control currently selected by the designer.

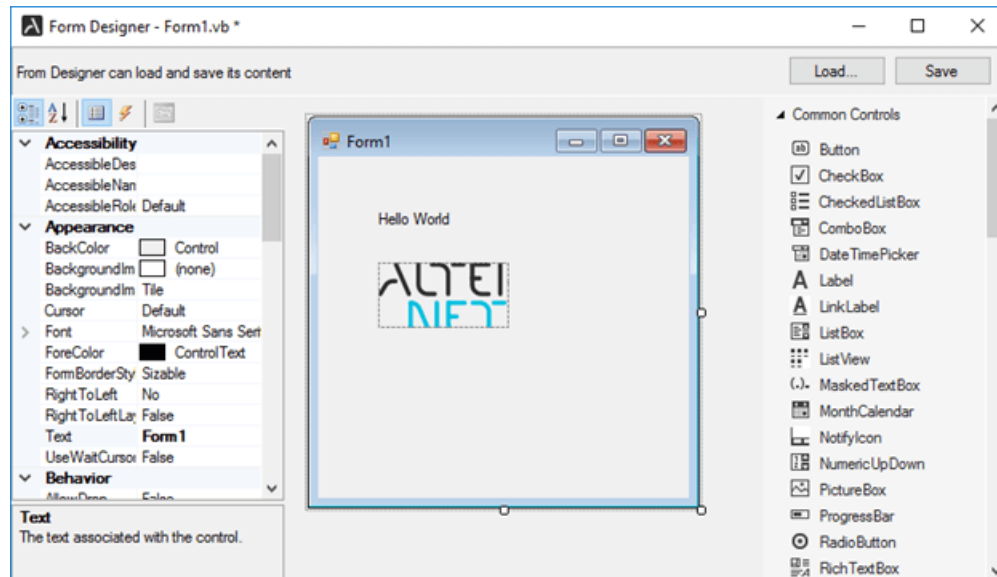
Similarly, for navigation through the form's controls, you can place <xref:Alternet.FormDesigner.WinForms.OutlineControl> or <xref:Alternet.FormDesigner.Wpf.Outline.OutlineControl> controls and set their FormDesignerControl property.

# WinForms Form Designer

WinForms Form Designer provides a design-time surface where the user can place controls from the toolbox, arrange them, examine and change their properties and write event handlers for their events.

## FormDesignerControl Control

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl> is based on .NET Framework FormDesigner services, which are implemented in System.ComponentModel.Design namespace and are included in the .NET framework. It allows AlterNET FormDesigner to look and feel very similar to Visual Studio WinForms Form Designer.



Below are the essential properties, methods, and events of FormDesignerControl class:

### Properties:

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.DesignerCommands> - provides an interface to Form Designer commands, such as Copy/Paste, Undo/Redo, Aligning and Arranging controls, etc.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.DesignerHost> - Provides an interface for managing designer transactions and components.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.IsModified> - Indicates whether designer content has been modified since the last save.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.SelectedComponents> - contains a list of selected components or controls.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.PrimarySelection> - gets the first selected component or control.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.Source> - gets or sets FormDesigner Source.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.ToolboxControl> - gets or sets toolbox control associated with the designer.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.ReferencedAssemblies> - gets a collection of assemblies where the controls and components used on the form being designed are declared.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.ImportedNamespaces> - in the case of Visual Basic, it gets a collection of globally available namespaces.

<xref:Alternet.FormDesigner.WinForms.FormDesignerControl.Options> - allows changing Form Designer appearance by



specifying whether to display snap lines, smart tags, form designer grid, and change grid size.

#### Events:

<xref:Alternet.WinForms.FormDesignerControl.DesignerHostChanged> - occurs when the designer host changes, for example, if a new form is loaded.

<xref:Alternet.WinForms.FormDesignerControl.NavigateToUserMethodRequested> - occurs when the form designer is requested to navigate to the event handler. For example, when a user double-clicks on the control.

<xref:Alternet.WinForms.FormDesignerControl.SelectionChanged> - occurs when a user selects a different control in the designer.

<xref:Alternet.WinForms.FormDesignerControl.CommandStateChanged> - occurs when a state of designer commands changes (for example, when undo stack becomes available)

<xref:Alternet.WinForms.FormDesignerControl.DesignedContentChanged> - occurs when a user modifies any aspect of the control being designed.

<xref:Alternet.WinForms.FormDesignerControl.LoadingErrorOccured> - occurs when the design code contains any syntax error during loading.

<xref:Alternet.WinForms.FormDesignerControl.CompilerErrorClick> - occurs when a user clicks on a compiler error on the Form Designer surface.

<xref:Alternet.WinForms.FormDesignerControl.DesignSurfaceKeyDown> - when a user presses a key when the design surface is focused.

#### Methods:

<xref:Alternet.WinForms.FormDesignerControl.Reload> - reloads form to be designed from the source.

<xref:Alternet.WinForms.FormDesignerControl.Save> - serializes designer to C# / Visual Basic file, Python, or TypeScript / JavaScript code.

Form Designer works with three source files simultaneously: one containing design-time code and another containing user-written event handlers and resource files for saving/loading the form's resources (such as images). Most often, users will need to edit at least a file containing event handlers, which will require setting up

<xref:Alternet.WinForms.FormDesignerControl> control's source to the one supporting integration with the editor. Refer to <xref:Alternet.Integration.WinForms.FormDesignerTextSource> class for the implementation of the source, which integrates with <xref:Alternet.Editor.SyntaxEdit> control included in our demo projects.

#### Error Handling

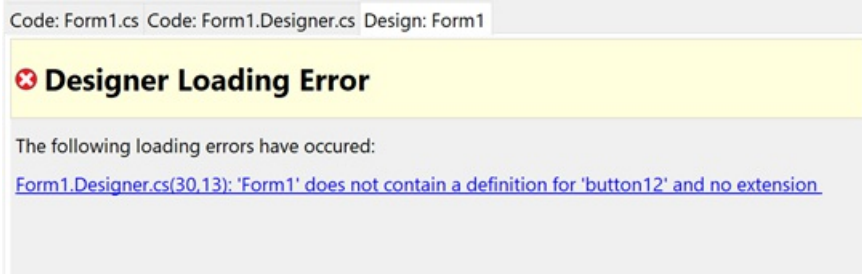
WinForms FormDesigner loads and saves its content into C#/VisualBasic, Python, or TypeScript/JavaScript code; this code needs to be correct both from a syntax and semantic point of view. If the FormDesigner loader encounters an error in the code, it switches to error mode. It displays a list of found errors, allowing a user to click and navigate to the error source by handling <xref:Alternet.WinForms.FormDesignerControl.CompilerErrorClick> event.

**Note:** specific language assembly handling code serialization needs to be included in the project to save/load Form designer content into the code.

C#/VisualBasic language services are implemented in Alternet.WinForms.Roslyn.v9 assembly;

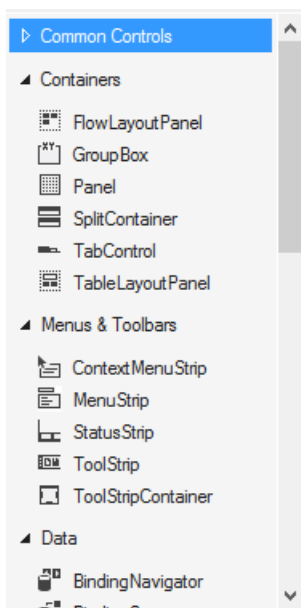
Python language services are implemented in Alternet.WinForms.Python.v9 assembly.

TypeScript/JavaScript language services are implemented in Alternet.WinForms.TypeScript.v9 assembly.



## ToolboxControl

The `<xref:Altneret.FormDesigner.WinForms.ToolboxControl>` control displays components and controls you can place onto the design surface. It provides a set of foldable tabs helping to organize controls by categories and allowing to specify which components and controls, including third-party controls, appear on the toolbox, on which tabs, and sort order.



ToolBox control can be linked to `<xref:Altneret.FormDesigner.WinForms.FormDesignerControl>` by setting `<xref:Altneret.FormDesigner.WinForms.ToolboxControl.FormDesignerControl>` property which allows dragging components and controls to the Form Designer.

Below are essential properties and methods to manipulate Toolbox control:

### Properties

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.CategoryNames>` - gets a collection of Categories (Tabs) displayed by the toolbox.

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.SelectedTool>` - returns currently selected toolbox item.

### Methods

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.AddCategory*>` - adds a new category to the toolbox.

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.AddItem*>` - places a toolbox item onto the specified toolbox tab.

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.ClearItemsInCategory*>` - clears items in the specified tab.

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.GetAllTools>` - gets all toolbox items.

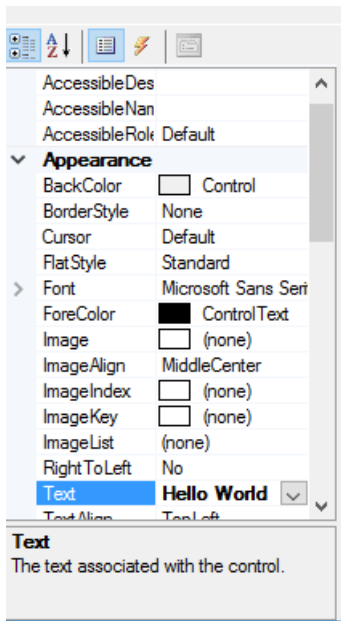
`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.GetToolsFromCategory*>` - gets toolbox items on the specific tab.

`<xref:Altneret.FormDesigner.WinForms.ToolboxControl.SelectPointer>` - deselects currently selected toolbox item and selects pointer tool.

- <xref:Alternet.WinForms.ToolboxControl.RemoveCategory\*> - removes a specific tab.
- <xref:Alternet.WinForms.ToolboxControl.RemoveItem\*> - removes a toolbox item from the category.
- <xref:Alternet.WinForms.ToolboxControl.SetSelectedItem\*> - selects toolbox item.
- <xref:Alternet.WinForms.ToolboxControl.AddItemForType\*> - adds toolbox item from the type name.
- <xref:Alternet.WinForms.ToolboxControl.AddItemsFromAssembly\*> - add all types that can appear on the toolbox from the assembly.
- <xref:Alternet.WinForms.ToolboxControl.ScrollToCategory\*> - scrolls toolbox control to the specified category.
- <xref:Alternet.WinForms.ToolboxControl.ScrollToItem\*> - scrolls toolbox control to the specified item.
- <xref:Alternet.WinForms.ToolboxControl.BeginUpdate> - prevents repainting of the toolbox until EndUpdate is called.
- <xref:Alternet.WinForms.ToolboxControl.EndUpdate> - re-enables toolbox repainting.
- <xref:Alternet.WinForms.ToolboxControl.Save\*> - saves the toolbox content to the specified stream.
- <xref:Alternet.WinForms.ToolboxControl.Load\*> - loads the toolbox content from the specified stream.

## PropertyGridControl

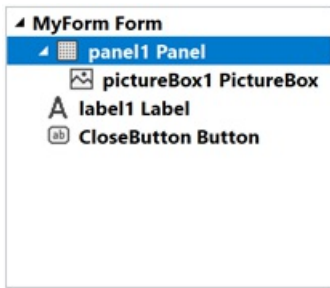
The <xref:Alternet.WinForms.PropertyGridControl> control allows the user to view and change the design-time properties and events of the selected controls or components.



PropertyGrid control can be linked to <xref:Alternet.WinForms.FormDesignerControl> by setting <xref:Alternet.WinForms.PropertyGridControl.FormDesignerControl> property allows viewing and changing properties and events for the controls selected in the Form Designer.

## OutlineControl

<xref:Alternet.WinForms.OutlineControl> displays the form's layout as a tree view, providing an easy way to navigate, show/hide and re-arrange controls on the form.



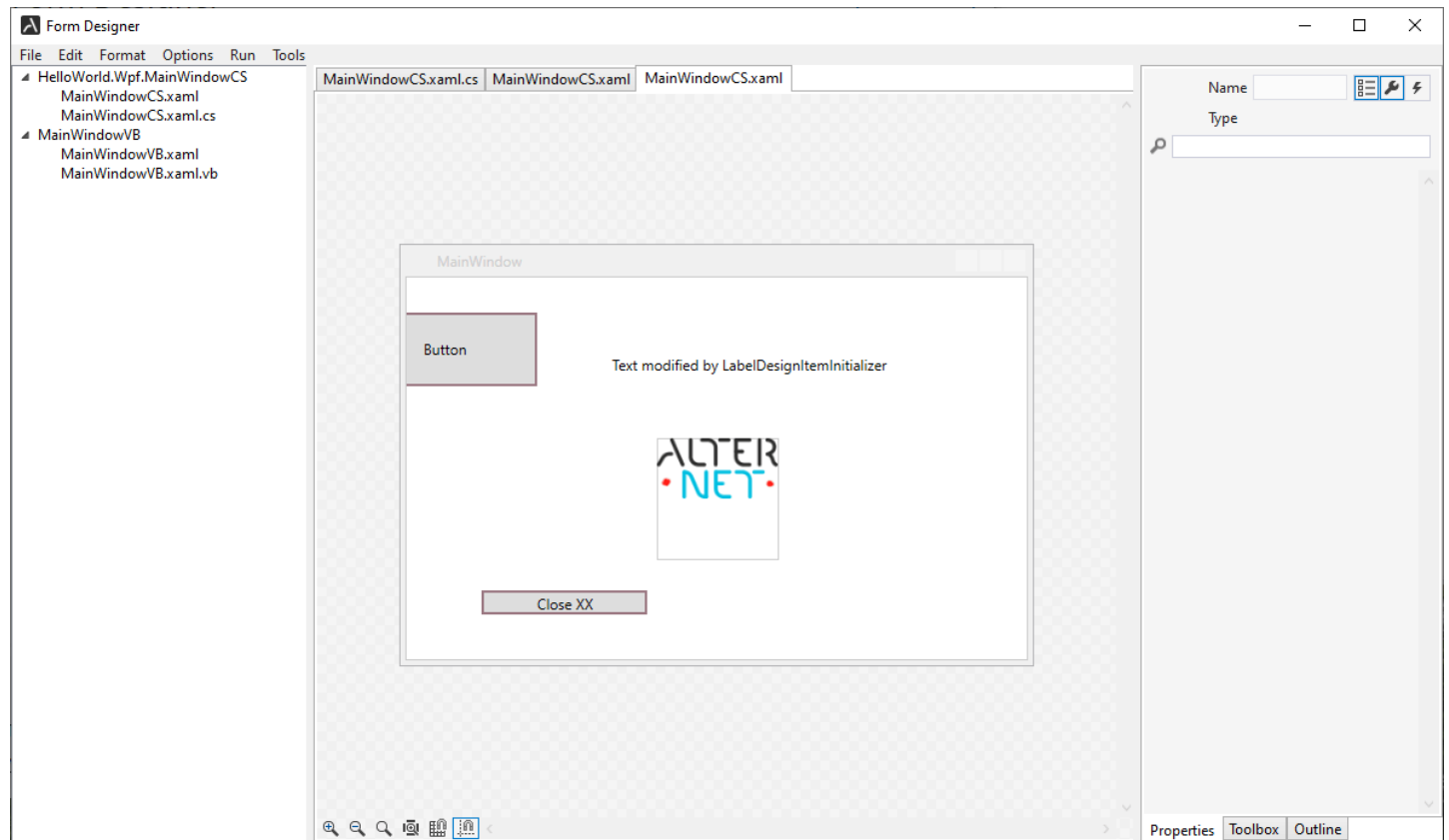
OutlineControlcontrol can be linked to `<xref:Alternet.FormDesigner.WinForms.FormDesignerControl>` by setting `<xref:Alternet.FormDesigner.WinForms.OutlineControl.FormDesignerControl>` property which allows navigating through the controls displayed by the Form Designer.

# WPF Form Designer

WPF Form Designer provides a design-time surface where the user can place controls from the toolbox, arrange them, examine and change their properties and write event handlers for their events.

## FormDesignerControl Control

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl> is based on SharpDevelop open-source FormDesigner package:  
<https://github.com/icsharpcode/WpfDesigner>



Below are the essential properties, methods, and events of FormDesignerControl class:

### Properties:

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.DesignerCommands> - provides an interface to Form Designer commands, such as Copy/Paste, Undo/Redo, Aligning and Arranging controls, etc.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.IsModified> - Indicates whether designer content has been modified since the last save.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.SelectedItems> - contains a list of selected controls.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.Source> - gets or sets FormDesigner Source.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.ReferencedAssemblies> - gets a collection of assemblies where the controls used on the form being designed are declared.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.CurrentTool> - gets or sets the currently selected tool in the Form Designer.

### Events:

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.NavigateToUserMethodRequested> - occurs when the form designer is requested to navigate to the event handler. For example, when a user double-clicks on the control.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.SelectionChanged> - occurs when a user selects a different control in the designer.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.DesignedContentChanged> - occurs when a user modifies any aspect of the control being designed.

### Methods:

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.Reload> - reloads form to be designed from the source.

<xref:Alternet.FormDesigner.Wpf.FormDesignerControl.Save> - serializes designer content to the XAML code.

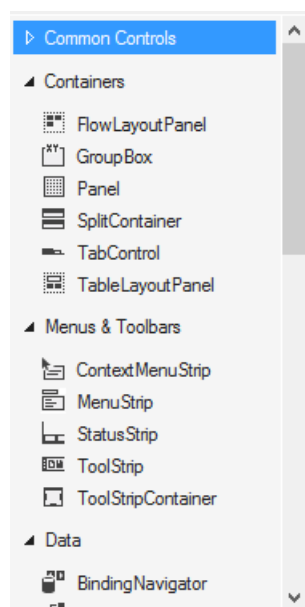
Form Designer works with two different source files simultaneously: XAML containing design-time code and C# or Visual Basic source containing user-written event handlers. Most often, users will need to edit a file containing event handlers, which will require setting up <xref:Alternet.FormDesigner.WinForms.FormDesignerControl> control's source to the one supporting integration with the editor. Refer to <xref:Alternet.FormDesigner.Integration.Wpf.FormDesignerTextSource> class for the implementation of the source, which integrates with <xref:Alternet.Editor.Wpf.TextEditor> control included in our demo projects.

### Error Handling

WinForms FormDesigner loads and saves its content into C#/VisualBasic, Python, or TypeScript/JavaScript code; this code needs to be correct both from a syntax and semantic point of view. If the FormDesigner loader encounters an error in the code, it switches to error mode. It displays a list of found errors, allowing a user to click and navigate to the error source by handling <xref:Alternet.FormDesigner.WinForms.FormDesignerControl.CompilerErrorClick> event.

## ToolboxControl

The <xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl> control displays components and controls you can place onto the design surface. It provides a set of foldable tabs helping to organize controls by categories and allowing to specify which components and controls, including third-party controls, appear on the toolbox, on which tabs, and sort order.



ToolBox control can be linked to <xref:Alternet.FormDesigner.Wpf.FormDesignerControl> by setting <xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.FormDesigner> property which allows dragging components and controls to the Form Designer.

Below are essential properties and methods to manipulate Toolbox control:

### Properties

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.CategoryNames> - gets a collection of Categories (Tabs) displayed by the toolbox.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.SelectedToolboxItem> - returns the currently selected toolbox item.

## Methods

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.AddCategory\*> - adds a new category to the toolbox.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.AddItem\*> - places a toolbox item onto the specified toolbox tab.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.ClearItemsInCategory\*> - clears items in the specified tab.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.GetAllTools> - gets all toolbox items.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.GetToolsFromCategory\*> - gets toolbox items on the specific tab.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.SelectPointer> - deselects currently selected toolbox item and selects pointer tool.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.RemoveCategory\*> - removes a specific tab.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.RemoveItem\*> - removes a toolbox item from the category.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.SetSelectedItem\*> - selects toolbox item.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.AddItemForType\*> - adds toolbox item from the type name.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.AddItemsFromAssembly\*> - add all types that can appear on the toolbox from the assembly.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.BeginUpdate> - prevents repainting of the toolbox until EndUpdate is called.

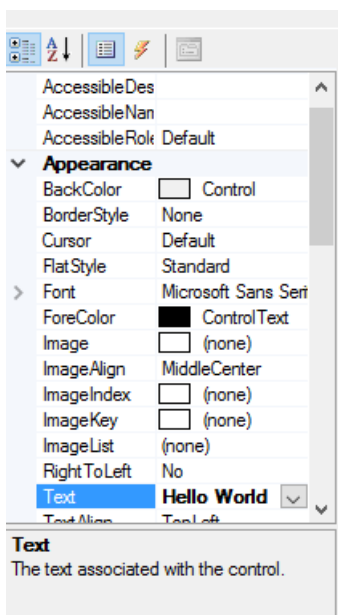
<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.EndUpdate> - re-enables toolbox repainting.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.Save\*> - saves the toolbox content to the specified stream.

<xref:Alternet.FormDesigner.Wpf.Toolbox.ToolboxControl.Load\*> - loads the toolbox content from the specified stream.

## PropertyGridControl

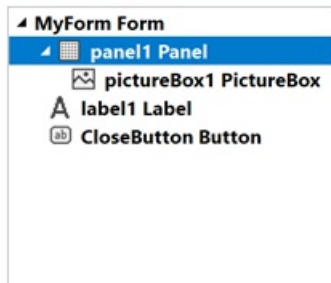
The <xref:Alternet.FormDesigner.Wpf.PropertyGrid.PropertyGridControl> control allows the user to view and change the design-time properties and events of the selected controls or components.



PropertyGrid control can be linked to `<xref:Alternet.FormDesigner.Wpf.FormDesignerControl>` by setting `<xref:Alternet.FormDesigner.WinForms.PropertyGridControl.FormDesignerControl>` property allows viewing and changing properties and events for the controls selected in the Form Designer.

## OutlineControl

`<xref:Alternet.FormDesigner.WinForms.OutlineControl>` displays the form's layout as a tree view, providing an easy way to navigate, show/hide and re-arrange controls on the form.



OutlineControlcontrol can be linked to `<xref:Alternet.FormDesigner.Wpf.FormDesignerControl>` by setting `<xref:Alternet.FormDesigner.Wpf.Outline.OutlineControl.FormDesigner>` property which allows navigating through the controls displayed by the Form Designer.