CHAPTER 57

Introducing the Visual Studio Extensibility

IN THIS CHAPTER

- Introducing Visual Studio Extensibility
- Building a Visual Studio Package
- Deploying Visual Studio Extensions
- Managing Extensions with the Extension Manager
- Managing Add-Ins with the Add-In Manager
- Extending the Code Editor

Visual Studio is with no doubt a great application, offering hundreds of integrated tools that cover hundreds of aspects of the development experience. It is also a complex and composite application, made of components. For example, each tool window is a single component developed separately and then put together with the rest of the environment. Developing Visual Studio components and then putting them together is something made possible because of Visual Studio Extensibility. This means that Visual Studio is an extensible application and that other developers, like you and me, can build their own components to be put together within the IDE. Although, as mentioned before, Visual Studio offers hundreds of tools that covers many development needs, it cannot cover all possible requirements; with regard to this, one of the biggest benefits inside the Visual Studio development environment is that you can customize it with additional tools, windows, and items that can make your developer life even easier. In this chapter you get started with the Visual Studio 2010 extensibility, building custom components, and also taking a tour of what is new in the 2010 version.

Introducing Visual Studio Extensibility

Since previous versions, Visual Studio has always been an extensible environment. This means that it can be extended and enhanced with additional tools, windows, add-ins, packages, and macros to increase your productivity with specific instruments that you might need for adjusting the environment to your developer needs. Behind the scenes, Visual Studio is a mixed-mode application meaning that it is built on both COM and .NET architectures, although in the 2008 and 2010 versions the managed architecture plays a bigger role than in the past.

Visual Studio takes advantage of several .NET assemblies whose names begin with Microsoft.VisualStudio.XXX.dll (where XXX stands for a particular environment area) for maintaining its infrastructure. Such assemblies expose lots of namespaces whose names begin with `Microsoft.VisualStudio` and play an important role in the IDE extensibility, because the developer can build components referencing those assemblies to get access to IDE functionalities and extend the functionalities with custom packages or add-ins. As you can imagine, this opens to interesting development scenarios; building extensions for Visual Studio can be an important business, and several companies build extensions for Visual Studio. But this is what developers could do with Visual Studio until the 2008 version. With the new Visual Studio 2010 IDE, Microsoft completely revisited the IDE architecture and infrastructure so that the environment can be extended in further ways other than classic add-ins. The next section explains what is new in the Visual Studio 2010 extensibility before showing practical examples.

What's New in the Extensibility with Visual Studio 2010

The IDE has been completely revisited in Visual Studio 2010. Several areas now rely on Windows Presentation Foundation, bringing a lot of improvements to the developer experience. The most evident area affected by this change is the code editor, which is entirely built upon WPF. Visual Studio 2010 enables extending the code editor with specific WPF objects that can actually enrich the code editor with useful or just attractive extensions. Another key concept is how the IDE infrastructure is now built. The old extensibility architecture has now been replaced with the Managed Extensibility Framework (or just MEF), a set of .NET libraries that favors building extensible applications with composition techniques according to a plug-in model. MEF is actually an open source project available on the CodePlex website that you can use to build your own extensible applications. You can check out MEF here: http://mef.codeplex.com. After this brief introduction we can divide the Visual Studio extensibility into two main areas: packages and add-ins development and code editor extensions development. The next section provides more details on the available projects, for now focus on the concept of extension. Each component extending the IDE is called extension, independently from its nature (for example, packages or code editor extensions). This concept, together with the new extensibility features (especially for the WPF-based features) required a new deployment system for extensions. With Visual Studio 2010, Microsoft introduces a new .VSIX file format, specific for deploying extensions and that is intended as a replacement for the .VSI file format (with some exceptions as explained later in this chapter). But before going into further discussions, you need some additional tools required for developing versus Visual Studio, known as the Visual Studio 2010 SDK.

The Visual Studio 2010 SDK

Basically you create custom extensions for and with Visual Studio taking advantage of specific project templates. To enable Visual Studio 2010 extensibility projects, you need to download and install the Visual Studio 2010 Software Development Kit, which is available from the Visual Studio Extensibility Center located here: http://msdn.microsoft.com/en-us/vsx/default.aspx. The SDK setup can install tools, project templates, and documentation so that you can build custom extensions for the IDE. In the Microsoft Visual Studio 2010 SDK you can find shortcuts to online tools, samples, and documentation about the extensibility. Also there is a subfolder named Tools where you can find a shortcut for starting Visual Studio under the *experimental hive* and for resetting the environment. The experimental hive is a fully functional instance of Visual Studio used for extension debugging and testing, and in most cases you do not need to launch it manually, because it will be launched by the development instance of Visual Studio. The experimental hive keeps track of all extensions you develop and debug, so you can reset the instance when you want it to be clean.

EXTENSIBILITY SAMPLES

The Visual Studio Extensibility team from Microsoft published (and periodically updates) code examples about extending Visual Studio 2010 onto the MSDN Code Gallery. I suggest you to visit the dedicated Web page located here: http://code.msdn.microsoft.com/vsx. You can find several interesting examples covering almost every extensibility area.

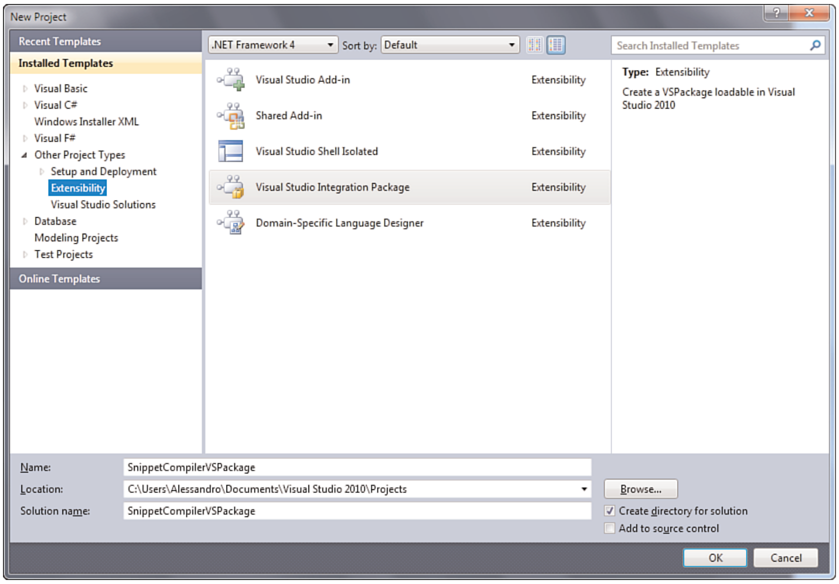
The SDK installs additional projects templates for the Visual Studio extensibility as summarized in the following list:

- Editor extensibility projects. Basically such projects are fully functional code examples that you can use for understanding how extensions work.
- Add-ins, integration packages, and Visual Studio Shell projects.
- Extension deployment projects, including toolbox controls.

All the listed projects templates are available in the New Project dialog. In next section you develop your first extension for Visual Studio 2010 taking advantage of the new WPF infrastructure.

Building a Visual Studio Package

The goal of this introductory chapter on the Visual Studio extensibility is showing how you create and deploy a Visual Studio Package. Basically Visual Studio is made of packages. Each package represents a working unit. For example, the toolbox is a package; Solution Explorer is another package, and so on. You can extend Visual Studio by building custom integration packages. There are different kinds of integration packages, such as tool windows, menus, wizards, and languages. The big difference between a package and an add-in is that a package can add completely new tools and features to the IDE, whereas add-ins typically extend existing features in the IDE with other features. In the next code example you learn to build a custom tool window that can provide the ability of compiling code snippets on-the-fly in both Visual Basic and Visual C#. Open the New Project window by selecting **File, New Project**. When the New Project window appears, select the **Other Project Types, Extensibility** subfolder on the left and then the **Visual Studio Integration Package** project template. Name the new project **SnippetCompilerVSPackage** (see Figure 57.1) and then click OK.



Type: Extensibility
Create a VSPackage loadable in Visual Studio 2010

Name: SnippetCompilerVSPackage
Location: C:\Users\Alessandro\Documents\Visual Studio 2010\Projects
Solution name: SnippetCompilerVSPackage
✓ Create directory for solution
Add to source control

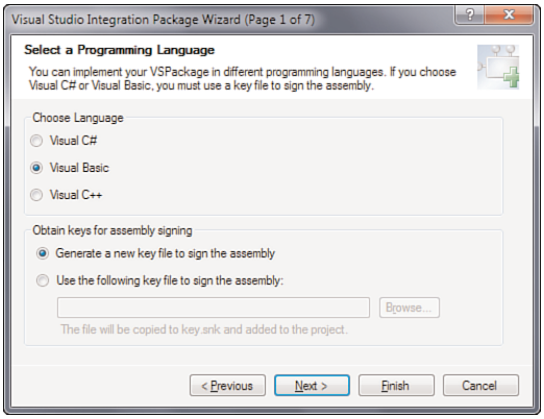
FIGURE 57.1 Creating the new extensibility project.

At this point the Visual Studio Integration Package Wizard starts. In the first step select Visual Basic as the programming language and leave unchanged the new key file option, as shown in Figure 57.2.

In the next window you can set information for the new package, such as author, description, and icon. Figure 57.3 shows an example for these settings.

The next step is important and is the place where you can select the package type. Select **Tool Window** and then click **Next** (see Figure 57.4). You can also select multiple options depending on where you want the tool to be available.

In the next step, represented in Figure 57.5, you can specify the Window name and Command ID. The Window name is actually the tool window title, whereas the ID is used


Visual Studio Integration Package Wizard (Page 1 of 7)

Select a Programming Language

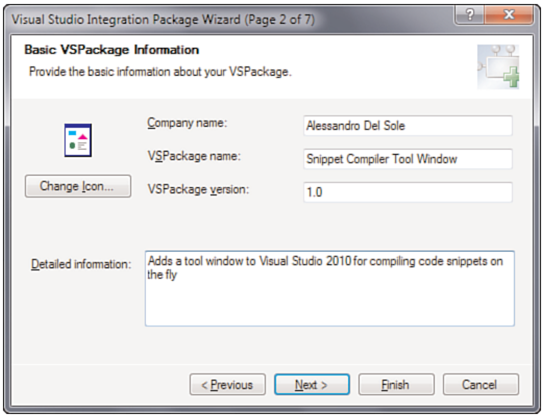
You can implement your VSPackage in different programming languages. If you choose Visual C# or Visual Basic, you must use a key file to sign the assembly.

Choose Language
- ○ Visual C#
- ● Visual Basic
- ○ Visual C++

Obtain keys for assembly signing
- ● Generate a new key file to sign the assembly
- ○ Use the following key file to sign the assembly:

The file will be copied to key.snk and added to the project.

FIGURE 57.2 Setting language and key file options.

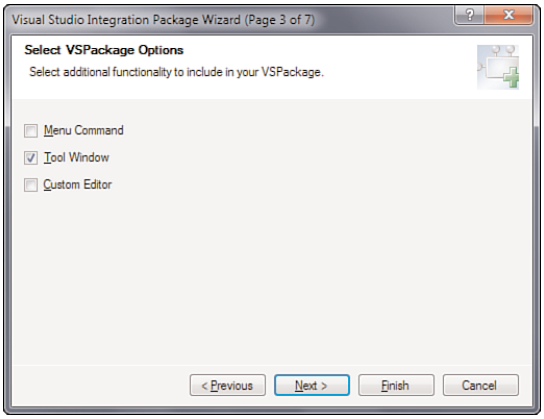

Visual Studio Integration Package Wizard (Page 2 of 7)

Basic VSPackage Information

Provide the basic information about your VSPackage.

Company name: Alessandro Del Sole
VSPackage name: Snippet Compiler Tool Window
VSPackage version: 1.0
Detailed information: Adds a tool window to Visual Studio 2010 for compiling code snippets on the fly

FIGURE 57.3 Setting package information.


Visual Studio Integration Package Wizard (Page 3 of 7)

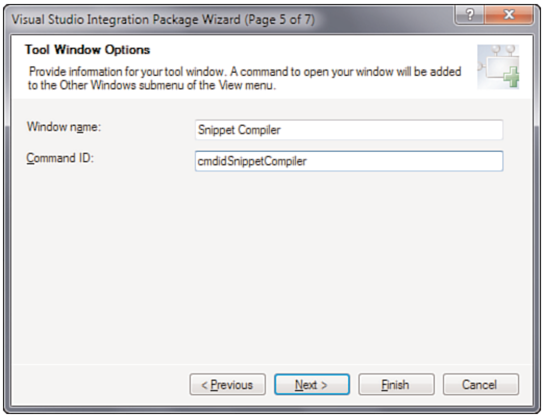
Select VSPackage Options

Select additional functionality to include in your VSPackage.

- ☐ Menu Command
- ☑ Tool Window
- ☐ Custom Editor

FIGURE 57.4 Package type selection.

internally by Visual Studio for invoking the new package. Figure 57.5 shows an example about setting the information.


Visual Studio Integration Package Wizard (Page 5 of 7)

Tool Window Options

Provide information for your tool window. A command to open your window will be added to the Other Windows submenu of the View menu.

Window name: Snippet Compiler

Command ID: cmdidSnippetCompiler

FIGURE 57.5 Setting title and ID for the new tool window.

The next step requires you to specify if you want to add test projects for the new package. For this example, uncheck both projects and proceed. At this point you can complete the wizard and Visual Studio will generate the new project. When the new project is ready, the first thing you notice is that, differently from previous version, the tool window is nothing but a WPF custom control. Now double-click the MyControl.xaml file in Solution Explorer, in order to enable the designer. Figure 57.6 shows how the IDE appears at this point.

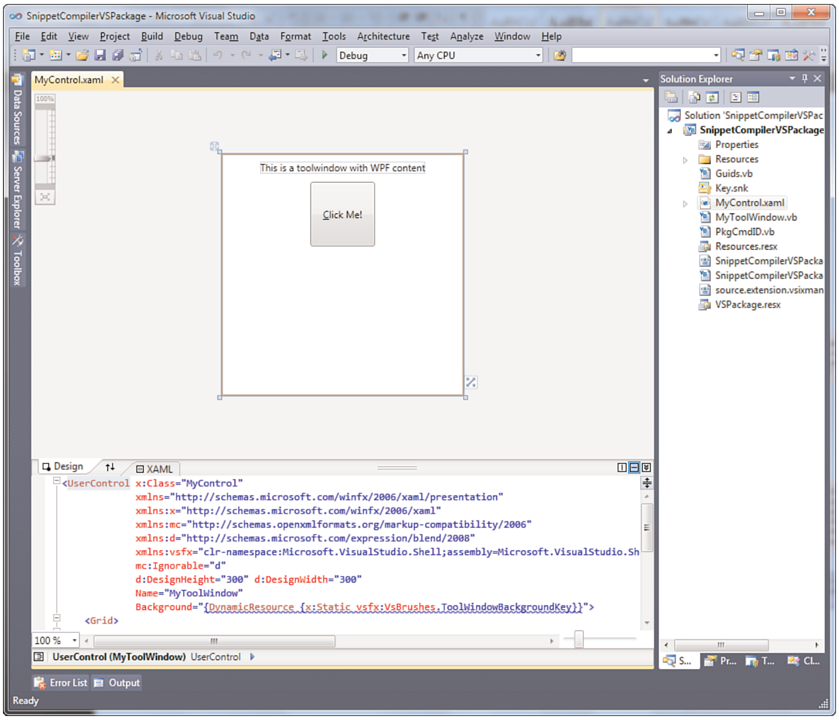
Visual Studio implements a WPF skeleton for a new tool window that you need to customize. Before going into that, consider the meaning of files available within Solution Explorer. This is summarized in Table 57.1.

TABLE 57.1 VS Package Code Files

File	Description
Guids.vb	Defines a number of GUIDs that Visual Studio will utilize to recognize and implement the tool window
MyToolWindow.vb	A class implementing the tool window hosting it as a user control
PkgCmdId.vb	Exposes a unique identifier for the package within Visual Studio
Resources.resx	Exposes resources required by the IDE
VSPackage.resx	Exposes resources required by the package
MyControl.Xaml	The WPF custom control actually implementing the tool window content

TABLE 57.1 Continued

File	Description
SnippetCompilerVsPackagePackage.vb	The class implementing the tool window
SnippetCompilerVsPackage.vsct	An xml file defining the layout of the package, including company information
Source.extension.vsixmanifest	An xml file used for deploying packages as a .Vsix file (see later in this chapter)
Key.snk	Strong name file required for signing the package assembly



```
<UserControl x:Class="MyControl"
             xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
             xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
             xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
             xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
             xmlns:vsfx="clr-namespace:Microsoft.VisualStudio.Shell;assembly=Microsoft.VisualStudio.Sh
             mc:Ignorable="d"
             d:DesignHeight="300" d:DesignWidth="300"
             Name="MyToolWindow"
             Background="{DynamicResource {x:Static vsfx:VsBrushes.ToolWindowBackgroundKey}}">
    <Grid>
```

FIGURE 57.6 The IDE is ready on the new extensibility project, showing the WPF custom control.

There is also a subfolder named Resources that contains the icons used within the package and that identifies the new tool in Visual Studio. All code files contain comments that can help you understand what that particular file is for. For example, take a look at the SnippetCompilerVsPackagePackage.vb file. For your convenience, Listing 57.1 shows the content of this file. Notice how comments are detailed and how they provide complete explanations on types and their role within the user interface.

LISTING 57.1 Understanding Packages Behind the Scenes

```
Imports Microsoft.VisualBasic
Imports System
Imports System.Diagnostics
Imports System.Globalization
Imports System.Runtime.InteropServices
Imports System.ComponentModel.Design
Imports Microsoft.Win32
Imports Microsoft.VisualStudio.Shell.Interop
Imports Microsoft.VisualStudio.OLE.Interop
Imports Microsoft.VisualStudio.Shell

''' <summary>
''' This is the class that implements the package exposed by this assembly.
'''
''' The minimum requirement for a class to be considered a valid package for
''' Visual Studio is to implement the IVsPackage interface and register itself with
''' the shell.
''' This package uses the helper classes defined inside the
''' Managed Package Framework (MPF)
''' to do it: it derives from the Package class that provides the implementation of
''' the IVsPackage interface and uses the registration attributes defined in the
''' ''' framework to register itself and its components with the shell.
''' </summary>
' The PackageRegistration attribute tells the PkgDef creation utility
' (CreatePkgDef.exe) that this class is a package.
'
' The InstalledProductRegistration attribute is used to register the information
needed to show this package
' in the Help/About dialog of Visual Studio.
    '
' The ProvideMenuResource attribute is needed to let the shell know that this
' package exposes some menus.
' The ProvideToolWindow attribute registers a tool window exposed by this package.

    <PackageRegistration(UseManagedResourcesOnly := true), _
    InstalledProductRegistration("#110", "#112", "1.0", IconResourceID := 400), _
    ProvideMenuResource("Menus.ctmenu", 1), _
    ProvideToolWindow(GetType(MyToolWindow)), _
    Guid(GuidList.guidSnippetCompilerVSPackagePkgString)> _
    Public NotInheritable Class SnippetCompilerVSPackagePackage
Inherits Package
```

```
''' <summary>
''' Default constructor of the package.
''' Inside this method you can place any initialization code that does not require
''' any Visual Studio service because at this point the package object is created
''' but not sited yet inside Visual Studio environment. The place to do all the
''' other initialization is the Initialize method.
''' </summary>
Public Sub New()
        Trace.WriteLine(String.Format(CultureInfo.CurrentCulture,
                                     "Entering constructor for: {0}",
Me.GetType().Name))
End Sub

        ''' <summary>
''' This function is called when the user clicks the menu item that shows the
''' tool window. See the Initialize method to see how the menu item is associated to
''' this function using the OleMenuCommandService service and the MenuCommand class.
''' </summary>
Private Sub ShowToolWindow(ByVal sender As Object, ByVal e As EventArgs)
    ' Get the instance number 0 of this tool window. This window is single instance
    ' so this instance
    ' is actually the only one.
    ' The last flag is set to true so that if the tool window does not exists it
    ' will be created.
    Dim window As ToolWindowPane = Me.FindToolWindow(GetType(MyToolWindow), 0, True)
    If (window Is Nothing) Or (window.Frame Is Nothing) Then
        Throw New NotSupportedException(Resources.CanNotCreateWindow)
    End If

    Dim windowFrame As IVsWindowFrame = TryCast(window.Frame, IVsWindowFrame)
    Microsoft.VisualStudio.ErrorHandler.ThrowOnFailure(windowFrame.Show())
End Sub


'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
' Overriden Package Implementation
#Region "Package Members"

''' <summary>
''' Initialization of the package; this method is called right
''' after the package is sited, so this is the place
''' where you can put all the initilaization code that rely on services provided by
''' VisualStudio.
''' </summary>
Protected Overrides Sub Initialize()
        Trace.WriteLine(String.Format(CultureInfo.CurrentCulture,
                                      "Entering Initialize() of: {0}",
                                      Me.GetType().Name))
    MyBase.Initialize()

        ' Add our command handlers for menu (commands must exist in the .vsct file)
        Dim mcs As OleMenuCommandService = _
            TryCast(GetService(GetType(IMenuCommandService)), OleMenuCommandService)
    If Not mcs Is Nothing Then
                ' Create the command for the tool window
            Dim toolwndCommandID As New CommandID(GuidList.
                                    guidSnippetCompilerVSPackageCmdSet,
                                    CInt(PkgCmdIDList.cmdidSnippetCompiler))
            Dim menuToolWin As New MenuCommand(New EventHandler _
                               (AddressOf ShowToolWindow), toolwndCommandID)
        mcs.AddCommand(menuToolWin)
            End If
        End Sub
#End Region
End Class
```

The class inherits from `Microsoft.VisualStudio.Shell.Package`, the base class exposing the required interface for every functional package. Notice how the `ShowToolWindow` method gets an instance of the `Microsoft.VisualStudio.Shell.ToolWindowPane` class pointing to the custom tool window (`Me.FindToolWindow (GetType(MyToolWindow))`). The same exam can be done on the ToolWindow.vb file. After doing this, it is possible to customize the WPF control. The goal of the tool window is enabling on-the fly compilation for code snippets. With that said, there is the need of implementing the user interface side, so in the XAML editor type the code shown in Listing 57.2.

LISTING 57.2 Implementing the Tool Window User Interface

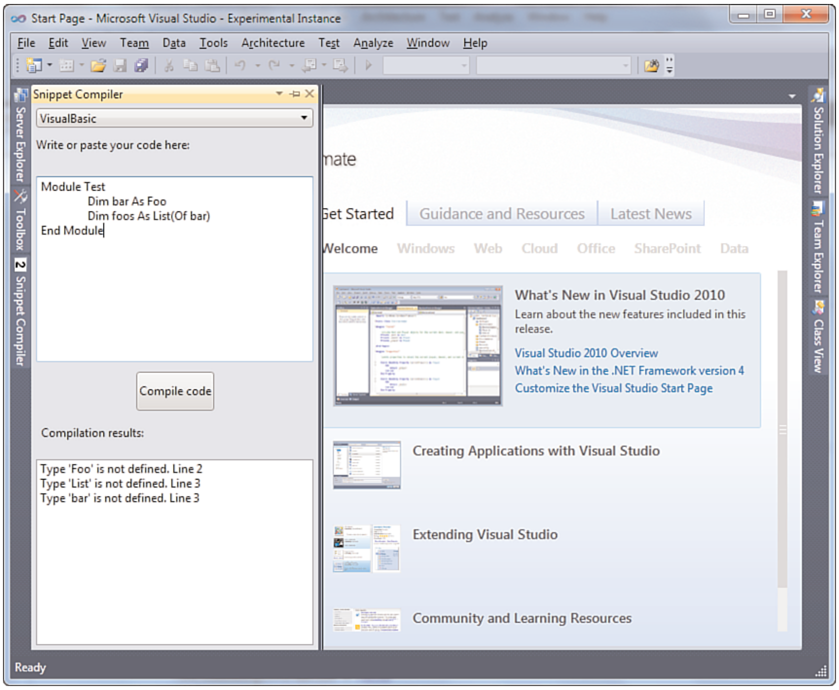
```
<UserControl x:Class="MyControl"
             xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
             xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
             xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
             xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
             xmlns:vsfx="clr-
namespace:Microsoft.VisualStudio.Shell;assembly=Microsoft.VisualStudio.Shell.10.0"
             mc:Ignorable="d"
             d:DesignHeight="300" d:DesignWidth="300"
             Name="MyToolWindow"
             Background="{DynamicResource
             {x:Static vsfx:VsBrushes.ToolWindowBackgroundKey}}">
    <Grid>
        <Grid.RowDefinitions>
            <RowDefinition Height="30" />
            <RowDefinition Height="40" />
            <RowDefinition />
            <RowDefinition Height="50" />
            <RowDefinition Height="40" />
            <RowDefinition />
        </Grid.RowDefinitions>
        <!— This will allow selecting the compiler —>
        <ComboBox Name="LanguageCombo" Text="VisualBasic" Margin="5">
            <ComboBoxItem Content="VisualBasic" />
            <ComboBoxItem Content="CSharp" />
        </ComboBox>
        <TextBlock Margin="5" Grid.Row="1"
                       Foreground="{DynamicResource
                       {x:Static vsfx:VsBrushes.ToolWindowTextKey}}">
                Write or paste your code here:</TextBlock>
            <TextBox Grid.Row="2"  Name="CodeTextBox" Margin="5"
                     Foreground="{DynamicResource
                     {x:Static vsfx:VsBrushes.ToolWindowTextKey}}"
                     AcceptsReturn="True" AcceptsTab="True"
                     VerticalAlignment="Stretch"
                     VerticalScrollBarVisibility="Auto"
                     HorizontalScrollBarVisibility="Auto" />
            <Button Grid.Row="3" Content="Compile code" Width="80" Height="40"
                    Name="button1"/>
            <TextBlock Grid.Row="4" Margin="10"
                       Foreground="{DynamicResource
                       {x:Static vsfx:VsBrushes.ToolWindowTextKey}}">
                Compilation results:</TextBlock>
            <ListBox Grid.Row="5" ItemsSource="{Binding}"
                Name="ErrorsListBox" Margin="5"
                Foreground="{DynamicResource
                {x:Static vsfx:VsBrushes.ToolWindowTextKey}}"/>
    </Grid>
</UserControl>
```

On the Visual Basic side, enter the **MyControl.xaml.vb** file and write the code shown in Listing 57.3. This adds compile functionalities to the tool window when the button is clicked. Basically the code makes use of the `System.CodeDom` namespace for getting instances of the .NET compilers, as you will understand through comments in the code.

LISTING 57.3 Code for Compiling On-the-Fly the Code Typed Inside the Tool Window

```
Imports System.Security.Permissions
Imports System
Imports System.Reflection
Imports System.Reflection.Emit
Imports System.CodeDom.Compiler
Imports System.Windows.Controls

'''<summary>
'''  Interaction logic for MyControl.xaml
'''</summary>
Partial Public Class MyControl
    Inherits System.Windows.Controls.UserControl

    <System.Diagnostics.CodeAnalysis.SuppressMessage("Microsoft.Globalization",
                        "CA1300:SpecifyMessageBoxOptions")> _
    Private Sub button1_Click(ByVal sender As Object,
                              ByVal e As System.EventArgs) Handles button1.Click
        Try
            If String.IsNullOrEmpty(CodeTextBox.Text) = False Then

                Me.ErrorsListBox.ItemsSource = _
                Compile(CType(Me.LanguageCombo.SelectedItem,
                        ComboBoxItem).Content.ToString)

            End If
        Catch ex As Exception
            'Handle other exceptions here, no compiler errors
        End Try

    End Sub

    Private Function Compile(ByVal language As String) As IEnumerable(Of String)

        'Gets the ComboBox selected language
        Dim languageProvider As String = language

        'Creates an instance of the desired compiler
        Dim CompilerProvider As CodeDomProvider = _
            CodeDomProvider.CreateProvider(languageProvider)
        'Sets compiler parameters
        Dim params As New CompilerParameters()
        Dim results As CompilerResults

        'Configure self-explanatory parameters
        With params
            .GenerateExecutable = False
            .GenerateInMemory = True
            .IncludeDebugInformation = False
            'You can add multiple references here
            .ReferencedAssemblies.Add("System.dll")
        End With

        'Compiles the specified source code
        results = CompilerProvider.
                  CompileAssemblyFromSource(params,
                                            CodeTextBox.Text)

        'If no errors, the ListBox is empty
        If results.Errors.Count = 0 Then
            Return Nothing
        Else
            'If any errors, creates a list of errors...
            Dim errorsList As New List(Of String)

            '..iterating the compiler errors
            For Each item As CompilerError In results.Errors
                errorsList.Add(item.ErrorText & " Line " & item.Line.ToString)
            Next
            Return errorsList.AsEnumerable
            errorsList = Nothing
        End If

    End Function
End Class
```

At this point you can test the new tool window. This can be accomplished by simply pressing **F5** as you would do in any other kind of .NET application. This starts a new instance of Visual Studio known as Experimental Hive. It is a fully functional instance of Visual Studio that is used for debugging custom extensions. If the new tool window is not visible, simply click the new **View, Other Windows, Snippet Compiler** command. Figure 57.7 shows how the new tool window appears in the IDE.


Start Page - Microsoft Visual Studio - Experimental Instance
File Edit View Team Data Tools Architecture Test Analyze Window Help
Snippet Compiler
VisualBasic
Write or paste your code here:
Compile code
Compilation results:
Get Started
Guidance and Resources
Latest News
Welcome
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What's New in Visual Studio 2010
Learn about the new features included in this release.
Visual Studio 2010 Overview
What's New in the .NET Framework version 4
Customize the Visual Studio Start Page
Creating Applications with Visual Studio
Extending Visual Studio
Community and Learning Resources
Server Explorer
Toolbox
Snippet Compiler
Solution Explorer
Team Explorer
Class View
Ready

```
Module Test
        Dim bar As Foo
        Dim foos As List(Of bar)
End Module
```

```
Type 'Foo' is not defined. Line 2
Type 'List' is not defined. Line 3
Type 'bar' is not defined. Line 3
```

FIGURE 57.7 The new tool window running inside Visual Studio 2010.

The new tool window is a fully functional one, so it can be anchored like any other Visual Studio window. To stop the test environment, simply close the experimental instance of Visual Studio. Until now you saw a debugging scenario. When the debugging and testing phase is completed, you need to deploy the extension to other developers. As explained in the next section, Visual Studio 2010 offers a new, simple deployment system for this kind of extensions.

Deploying Visual Studio Extensions

Among new features in the Visual Studio extensibility, deploying extensions also changes. Microsoft introduces a new file type named VSIX (with .vsix extension) for packaging deploying Visual Studio extensions. This new format is intended as a replacement for the previous .vsi file format first introduced with Visual Studio 2005. Basically a VSIX package is nothing but a zip archive that is built with regard to the open packaging convention. This means that if you rename the .vsix package into .zip, you can browse its content with any compression tool supporting zips. This kind of package needs to store some other files:

- A [Content_Types].xml file that describes the archive content according to the open packaging convention

- An extension.vsixmanifest file storing information on the extension and on how it will be deployed
- Binary files for the extension (set named product payload)
- Support files, such as license, icons, and so on

VSIX packages cannot deploy add-ins, macros, and code snippets, whereas they can deploy any other kind of extensions. You can also deploy extensions via Windows Installer packages; this is preferable when you need to accomplish specific requirements such as installing assemblies to the GAC or writing to the Registry. For all other cases, VSIX packages are a good thing.

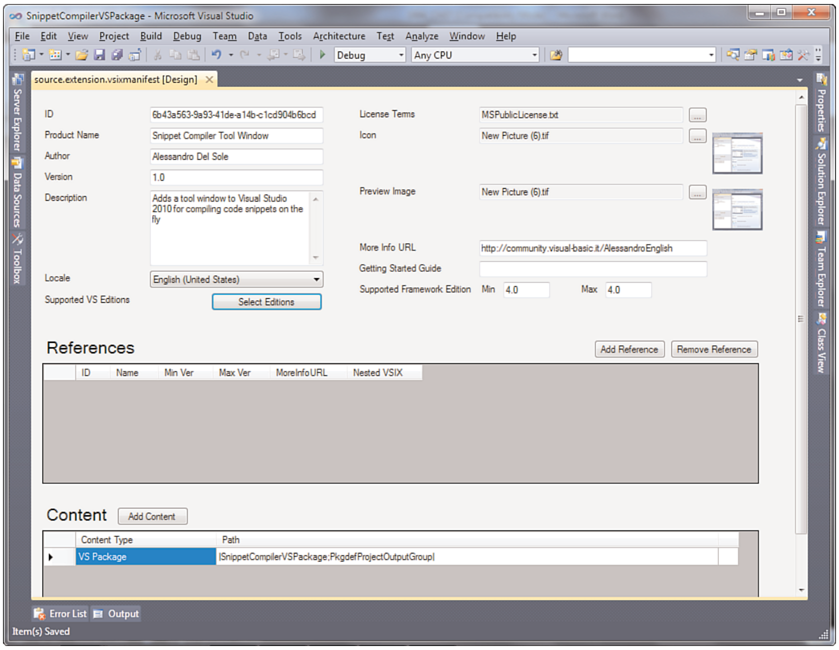
DEPLOYING ADD-INS AND CODE SNIPPETS

Because you cannot deploy Visual Studio add-ins and code snippets with Vsix packages, you still need to build a .vsi package or recur to Windows Installer projects.

There are also some other good reasons for preferring VSIX packages. First, they can check for updates. Second, they can be uploaded to the Visual Studio Gallery so that other developers can download your extension directly from the Visual Studio Extension Manager. (That will be covered later in this chapter.) Another good reason is that you do not need to edit a VSIX package manually. Visual Studio offers an integrated designer for creating VSIX packages directly into the current project. Continuing the previous example, double-click the **source.extension.vsixmanifest** file in Solution Explorer. This file is added to each extensibility project at creation time and is the deployment manifest for the extension. Once this is done, Visual Studio 2010 looks like Figure 57.8.

With the exception of the ID field, which is filled by Visual Studio, you just need to fill blank and self-explanatory fields with custom values, as Figure 57.8 exemplifies. It is worth mentioning that VSIX packages are localizable (check out the Locale combo box) and can target multiple editions of Visual Studio (click the Select Editions button). You can also specify a license agreement (License Terms field) adding an existing text file or RTF file. The References group simply enables specifying other extensions that the current one depends on. To build the deployment package, simply build the project. The VSIX package is now available in the project output folder (Bin\Debug or Bin\Release). With regard to the previous example, the package is named SnippetCompilerVSPackage.Vsix. If you double-click such a file, you will be prompted with some information before installation begins, as represented in Figure 57.9.

By clicking **Install**, the new custom extension will be available onto the target system. This means that you simply need to deploy the VSIX package and you are done.


SnippetCompilerVSPackage - Microsoft Visual Studio
File Edit View Project Build Debug Team Data Tools Architecture Test Analyze Window Help
Debug
Any CPU
source.extension.vsixmanifest [Design]
Server Explorer
Data Sources
Toolbox
Properties
Solution Explorer
Team Explorer
Class View
Error List
Output
Item(s) Saved

ID	6b43a563-9a93-41de-a14b-c1cd904b6bcd
Product Name	Snippet Compiler Tool Window
Author	Alessandro Del Sole
Version	1.0
Description	Adds a tool window to Visual Studio 2010 for compiling code snippets on the fly
Locale	English (United States)
Supported VS Editions	Select Editions
License Terms	MSPublicLicense.txt
Icon	New Picture (6).tif
Preview Image	New Picture (6).tif
More Info URL	http://community.visual-basic.it/AlessandroEnglish
Getting Started Guide	
Supported Framework Edition	Min 4.0 Max 4.0

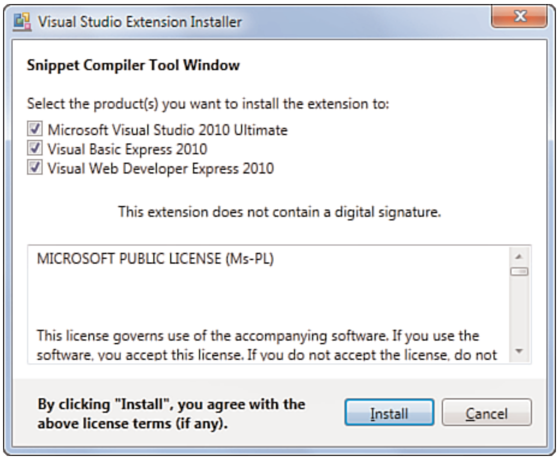
References — Add Reference, Remove Reference

ID	Name	Min Ver	Max Ver	MoreInfoURL	Nested VSIX

Content — Add Content

Content Type	Path
VS Package	|SnippetCompilerVSPackage;PkgdefProjectOutputGroup|

FIGURE 57.8 Customizing properties for the deployment package.


Visual Studio Extension Installer

Snippet Compiler Tool Window

Select the product(s) you want to install the extension to:

- [✓] Microsoft Visual Studio 2010 Ultimate
- [✓] Visual Basic Express 2010
- [✓] Visual Web Developer Express 2010

This extension does not contain a digital signature.

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This license governs use of the accompanying software. If you use the software, you accept this license. If you do not accept the license, do not

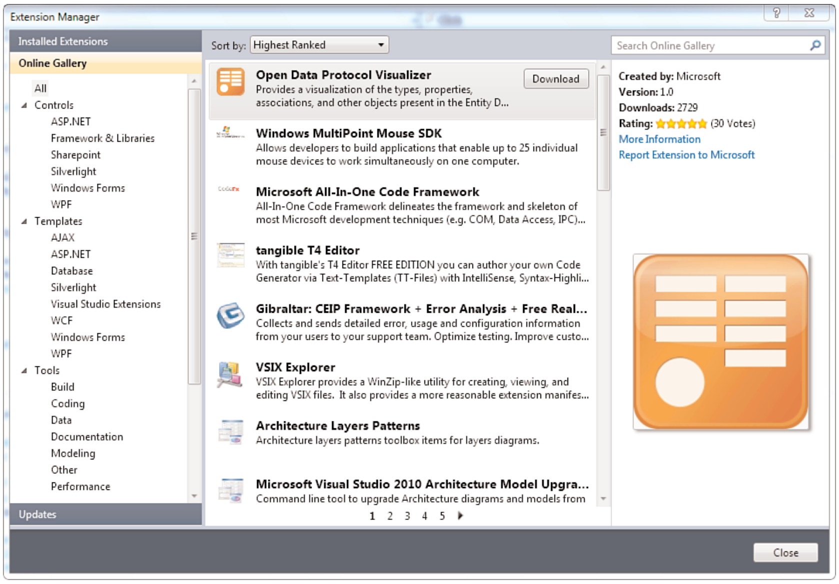
By clicking "Install", you agree with the above license terms (if any).

Install Cancel

FIGURE 57.9 Installing the new custom extension.

Managing Extensions with the Extension Manager

Visual Studio 2010 has a new integrated tool for easily managing installed extensions and for finding online extensions that can be easily installed from the Internet. To enter this tool, simply select the **Tools, Extension Manager** command. Figure 57.10 shows how the **Extension Manager** appears.



Open Data Protocol Visualizer
Provides a visualization of the types, properties, associations, and other objects present in the Entity D...

Windows MultiPoint Mouse SDK
Allows developers to build applications that enable up to 25 individual mouse devices to work simultaneously on one computer.

Microsoft All-In-One Code Framework
All-In-One Code Framework delineates the framework and skeleton of most Microsoft development techniques (e.g. COM, Data Access, IPC)...

tangible T4 Editor
With tangible's T4 Editor FREE EDITION you can author your own Code Generator via Text-Templates (TT-Files) with IntelliSense, Syntax-Highli...

Gibraltar: CEIP Framework + Error Analysis + Free Real...
Collects and sends detailed error, usage and configuration information from your users to your support team. Optimize testing. Improve custo...

VSIX Explorer
VSIX Explorer provides a WinZip-like utility for creating, viewing, and editing VSIX files. It also provides a more reasonable extension manifes...

Architecture Layers Patterns
Architecture layers patterns toolbox items for layers diagrams.

Microsoft Visual Studio 2010 Architecture Model Upgra...
Command line tool to upgrade Architecture diagrams and models from

Created by: Microsoft
Version: 1.0
Downloads: 2729
Rating: ★★★★★ (30 Votes)
More Information
Report Extension to Microsoft

FIGURE 57.10 The new Extension Manager tool.

The Extension Manager can be used for finding, downloading, and installing extensions to Visual Studio 2010. If you select the **Online Gallery** option on the left, the tool shows all available extensions in the Visual Studio Gallery, an online website from Microsoft specific for Visual Studio extensions (reachable at http://visualstudiogallery.com and that you should visit to get a complete overview of extensions and possibly the source code where available). The tool simply shows the list of available extensions, providing a brief description on the right side of the dialog. You simply click **Download** to download and install the desired extension. Each time you install an extension, Visual Studio needs to be restarted to correctly recognize such additions. As you can see, extensions can be of three categories: Controls, Templates (including project and item templates), and Tools. Each category is divided into subcategories, explaining what the extension is bound to. Basically the Extension Manager can find only VSIX packages, meaning that add-ins and code snippets are not supported and need to be handled differently. You can also search through on-line additions using the search box in the upper right of the dialog. Also, you can easily manage installed additions. Simply click **Installed Extensions** to get the full list of available extensions on your system, as shown in Figure 57.11, that lists extensions available on my development machine.

Here you can simply disable an extension, keeping it installed on the machine and available for future reuse, or completely uninstall. The tool can also find updates for installed extensions. This can be accomplished by selecting the **Updates** command on the left side.

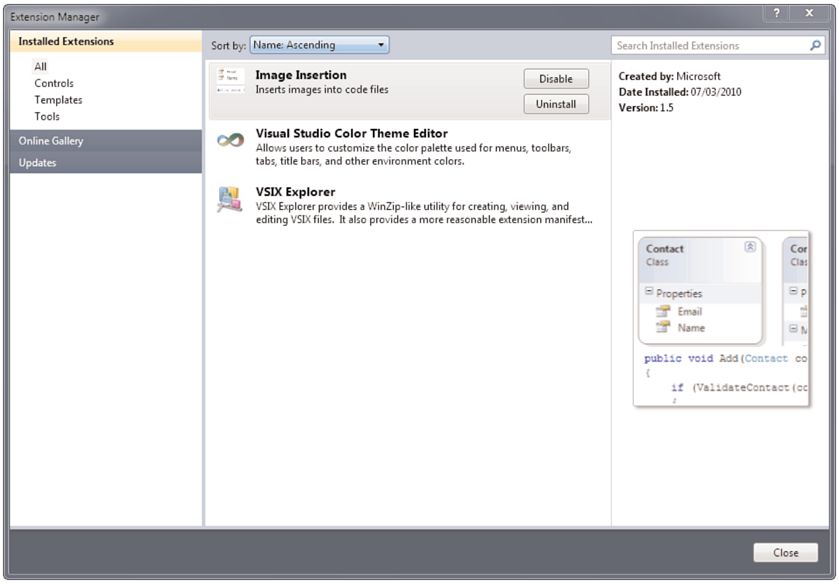


Image Insertion
Inserts images into code files

Visual Studio Color Theme Editor
Allows users to customize the color palette used for menus, toolbars, tabs, title bars, and other environment colors.

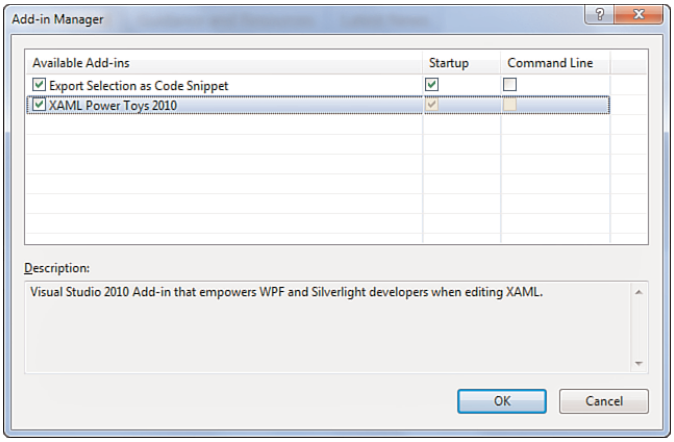
VSIX Explorer
VSIX Explorer provides a WinZip-like utility for creating, viewing, and editing VSIX files. It also provides a more reasonable extension manifest...

Created by: Microsoft
Date Installed: 07/03/2010
Version: 1.5

FIGURE 57.11 Managing installed extensions.

Managing Add-Ins with the Add-In Manager

Visual Studio 2010 enables enhancing the environment with add-ins. As mentioned at the beginning of this chapter, an add-in basically extends an existing functionality. You can manage installed add-ins via the Add-in Manager tool, which was already available in previous versions. You enter the tool by selecting **Tools**, **Add-In Manager**. Figure 57.12 shows how the tool looks when some add-ins are installed.



Available Add-ins	Startup	Command Line
✓ Export Selection as Code Snippet	✓	☐
✓ XAML Power Toys 2010	✓	☐

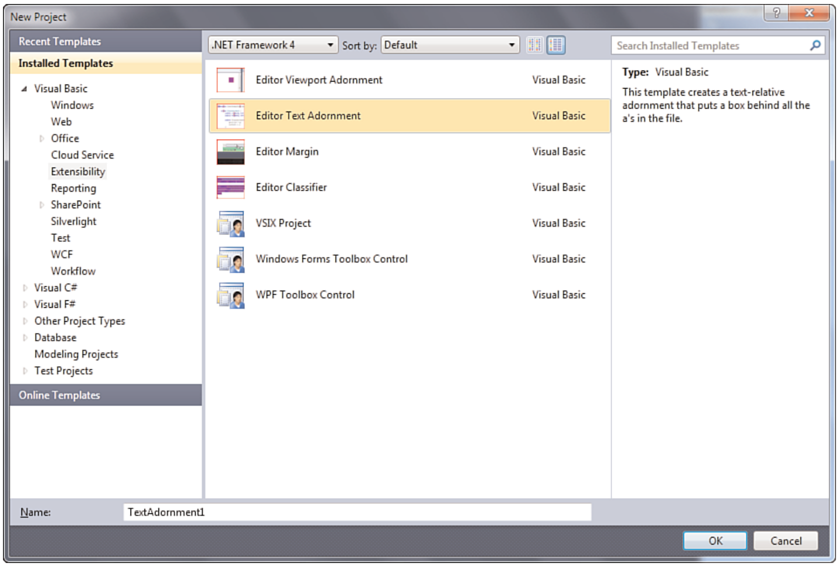
Description:
Visual Studio 2010 Add-in that empowers WPF and Silverlight developers when editing XAML.

FIGURE 57.12 The Add-in Manager.

Each add-in you can specify must be loaded at the IDE startup or if it has command-line support. Because building custom add-ins is something that was already available in previous versions of the IDE, this topic is not covered here, so refer to the official MSDN page at http://msdn.microsoft.com/en-us/library/80493a3w(VS.100).aspx.

Extending the Code Editor

As explained at the beginning of this chapter, one of the most important new features in the Visual Studio 2010 is the capability of extending the code editor, which is now based on WPF. Code editor extensions get the instance of the WPF objects keeping the editor itself alive. For a better understanding, instead of building a particular extension, we explain required objects taking advantage of one of the sample projects added by the Visual Studio 2010 SDK. Create a new project and select the **Visual Basic**, **Extensibility folder**; finally select the **Editor Text Adornment** project template, as shown in Figure57.13.



Type: Visual Basic

This template creates a text-relative adornment that puts a box behind all the a's in the file.

Name: TextAdornment1

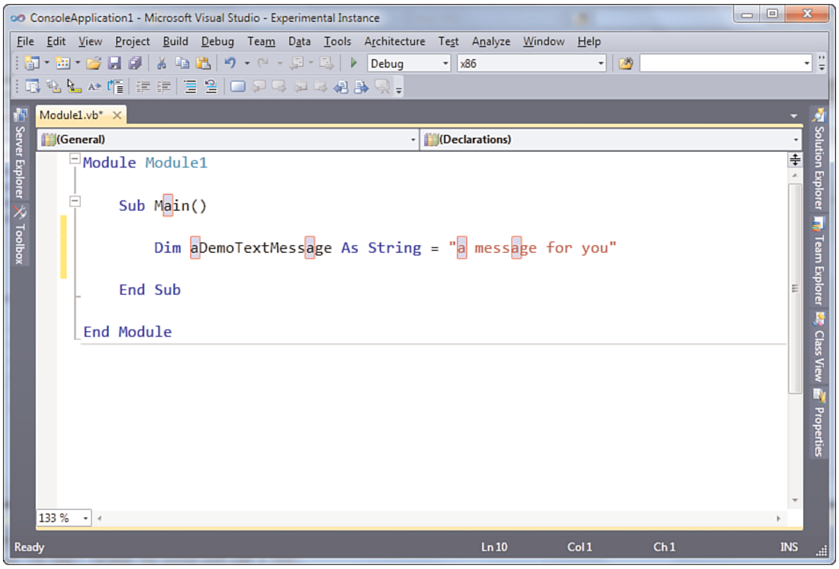
FIGURE 57.13 Selecting the code editor extension template.

The goal of this sample project is simple: adorning each "a" character in the code with a different background color. The most important object in providing editor extensions is the `Microsoft.VisualStudio.Text.Editor.IWpfTextView` type that represents the instance of the code editor. For the current example, there is the need of placing an adornment on all occurrences of the specified character. To place adornments, you need an instance of the `IAdornmentLayer` type that represents a space for placing adornments. Listing 57.4 shows the complete code; read comments that can help you understand what is under the hood.

LISTING 57.4 Providing a Code Editor Extension with Adornments

```
Imports System.Windows
Imports System.Windows.Controls
Imports System.Windows.Media
Imports Microsoft.VisualStudio.Text
Imports Microsoft.VisualStudio.Text.Editor
Imports Microsoft.VisualStudio.Text.Formatting

''' <summary>
''' ScarletCharacter adornment places red boxes behind all
''' the "a"s in the editor window
''' </summary>
Class ScarletCharacter

    Private WithEvents _view As IWpfTextView
    Private ReadOnly _layer As IAdornmentLayer
    Private ReadOnly _brush As Brush
    Private ReadOnly _pen As Pen

    'The IWpFTextView object represents the
    'instance of the code editor
    Public Sub New(ByVal view As IWpfTextView)
        _view = view

        'IAdornmentLayer represents the place where
        'adorners are placed
        _layer = view.GetAdornmentLayer("ScarletCharacter")

        'Create the pen and brush to color the box behind the a's
        Dim brush As New SolidColorBrush(Color.
                         FromArgb(&H20, &H0, &H0, &HFF))
        brush.Freeze()
        Dim penBrush As New SolidColorBrush(Colors.Red)
        penBrush.Freeze()
        Dim pen As New Pen(penBrush, 0.5)
        pen.Freeze()

        _brush = brush
        _pen = pen
    End Sub

    ''' <summary>
    ''' On layout change add the adornment to any reformated lines
    ''' </summary>
    Private Sub OnLayoutChanged(ByVal sender As Object,
                                ByVal e As TextViewLayoutChangedEventArgs) _
                                Handles _view.LayoutChanged

        'TextViewLayoutChangedEventArgs provides information when
        'the code editor layout changes
        For Each line In e.NewOrReformattedLines
            Me.CreateVisuals(line)
        Next line
    End Sub

    ''' <summary>
    ''' Within the given line add the scarlet box behind the a
    ''' </summary>
    Private Sub CreateVisuals(ByVal line As ITextViewLine)
        'grab a reference to the lines in the current TextView
        Dim textViewLines = _view.TextViewLines
        Dim lineStart As Integer = line.Start
        Dim lineEnd As Integer = line.End

        'Loop through each character, and place a box around any a
        For i = lineStart To lineEnd - 1
            If _view.TextSnapshot(i) = "a"c Then
                Dim charSpan As New SnapshotSpan(_view.TextSnapshot,
                                    Span.FromBounds(i, i + 1))
                Dim g As Geometry = textViewLines.GetMarkerGeometry(charSpan)
                If g IsNot Nothing Then
                    Dim drawing As New GeometryDrawing(_brush, _pen, g)
                    drawing.Freeze()

                    Dim drawingImage As New DrawingImage(drawing)
                    drawingImage.Freeze()

                    Dim image As New Image()
                    image.Source = drawingImage

                    'Align the image with the top of the bounds of the text geometry
                    Canvas.SetLeft(image, g.Bounds.Left)
                    Canvas.SetTop(image, g.Bounds.Top)

                    'AdornmentPositioningBehavior sets how
                    'the adornment is placed
                    _layer.AddAdornment(AdornmentPositioningBehavior.
                                        TextRelative, charSpan,
                                        Nothing, image, Nothing)
                End If
            End If
        Next
    End Sub

End Class
```

Notice how the `Microsoft.VisualStudio.Text` namespace exposes objects and other namespaces for interacting with the code editor. Now run the extension by pressing **F5**. Try to create a new console project and write some text containing “a” characters and you will see how they are surrounded with a different background, as shown in Figure 57.14.


ConsoleApplication1 - Microsoft Visual Studio - Experimental Instance
File Edit View Project Build Debug Team Data Tools Architecture Test Analyze Window Help
Debug
x86
Module1.vb*
(General)
(Declarations)
Server Explorer
Toolbox
Solution Explorer
Team Explorer
Class View
Properties
133 %
Ready
Ln 10
Col 1
Ch 1
INS

```
Module Module1

    Sub Main()

        Dim aDemoTextMessage As String = "a message for you"

    End Sub

End Module
```

FIGURE 57.14 The WPF editor extension adorning some text.

There are so many scenarios in which you might need to extend the Visual Studio code editor. You can find lots of interesting extensions by searching the Visual Studio Gallery with the Extension Manager.

Summary

Visual Studio 2010 is an extensible development environment that can be enhanced with custom extensions such as add-ins, packages, and new code editor extensions due to a new architecture based on Windows Presentation Foundation. Instrumentation required for creating extensibility projects are available when installing the Visual Studio 2010 SDK that provides projects templates, tools, and documentation. This chapter explained how to build a custom tool window based on WPF for the Visual Studio development environment. Then you saw how custom extensions can be packaged into VSIX files and deployed to other developers. Next you saw how you can take advantage of the new Extension Manager for getting and easily installing extensions from the Visual Studio Gallery. The last example provided in this chapter was about extending the WPF-based code editor by taking advantage of Visual Studio's managed assemblies.