**Contents**

"Hello, DevForce" is a small application which walks you through many of the common steps in building an n-tier DevForce desktop application.

- **Platform:** WPF
- **Language:** C#
- **Download:** Hello DevForce (WPF)

## Problem

The challenge: you'd like to build an n-tier DevForce desktop application but don't know where to begin. Maybe you've seen the quickie demo and tour, but want a few more details before you build your own application.

## Solution

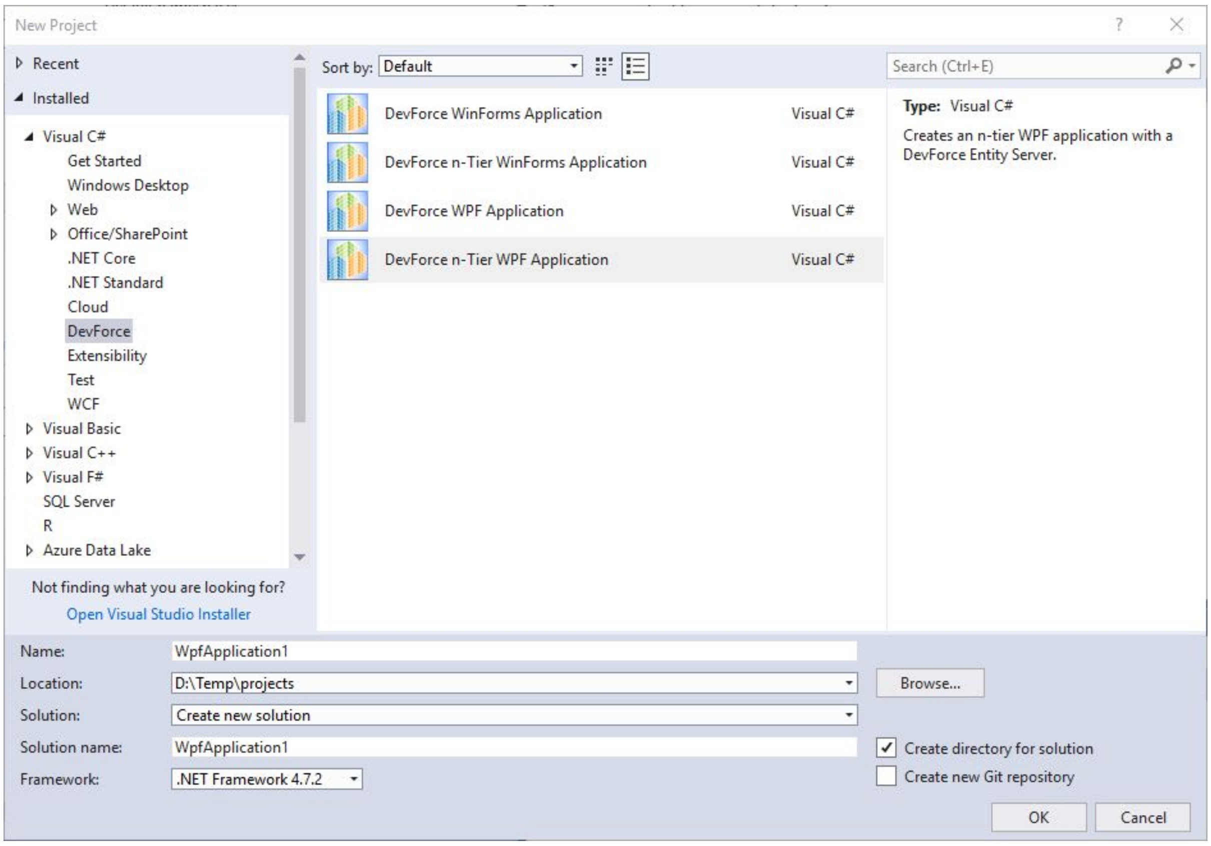
"Hello, DevForce" is a simple WPF application which is not about the UI. Instead, it shows how to choose a new project template, how to add an entity model project, and how to run the application n-tier. The concepts shown are not specific to WPF and apply to WinForms applications too.

### Create a solution using a DevForce project template

DevForce installs several Visual Studio project templates; in this walk through we'll use the *DevForce n-Tier WPF Application* template.

DevForce Templates are not currently available with Visual Studio 2019. You can download this sample to follow along.

In Visual Studio, choose *File / New Project* from the main menu; under Visual Basic or C#, find the DevForce templates; select the *DevForce n-Tier WPF Application* template; name and locate the new solution, and click OK.



Sort by: Default

| | |
|---|---|
| DevForce WinForms Application | Visual C# |
| DevForce n-Tier WinForms Application | Visual C# |
| DevForce WPF Application | Visual C# |
| DevForce n-Tier WPF Application | Visual C# |

**Type:** Visual C#

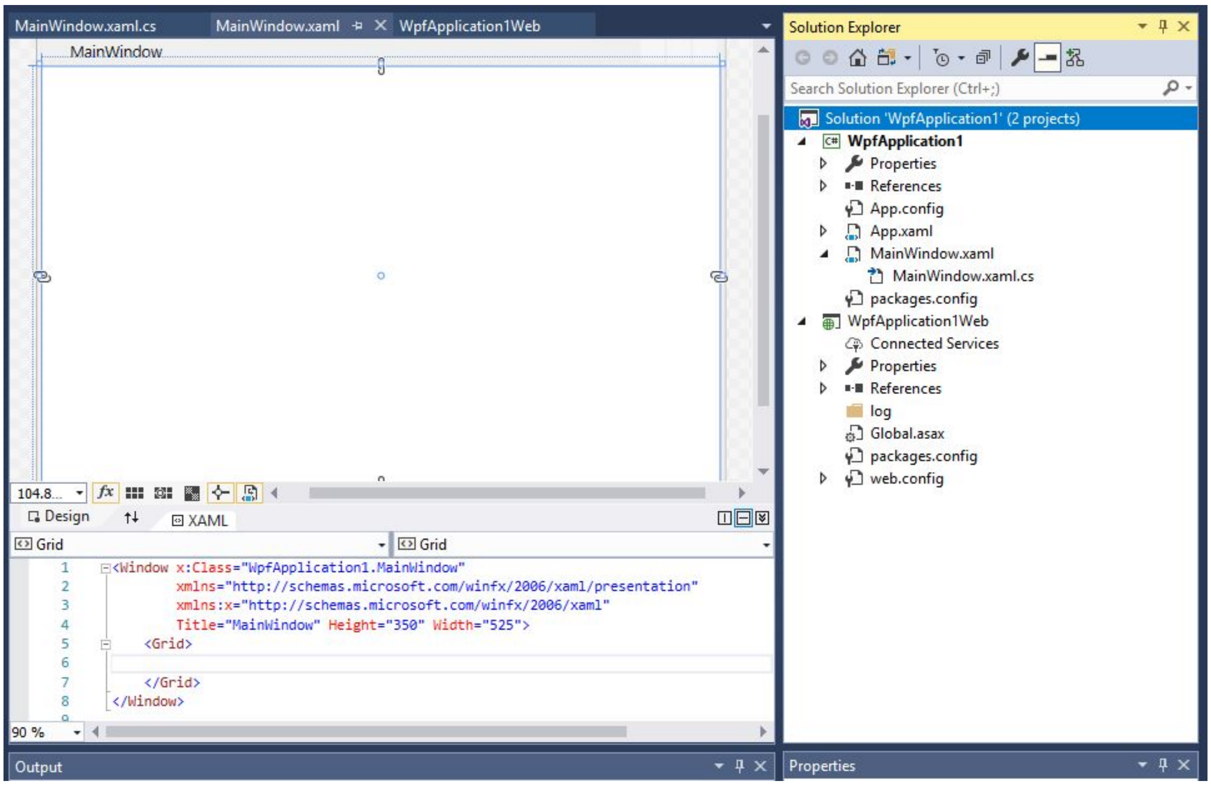
Creates an n-tier WPF application with a DevForce Entity Server.

| | |
|---|---|
| Name: | WpfApplication1 |
| Location: | D:\Temp\projects |
| Solution: | Create new solution |
| Solution name: | WpfApplication1 |
| Framework: | .NET Framework 4.7.2 |

[✓] Create directory for solution

[ ] Create new Git repository

A two-project solution containing a WPF client project and a web application project is created. The appropriate DevForce Nuget packages are also automatically installed.



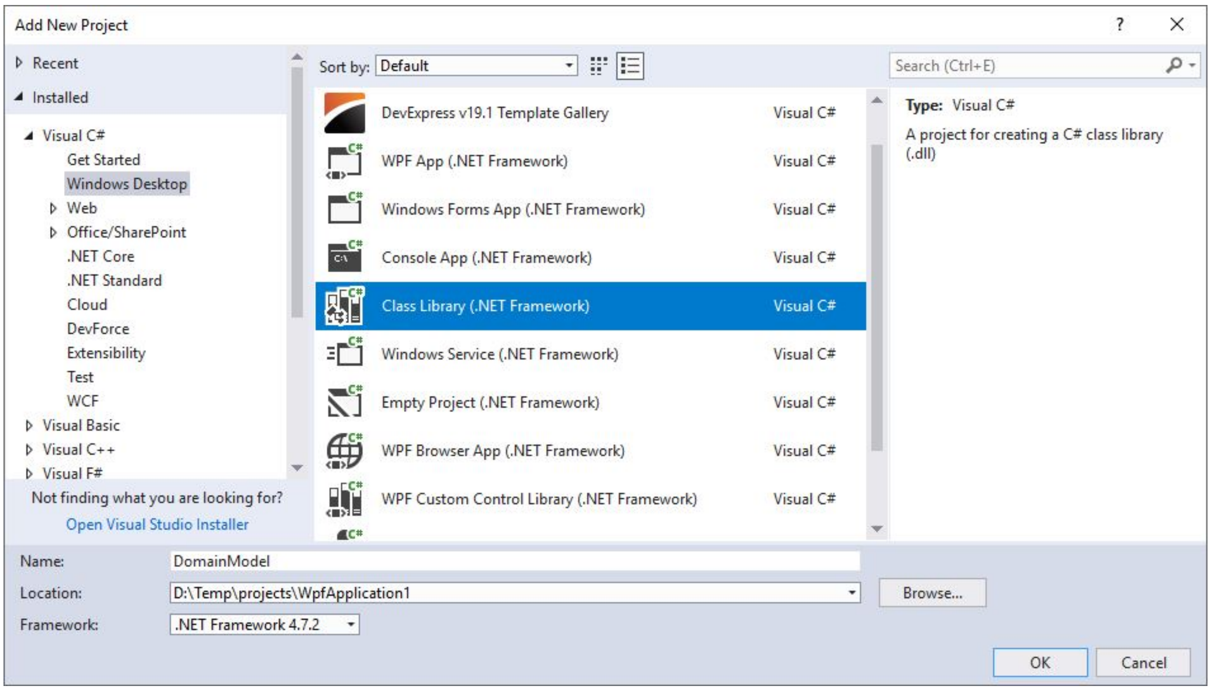
```
<Window x:Class="WpfApplication1.MainWindow"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="MainWindow" Height="350" Width="525">
    <Grid>

    </Grid>
</Window>
```

```
Solution 'WpfApplication1' (2 projects)
  WpfApplication1
    Properties
    References
    App.config
    App.xaml
    MainWindow.xaml
      MainWindow.xaml.cs
    packages.config
  WpfApplication1Web
    Connected Services
    Properties
    References
    log
    Global.asax
    packages.config
    web.config
```

## Add the entity model

Our next task will be to add the entity model. In a DevForce application, both the server-side and client-side applications need access to the domain model. We'll do that here by creating a separate project for the model.

Create a new Windows class library project in the solution. We'll call it "DomainModel" here.


Add New Project
Recent
Installed
Visual C#
Get Started
Windows Desktop
Web
Office/SharePoint
.NET Core
.NET Standard
Cloud
DevForce
Extensibility
Test
WCF
Visual Basic
Visual C++
Visual F#
Not finding what you are looking for?
Open Visual Studio Installer
Sort by: Default
Search (Ctrl+E)
DevExpress v19.1 Template Gallery
WPF App (.NET Framework)
Windows Forms App (.NET Framework)
Console App (.NET Framework)
Class Library (.NET Framework)
Windows Service (.NET Framework)
Empty Project (.NET Framework)
WPF Browser App (.NET Framework)
WPF Custom Control Library (.NET Framework)
Visual C#
Browse...
OK
Cancel

Type: Visual C#

A project for creating a C# class library (.dll)

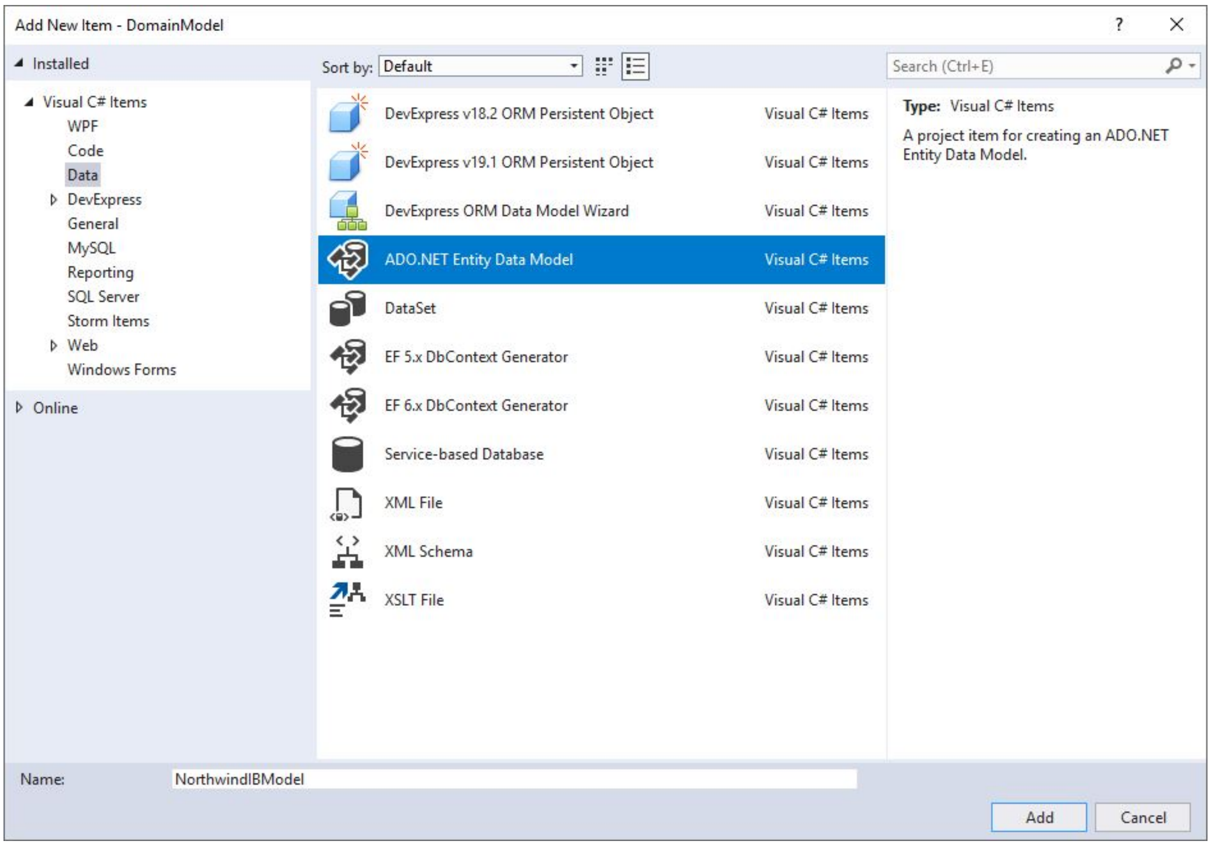
Name: DomainModel

Location: D:\Temp\projects\WpfApplication1

Framework: .NET Framework 4.7.2

Delete the "Class1.cs" file that Visual Studio creates; we won't need it.

To the DomainModel project, add a new item, an *ADO.NET Entity Data Model*. Name it "NorthwindIBModel".



Type: Visual C# Items

A project item for creating an ADO.NET Entity Data Model.

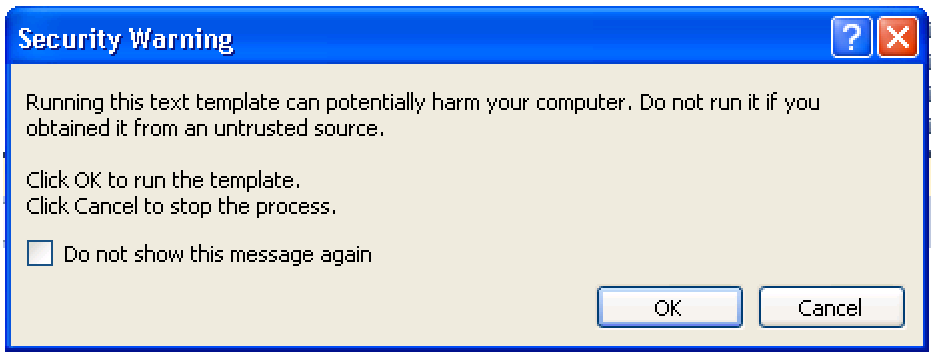
Name: NorthwindIBModel

Clicking <Add> will launch a wizard to help you build your Entity Data Model:

1. On the first dialog, accept the default choice of "EF Designer from database". Click Next.
2. On the "Choose Your Data Connection" dialog, select or create a connection to the NorthwindIB database, and tell Visual Studio to save the connection settings in app.config as "NorthwindIBEntityManager". Click Next.

3. On the "Choose Your Version" dialog, select Entity Framework 6.x. Click Next.
4. On the "Choose Your Database Objects and Settings" dialog, expand the tables node and select the Customer table. A typical model can have scores of entities, but we're using just the one in this sample. Click Finish.

If you receive the following security warning message…


Security Warning

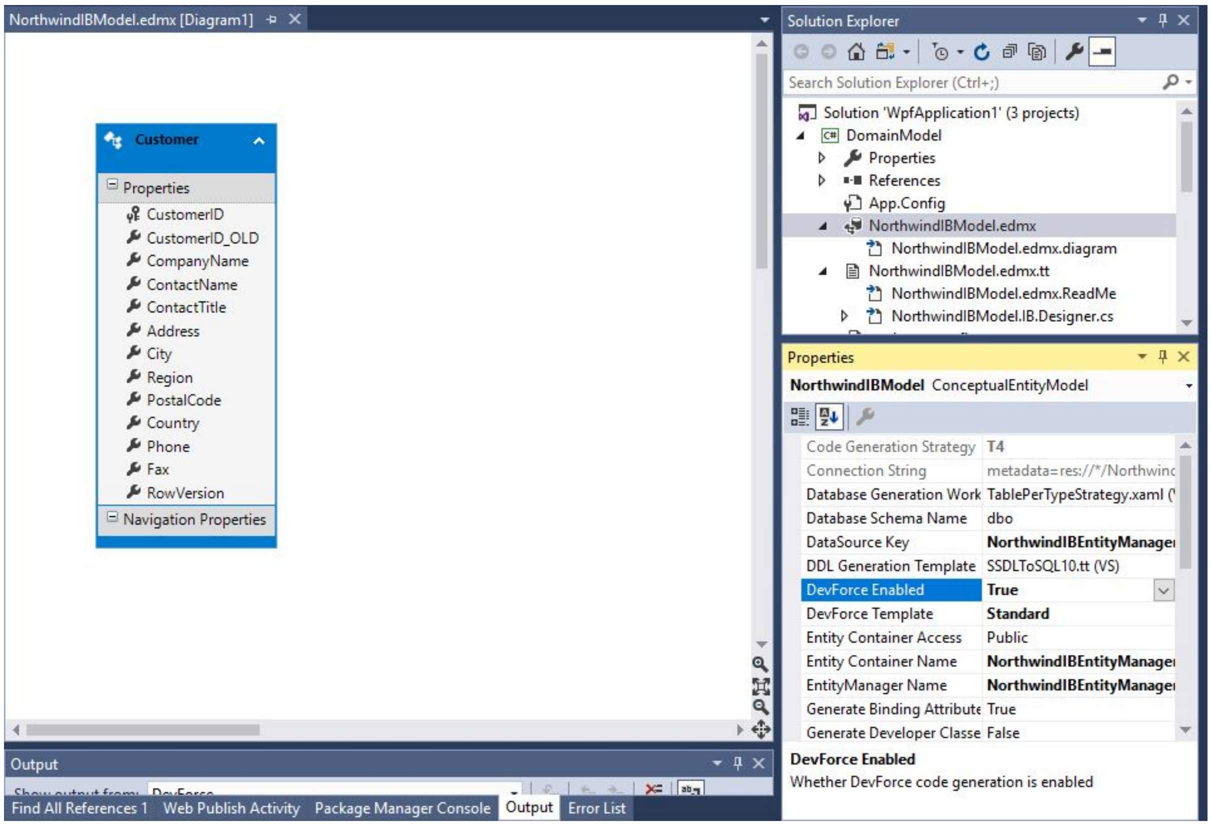
Running this text template can potentially harm your computer. Do not run it if you obtained it from an untrusted source.

Click OK to run the template.
Click Cancel to stop the process.

☐ Do not show this message again

… click <OK> so that DevForce can use the Entity Data Model to generate a C# or VB domain model. Until you turn this warning off, you will see it whenever DevForce wants to regenerate your domain model code.

The EDM designer will create an XML file with extension *.edmx* to capture the information supplied using the wizard. Then it will render the newly created model visually. Click in white space in the designer window to see the model properties, and set "DevForce Enabled" to true to have DevForce generate the code for the model:



Customer
Properties
CustomerID
CustomerID_OLD
CompanyName
ContactName
ContactTitle
Address
City
Region
PostalCode
Country
Phone
Fax
RowVersion
Navigation Properties

Solution 'WpfApplication1' (3 projects)
DomainModel
Properties
References
App.Config
NorthwindIBModel.edmx
NorthwindIBModel.edmx.diagram
NorthwindIBModel.edmx.tt
NorthwindIBModel.edmx.ReadMe
NorthwindIBModel.IB.Designer.cs

Properties
NorthwindIBModel ConceptualEntityModel

| | |
|---|---|
| Code Generation Strategy | T4 |
| Connection String | metadata=res://*/Northwinc |
| Database Generation Work | TablePerTypeStrategy.xaml (' |
| Database Schema Name | dbo |
| DataSource Key | NorthwindIBEntityManage |
| DDL Generation Template | SSDLToSQL10.tt (VS) |
| DevForce Enabled | True |
| DevForce Template | Standard |
| Entity Container Access | Public |
| Entity Container Name | NorthwindIBEntityManage |
| EntityManager Name | NorthwindIBEntityManage |
| Generate Binding Attribute | True |
| Generate Developer Classe | False |

DevForce Enabled
Whether DevForce code generation is enabled

## Write some code

There's a great deal more we could do to refine our model, but it's already sufficiently fleshed out to support data retrieval and persistence, so let's see how we can use it to do that.

1. Build the *DomainModel* project.
2. Add references to the *DomainModel* assembly in the *WpfApplication1* and *WpfApplication1Web* projects.

You may note that both of those projects already have references to several DevForce assemblies. These were put there by the project template that you used to create the solution initially. These templates add the latest DevForce Nuget packages to your projects.

The DevForce project template created a WPF Application project, so let’s add some code to that. First we’ll flesh out the *MainWindow* window that the template created, by adding a *TextBlock* within a *ScrollViewer* inside the window’s layout grid.

The XAML we’re starting with is this:

**XAML**

```
<Window x:Class="WpfApplication1.MainWindow"
   xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
   xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
   Title="MainWindow" Height="350" style="width:525px">
  <Grid>
  </Grid>
</Window>
```

We’ll enhance that to this:

**XAML**

```
<Window x:Class="WpfApplication1.MainWindow"
   xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
   xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
   Title="MainWindow" Height="350" style="width:525px">
   <Grid>
      <ScrollViewer>
         <TextBlock Name="_outputTextBlock" TextWrapping="Wrap"
            FontFamily="Courier New" />
      </ScrollViewer>
   </Grid>
</Window>
```

For the purpose of this very simple application, we’re going to use that *TextBlock* control like the output window of a Console application, and simply write output strings to it.

We could, of course, put code to retrieve and display data in the “code behind” area of the Window itself, but let’s just put ourselves off to a good start and build a very basic Model-View-ViewModel architecture so we can (a) keep our view extremely lightweight and (b) minimize the obstacles to our application’s testability.

We’ll create a class we’ll call *MainWindowViewModel*, give it a public string property named *Output*, and just bind our *TextBlock* to the value of that property:

**XAML**

```
<Grid >
   <ScrollViewer>
      <TextBlock Name="_outputTextBlock" TextWrapping="Wrap"
         FontFamily="Courier New" Text="{Binding Output}" />
   </ScrollViewer>
</Grid>
```

The MainWindow’s code behind starts out like this:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Data;
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Navigation;
using System.Windows.Shapes;
namespace WpfApplication1 {
 /// <summary>
 /// Interaction logic for MainWindow.xaml
 /// </summary>
 public partial class MainWindow : Window {
   public MainWindow() {
      InitializeComponent();
   }
```

```
  }
}
```

We'll add a handler for the window's Loaded event to do all of the following:

- Instantiate the view model;
- Set the view's DataContext to that view model; and
- Call a Start() menu on the view model to initiate data retrieval and display.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Data;
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Navigation;
using System.Windows.Shapes;
namespace WpfApplication1 {
 /// <summary>
 /// Interaction logic for MainWindow.xaml
 /// </summary>
 public partial class MainWindow : Window {
   public MainWindow() {
      InitializeComponent();
    this.Loaded += new RoutedEventHandler(MainWindow_Loaded);
    }
   void MainWindow_Loaded(object sender, RoutedEventArgs e) {
      MainWindowViewModel aMainWindowViewModel =
       new MainWindowViewModel();
    this.DataContext = aMainWindowViewModel;
      aMainWindowViewModel.Start();
    }
  }
}
```

Note that we did not have to know that the view's Loaded event handler had to be a RoutedEventHandler, etc.; we simply typed in "this.Loaded +=", and then pressed the TAB key a couple of times to let Visual Studio set up an appropriate stub. We then filled in the code representing the actions we wanted to take place.

Now let's create that *MainWindowViewModel* class. Add a new class by that name to the *WpfApplication1* project and flesh out its code to look like this:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using SysComp = System.ComponentModel;
using DomainModel;
using IdeaBlade.EntityModel;
namespace WpfApplication1 {
 class MainWindowViewModel : SysComp.INotifyPropertyChanged {
   private NorthwindIBEntityManager _mgr = new NorthwindIBEntityManager();
   string _output = "";
   public void Start() {
      FirstSample();
    }
   public void FirstSample() {
      StringBuilder aStringBuilder =
       new StringBuilder("Started FirstSample()...\n");
      var customersQuery =
        from cust in _mgr.Customers
        where cust.ContactTitle == "Sales Representative"
        orderby cust.CompanyName
        select cust;
      aStringBuilder.Append(string.Format(
       "Retrieved {0} customers\n", customersQuery.ToList().Count));
    foreach (Customer aCustomer in customersQuery) {
        aStringBuilder.Append(string.Format("Customer: {0}\n",
          aCustomer.CompanyName));
      }
      Output = aStringBuilder.ToString();
    }
   public string Output {
      get {
       return _output;
      }
      set {
        _output = value;
        RaisePropertyChanged("Output");
      }
    }
   #region INotifyPropertyChanged
   public event SysComp.PropertyChangedEventHandler PropertyChanged
      = delegate { };
   protected void RaisePropertyChanged(string propertyName) {
      PropertyChanged(this, new SysComp.PropertyChangedEventArgs(
        propertyName));
    }
   #endregion
 }
}
```

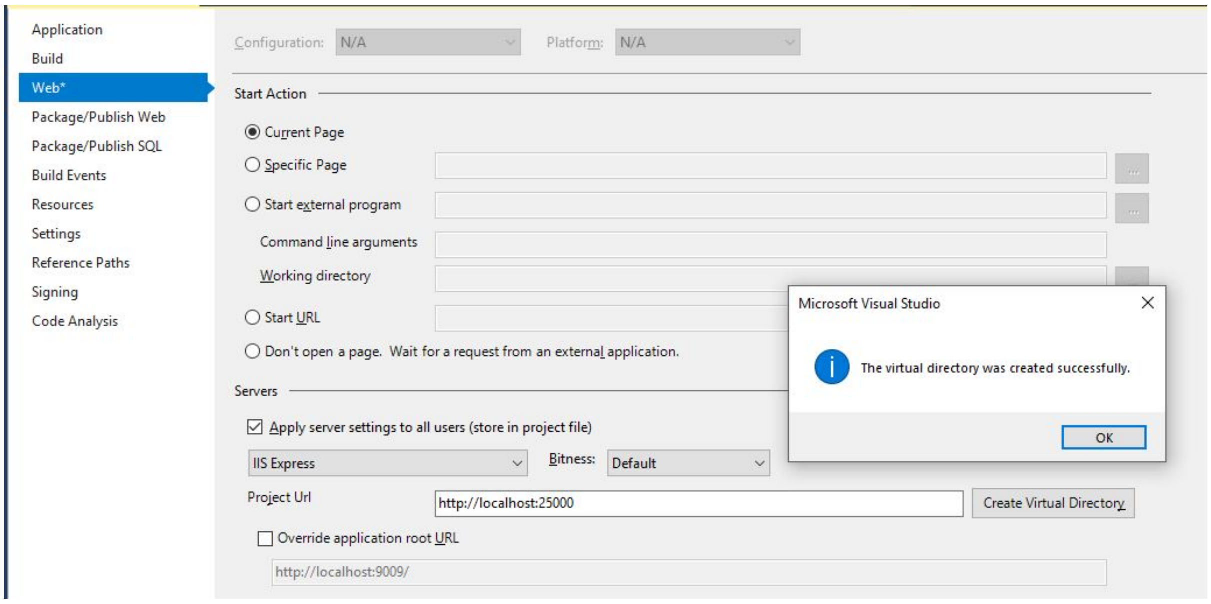
Note a few things about our ViewModel:

1. We made the class implement the INotifyPropertyChanged from the .NET namespace System.Component model. That interface requires the definition of an event name “PropertyChanged”, to be raised by an instance of this (MainWindowViewModel) class whenever the value of one of its public properties changes.
2. We’ve defined exactly one such public property – a string property named “Output” – which when set will cause the PropertyChanged event to be fired. Most WPF and Silverlight user interface controls listen for this event and respond to it by refreshing themselves with current data from the source object to which they are bound. In our app, the TextBlock on MainWindow will get refreshed automatically whenever the value of Output is changed.

Beyond that, our view model, when the Start() method is run, simply submits a LINQ query requesting Customers who meet some condition; then uses that query to retrieve, first a count of such Customers, and then the Customer objects themselves. With each operation it writes text to the Output property.

## Set the server port

The template assigned a default port of 9009 to the WpfApplication1Web project, and set IIS Express as the default web server for development. This port is often not available, so let's manually assign a new port for IIS Express - in this case we used 25000 - then click "Create Virtual Directory".



Project Url: http://localhost:25000

http://localhost:9009/

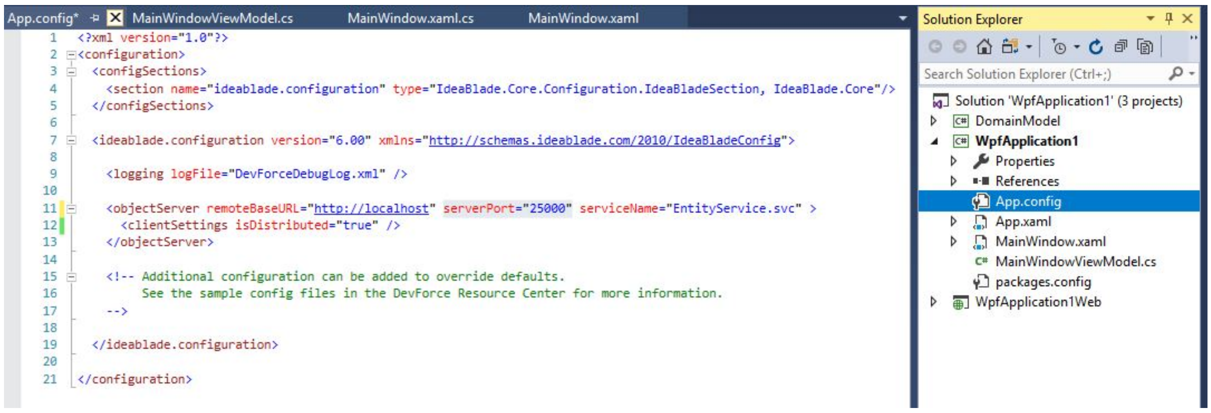
Microsoft Visual Studio

The virtual directory was created successfully.

## Modify the app.config

Now for the most important piece in setting up an n-tier application: tell the client app where the server is!

Open the App.config in the WpfApplication1 project. Find the objectServer entry, and change the serverPort to the one set in the step above, in this case 25000.



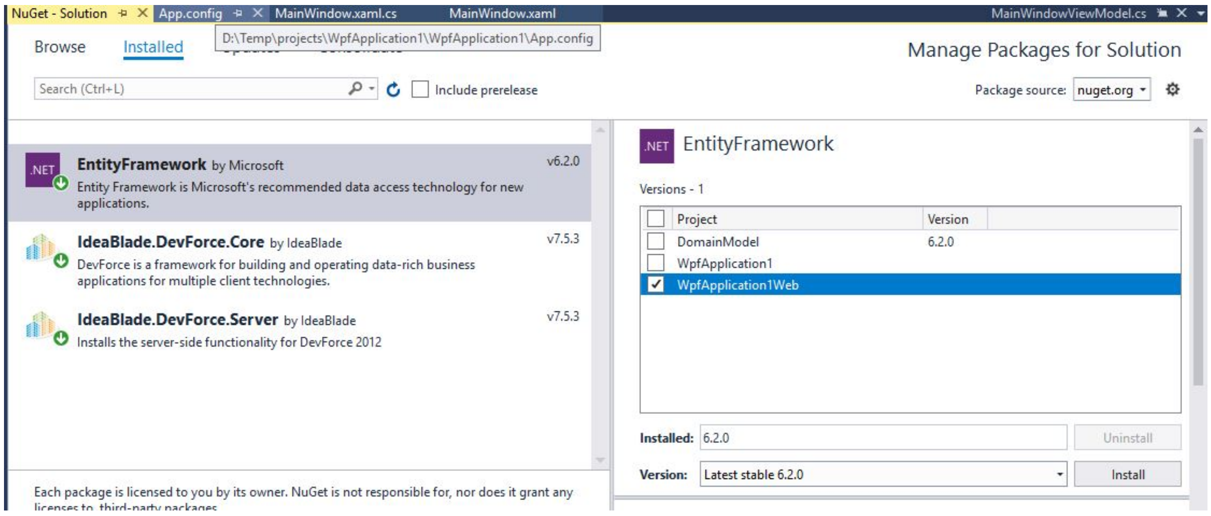
```
<?xml version="1.0"?>
<configuration>
  <configSections>
    <section name="ideablade.configuration" type="IdeaBlade.Core.Configuration.IdeaBladeSection, IdeaBlade.Core"/>
  </configSections>

  <ideablade.configuration version="6.00" xmlns="http://schemas.ideablade.com/2010/IdeaBladeConfig">

    <logging logFile="DevForceDebugLog.xml" />

    <objectServer remoteBaseURL="http://localhost" serverPort="25000" serviceName="EntityService.svc" >
      <clientSettings isDistributed="true" />
    </objectServer>

    <!-- Additional configuration can be added to override defaults.
         See the sample config files in the DevForce Resource Center for more information.
    -->

  </ideablade.configuration>

</configuration>
```

We don't yet need to worry about the settings for remoteBaseURL and serviceName, but will when we deploy to IIS.

## Modify the web.confg

Because we added the entity data model to the "DomainModel" project, EF added the connection string and other configuration settings to the app.config in that project. We now need to ensure the web project has the necessary information and references.

First, install the Entity Framework NuGet package to the web project:



EntityFramework by Microsoft v6.2.0
Entity Framework is Microsoft's recommended data access technology for new applications.

IdeaBlade.DevForce.Core by IdeaBlade v7.5.3
DevForce is a framework for building and operating data-rich business applications for multiple client technologies.

IdeaBlade.DevForce.Server by IdeaBlade v7.5.3
Installs the server-side functionality for DevForce 2012

Each package is licensed to you by its owner. NuGet is not responsible for, nor does it grant any licenses to, third-party packages.

EntityFramework

Versions - 1

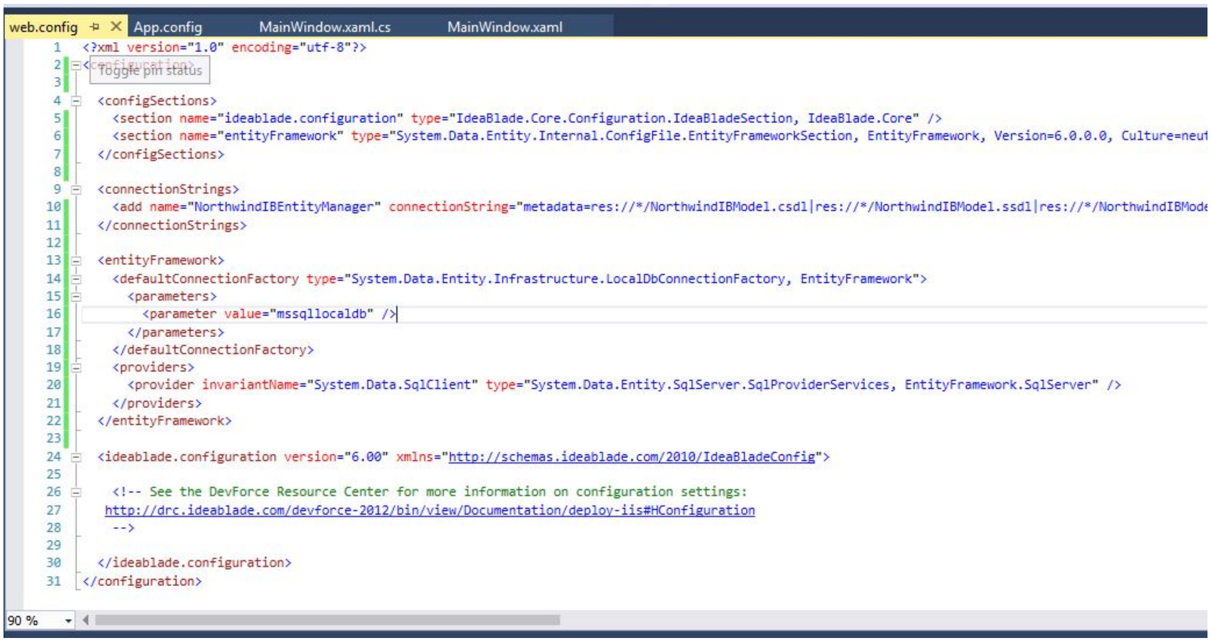
| | Project | Version |
|---|---|---|
| ☐ | DomainModel | 6.2.0 |
| ☐ | WpfApplication1 | |
| ✓ | WpfApplication1Web | |

Installed: 6.2.0

Version: Latest stable 6.2.0

Next, copy the **connectionStrings** information over from the app.config in the DomainModel project to the web.config in the web project.

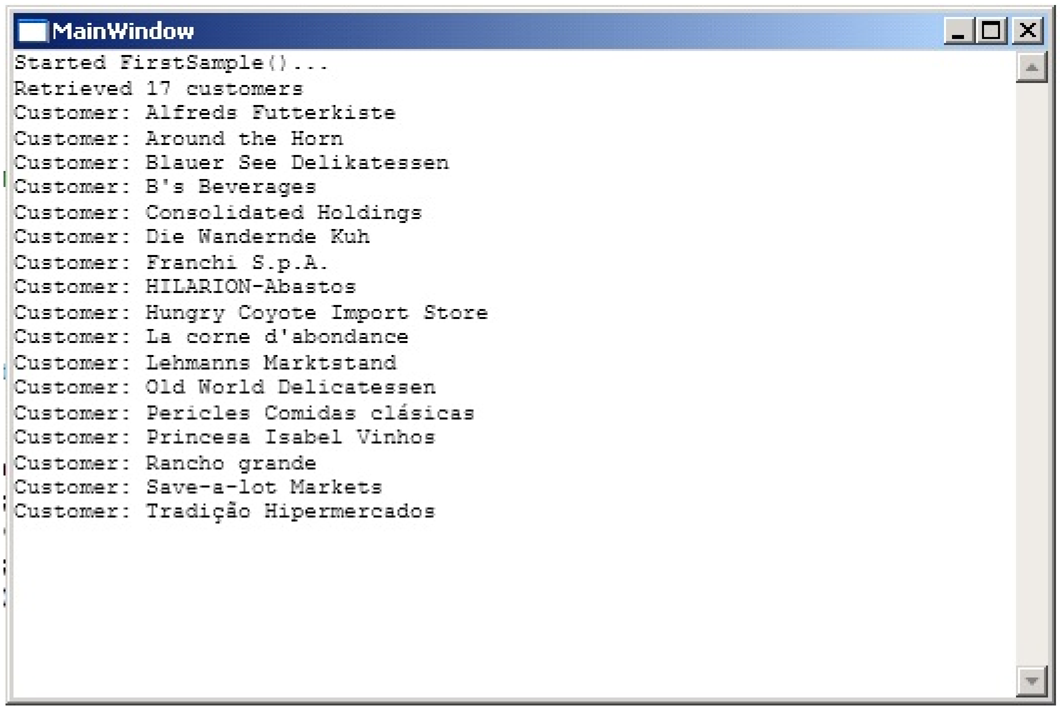
The final web.config will look like this:



```xml
<?xml version="1.0" encoding="utf-8"?>
<configuration>

  <configSections>
    <section name="ideablade.configuration" type="IdeaBlade.Core.Configuration.IdeaBladeSection, IdeaBlade.Core" />
    <section name="entityFramework" type="System.Data.Entity.Internal.ConfigFile.EntityFrameworkSection, EntityFramework, Version=6.0.0.0, Culture=neut
  </configSections>

  <connectionStrings>
    <add name="NorthwindIBEntityManager" connectionString="metadata=res://*/NorthwindIBModel.csdl|res://*/NorthwindIBModel.ssdl|res://*/NorthwindIBMode
  </connectionStrings>

  <entityFramework>
    <defaultConnectionFactory type="System.Data.Entity.Infrastructure.LocalDbConnectionFactory, EntityFramework">
      <parameters>
        <parameter value="mssqllocaldb" />
      </parameters>
    </defaultConnectionFactory>
    <providers>
      <provider invariantName="System.Data.SqlClient" type="System.Data.Entity.SqlServer.SqlProviderServices, EntityFramework.SqlServer" />
    </providers>
  </entityFramework>

  <ideablade.configuration version="6.00" xmlns="http://schemas.ideablade.com/2010/IdeaBladeConfig">

    <!-- See the DevForce Resource Center for more information on configuration settings:
   http://drc.ideablade.com/devforce-2012/bin/view/Documentation/deploy-iis#HConfiguration
    -->

  </ideablade.configuration>
</configuration>
```

## Run the app

Now we’re ready to run our app. Press F5 to start debugging.  If "Always Start When Debugging" is set to true (the default) in the properties for WpfApplication1Web, IIS Express will start the web application, and the client application will also launch.  The client app will connect to the EntityServer and send a query for customer data.  You'll soon see the following:



```
Started FirstSample()...
Retrieved 17 customers
Customer: Alfreds Futterkiste
Customer: Around the Horn
Customer: Blauer See Delikatessen
Customer: B's Beverages
Customer: Consolidated Holdings
Customer: Die Wandernde Kuh
Customer: Franchi S.p.A.
Customer: HILARION-Abastos
Customer: Hungry Coyote Import Store
Customer: La corne d'abondance
Customer: Lehmanns Marktstand
Customer: Old World Delicatessen
Customer: Pericles Comidas clásicas
Customer: Princesa Isabel Vinhos
Customer: Rancho grande
Customer: Save-a-lot Markets
Customer: Tradição Hipermercados
```

If instead you get an error, check our troubleshooting page.

## Publish

With an n-tier desktop application you'll typically deploy the client app and Entity Server to separate environments.  This doesn't mean though that these pieces are entirely independent.  Both will always need to reference the same version of DevForce assemblies, and also the same versions of your own application-specific assemblies, such as the domain model in this sample.

**Web application deployment**

The web application project hosting the DevForce EntityServer can be published like any other web application.  See here for more information on deployment options from within Visual Studio.

Be sure that the global.asax and web.config files are included in the deployment, along with all referenced assemblies - both DevForce and application specific. For more information on DevForce-specific requirements, see the Deploy to IIS topic.  This topic also includes discussions of database connection strings - which may need to be modified - and how to enable logging.

**Client app deployment**

Once you have a URL for the deployed web application, you need to ensure that your client application is using it.

The catch with DevForce is that we break out the pieces of your URL into separate properties on the objectServer element:

- remoteBaseURL: The protocol and machine name (or IP address) used to form the full URL
- serverPort:  The port on which the web server is listening
- serviceName: Usually consists of both the ASP.NET application name and the service file name "EntityService.svc"

For example, if the web app is deployed to an Azure website with URL "https://myapp.azurewebsites.net" the objectServer properties would be:

```
<objectServer remoteBaseURL="https://myapp.azurewebsites.net"
          serverPort="443"
          serviceName="EntityService.svc"
          >
```

If deployed as an application or virtual directory to IIS with the URL "http://myserver/myapp" the objectServer properties would be:

```
<objectServer remoteBaseURL="http://myserver"
          serverPort="80"
          serviceName="myapp/EntityService.svc"
          >
```

More information on deploying the client app is available here.