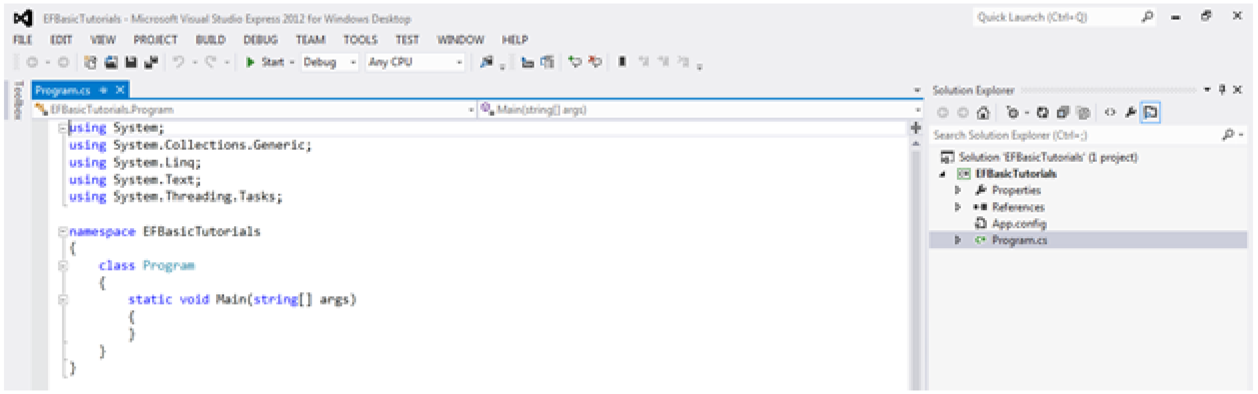
< Previous Next >

Creating an Entity Data Model

Here, we are going to create an Entity Data Model (EDM) for an existing database in database-first approach and understand the basic building blocks.

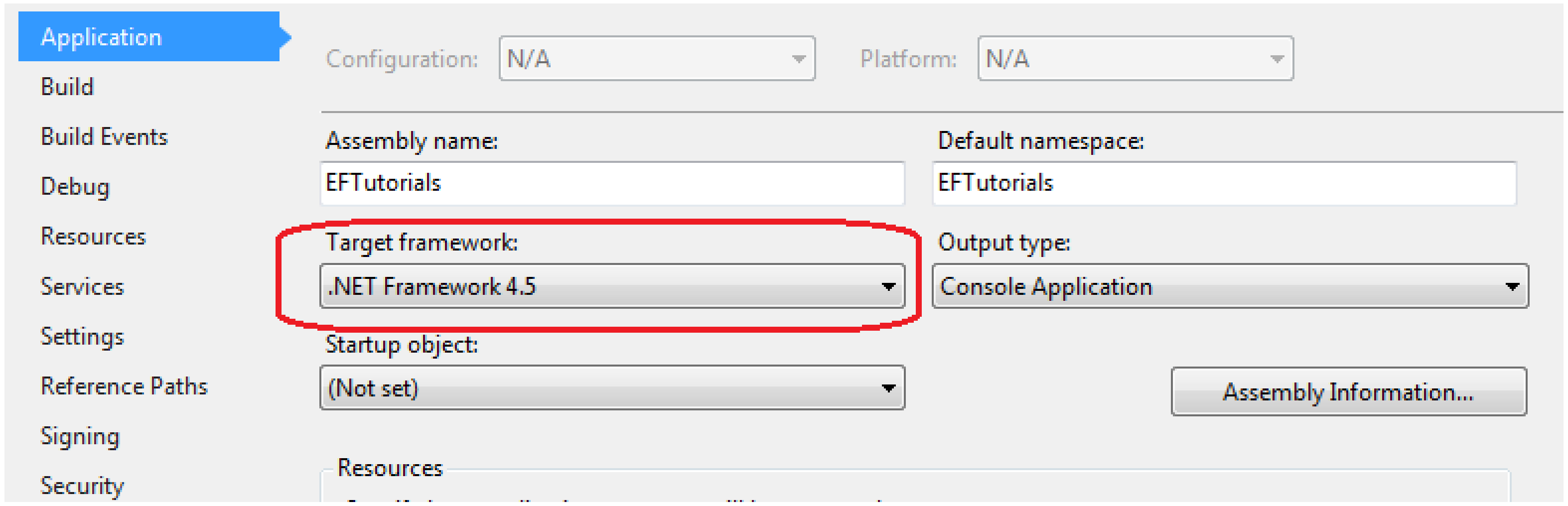
Entity Framework uses EDM for all the database-related operations. Entity Data Model is a model that describes entities and the relationships between them. Let's create a simple EDM for the `School` database using Visual Studio (2012\2015\2017) and Entity Framework 6.

1. Open Visual Studio and create a console project.


EFBasicTutorials - Microsoft Visual Studio Express 2012 for Windows Desktop
Quick Launch (Ctrl+Q)
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM TOOLS TEST WINDOW HELP
Start Debug Any CPU
Toolbox
Program.cs
EFBasicTutorials.Program
Main(string[] args)
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'EFBasicTutorials' (1 project)
EFBasicTutorials
Properties
References
App.config
Program.cs

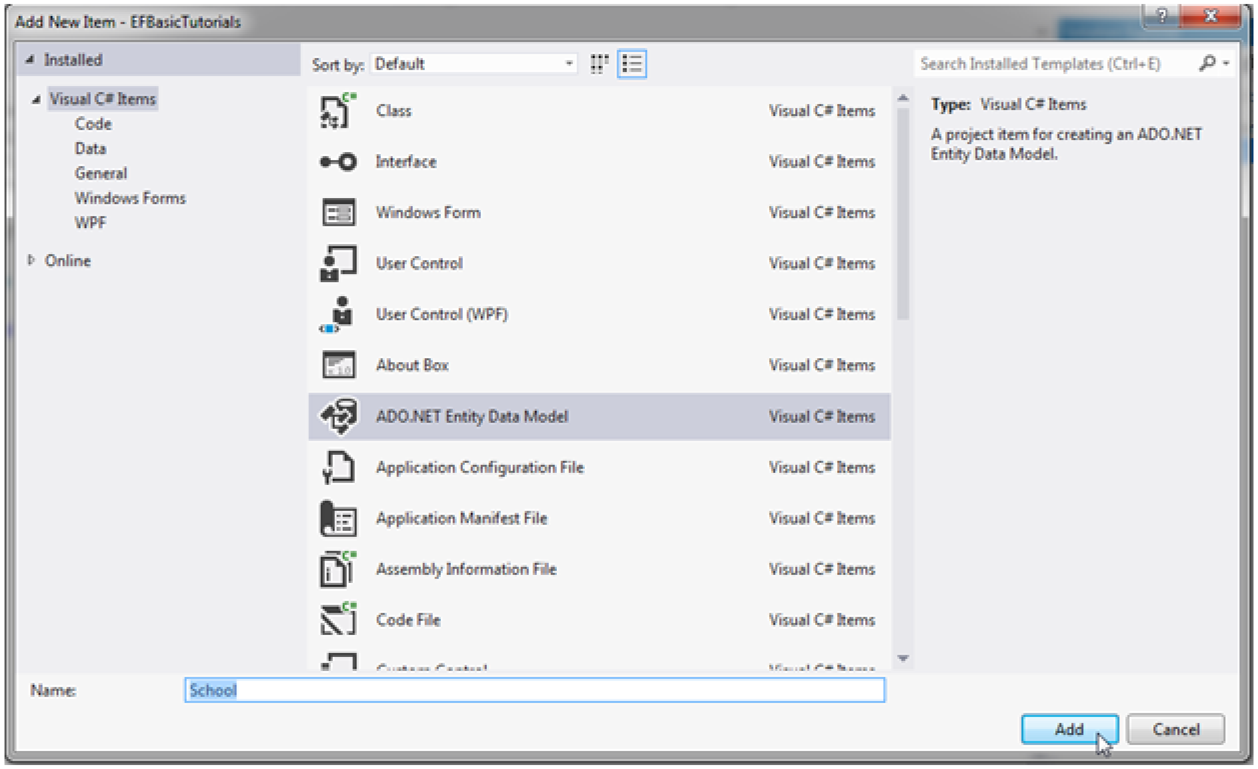
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace EFBasicTutorials
{
    class Program
    {
        static void Main(string[] args)
        {
        }
    }
}
```

Go to **PROJECT** menu -> **{project name} Properties..** - and make sure that the project's target framework is .NET Framework 4.5, as shown below.

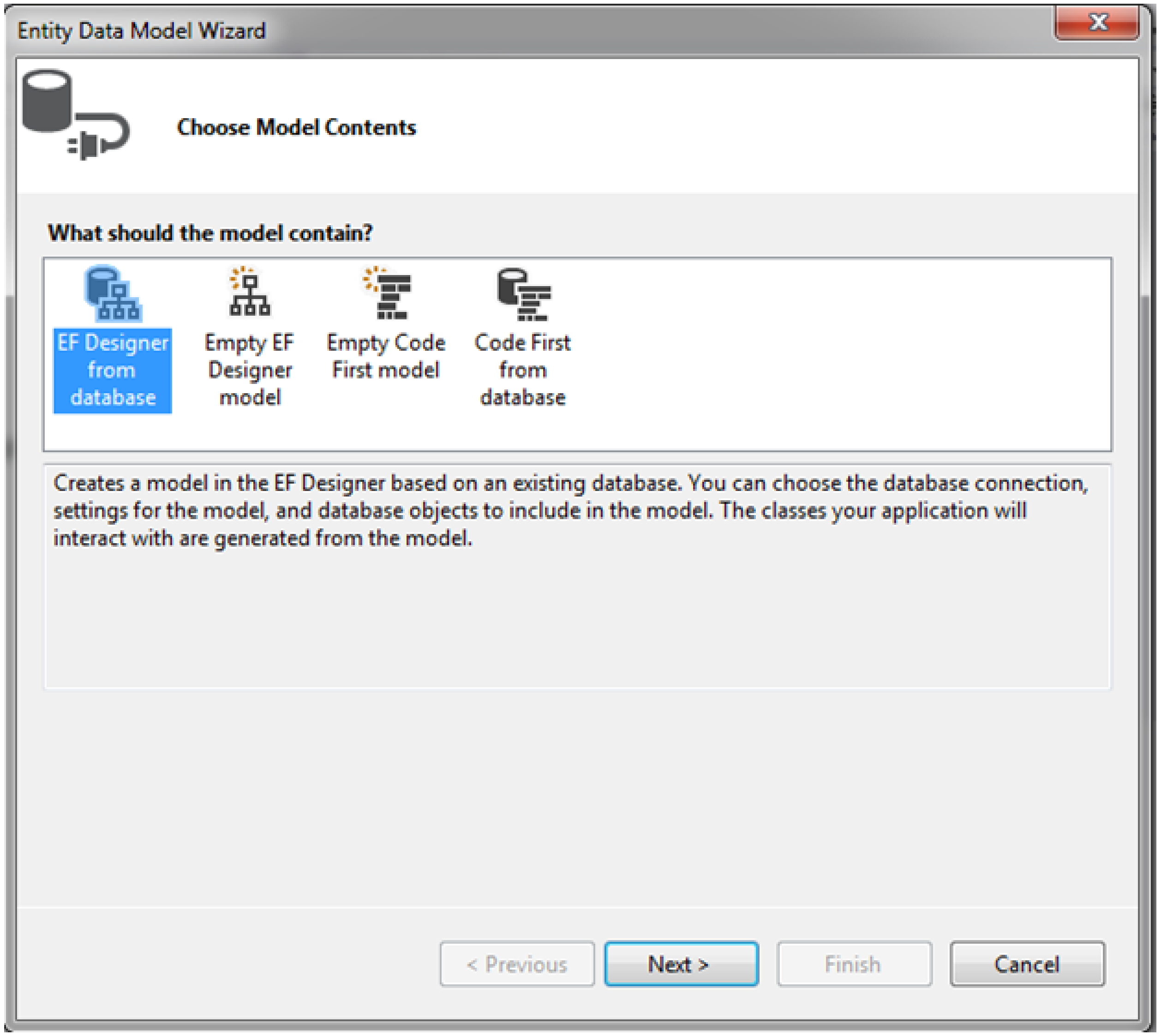


Configuration: N/A
Platform: N/A
Assembly name: EFTutorials
Default namespace: EFTutorials
Target framework: .NET Framework 4.5
Output type: Console Application
Startup object: (Not set)

2. Now, add Entity Data Model by right clicking on the project in the solution explorer -> **Add** -> **New Item**. This will open the **Add New Item** popup. In the popup, select **ADO.NET Entity Data Model** and provide an appropriate name to the EDM ('School' in this case) and click the **Add** button.

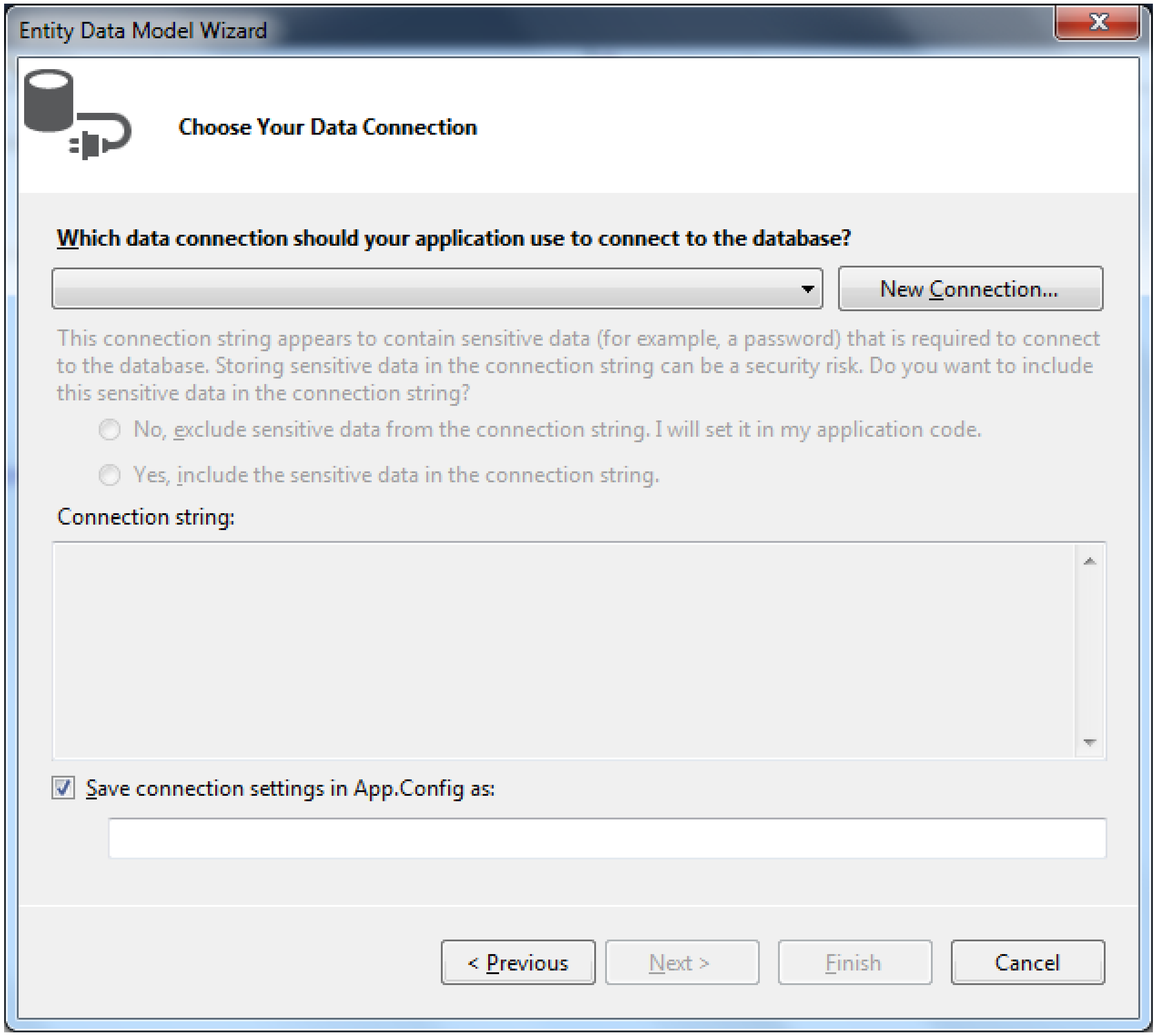

Add New Item - EFBasicTutorials
Installed
Visual C# Items
Code
Data
General
Windows Forms
WPF
Online
Sort by: Default
Search Installed Templates (Ctrl+E)
Class — Visual C# Items
Interface — Visual C# Items
Windows Form — Visual C# Items
User Control — Visual C# Items
User Control (WPF) — Visual C# Items
About Box — Visual C# Items
ADO.NET Entity Data Model — Visual C# Items
Application Configuration File — Visual C# Items
Application Manifest File — Visual C# Items
Assembly Information File — Visual C# Items
Code File — Visual C# Items
Type: Visual C# Items
A project item for creating an ADO.NET Entity Data Model.
Name: School
Add
Cancel

3. Entity Data Model Wizard in Visual Studio (2012/2015/2017) opens with four options to select from: **EF Designer from database** for the database-first approach, **Empty EF Designer model** for the model-first approach, **Empty Code First model** and **Code First from database** for Code-First approach. We are using database-first approach here, so select the **EF Designer from database** option and click **Next**.



Creates a model in the EF Designer based on an existing database. You can choose the database connection, settings for the model, and database objects to include in the model. The classes your application will interact with are generated from the model.

4. In this step, you need to create a connection with your existing database. If this is the first time you are creating an EDM for your database, then you need to create a new connection by clicking on the **New Connection...** button.



Which data connection should your application use to connect to the database?

This connection string appears to contain sensitive data (for example, a password) that is required to connect to the database. Storing sensitive data in the connection string can be a security risk. Do you want to include this sensitive data in the connection string?

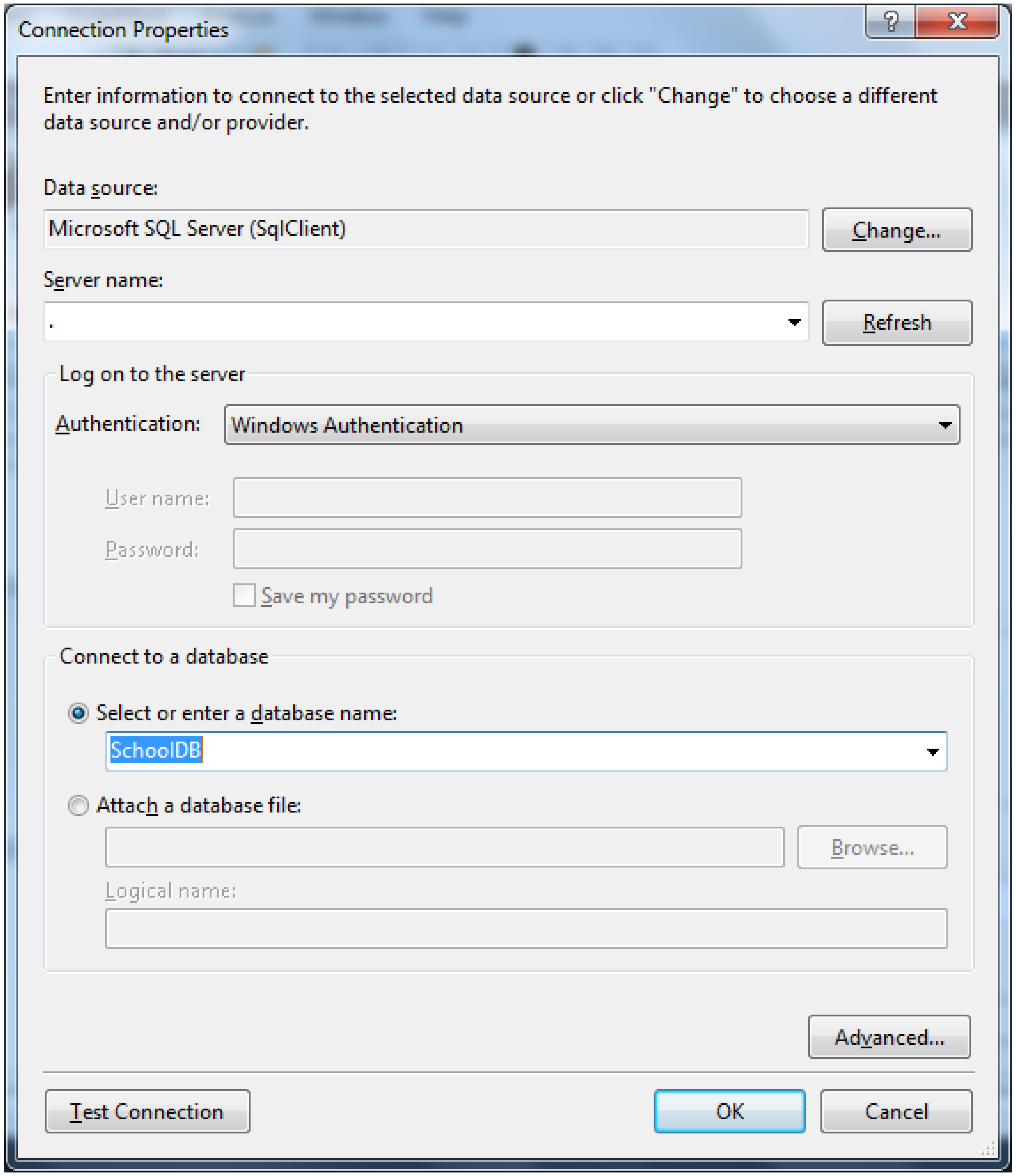
No, exclude sensitive data from the connection string. I will set it in my application code.

Yes, include the sensitive data in the connection string.

Connection string:

☑ Save connection settings in App.Config as:

In the Connection Properties popup, provide the server name (. for the local database) and select your database name and click the **OK** button.



Enter information to connect to the selected data source or click "Change" to choose a different data source and/or provider.

Data source: Microsoft SQL Server (SqlClient)

Server name: .

Log on to the server

Authentication: Windows Authentication

User name:

Password:

☐ Save my password

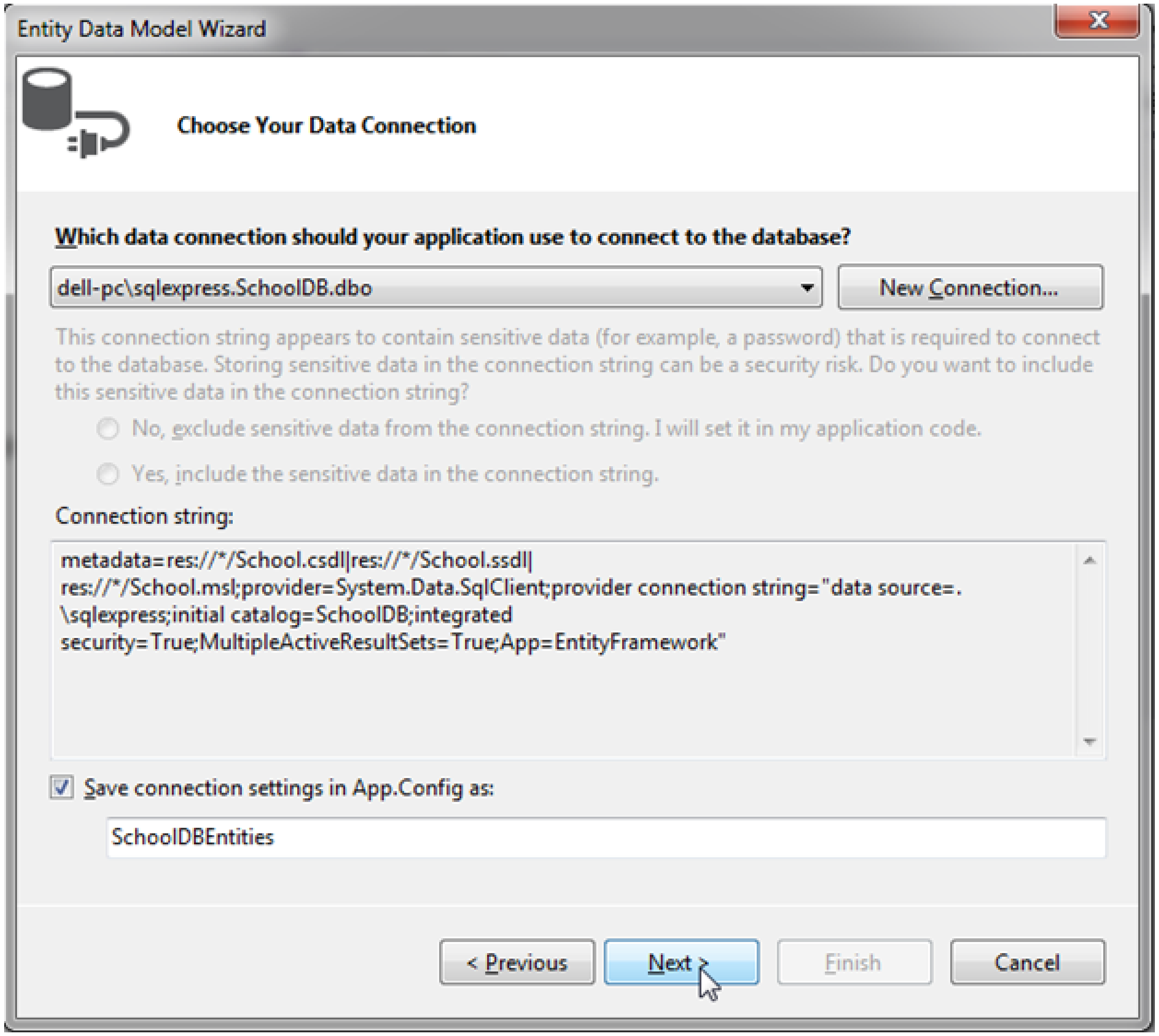
Connect to a database

● Select or enter a database name: SchoolDB

○ Attach a database file:

Logical name:

This will add a connection string to your app.config file with the `<DB name>Entities` name. Click **Next** after you set up your DB connection.



Which data connection should your application use to connect to the database?

dell-pc\sqlexpress.SchoolDB.dbo

This connection string appears to contain sensitive data (for example, a password) that is required to connect to the database. Storing sensitive data in the connection string can be a security risk. Do you want to include this sensitive data in the connection string?

- No, exclude sensitive data from the connection string. I will set it in my application code.
- Yes, include the sensitive data in the connection string.

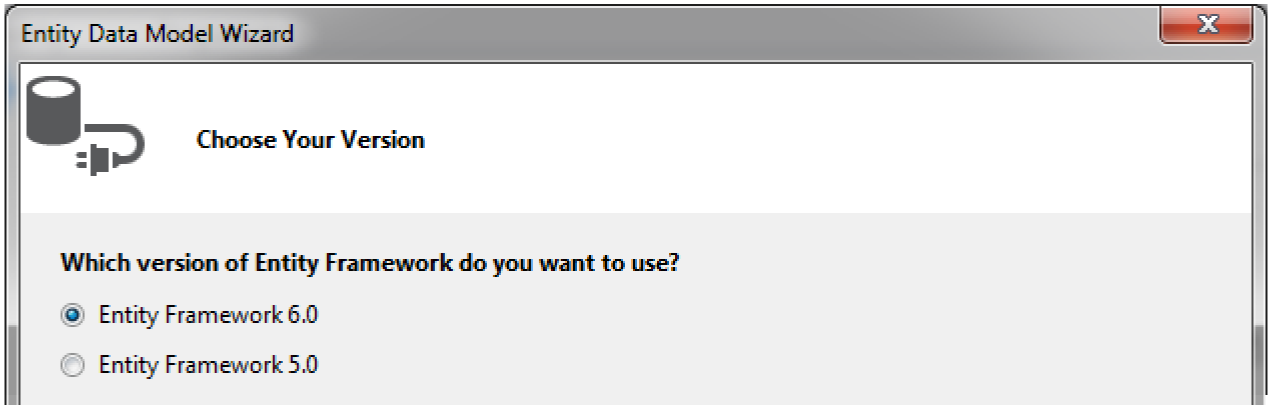
Connection string:

```
metadata=res://*/School.csdl|res://*/School.ssdl|
res://*/School.msl;provider=System.Data.SqlClient;provider connection string="data source=.
\sqlexpress;initial catalog=SchoolDB;integrated
security=True;MultipleActiveResultSets=True;App=EntityFramework"
```

[✓] Save connection settings in App.Config as:

SchoolDBEntities

5. In this step, you need to choose the version of Entity Framework. We will use Entity Framework 6.0 in the basic tutorials so select Entity Framework 6.0 and click Next.



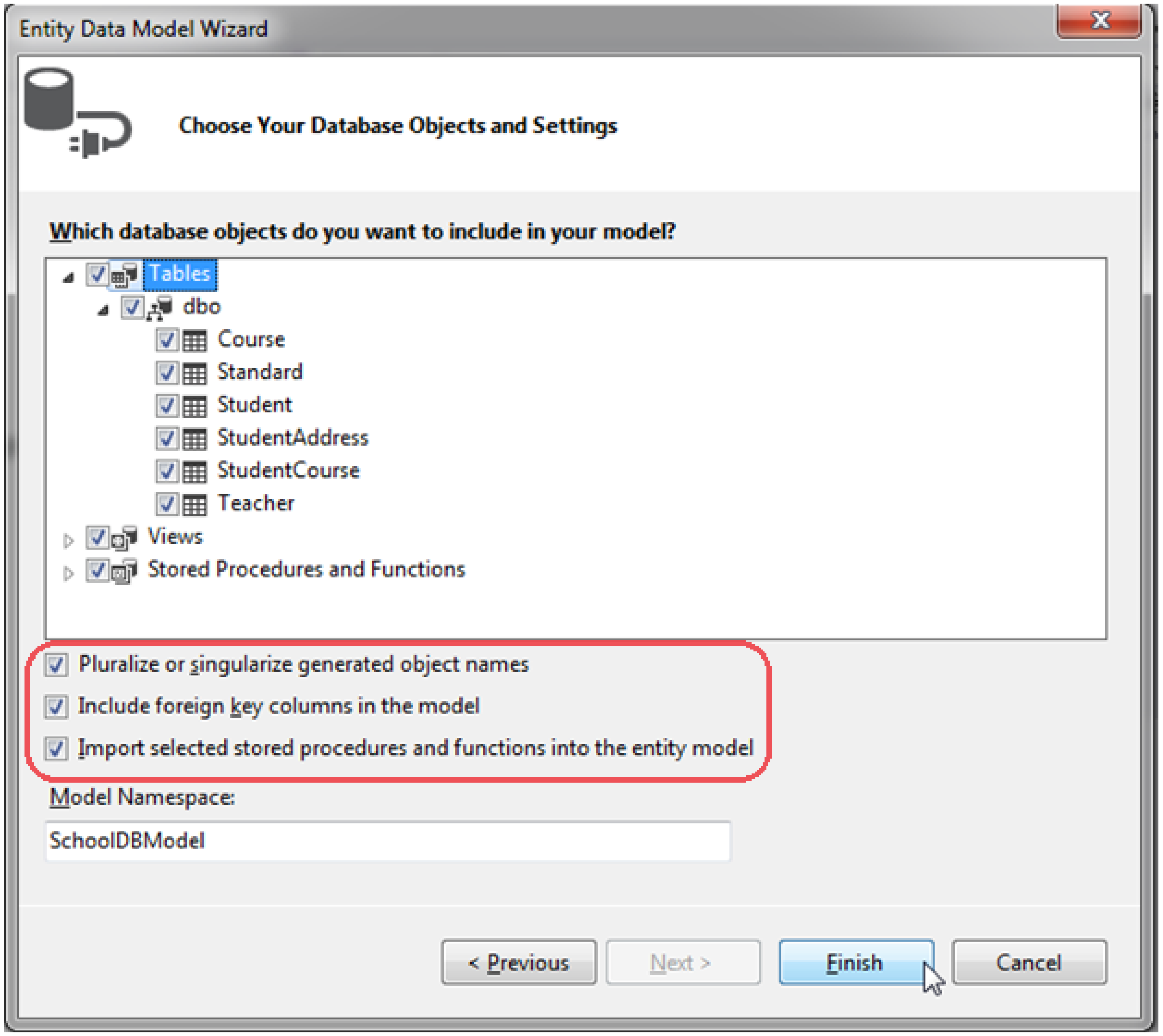
Which version of Entity Framework do you want to use?

[✓ Entity Framework 6.0]

Entity Framework 5.0

Note: If you already have installed the latest version of Entity Framework using NuGet manager, then this step of the wizard will no longer appear.

6. Next step will display all the Tables, Views and Stored Procedures (SP) in the database. Select the Tables, Views and SPs you want, keep the default checkboxes selected and click **Finish**. You can change the Model Namespace if you want.


Entity Data Model Wizard

Choose Your Database Objects and Settings

Which database objects do you want to include in your model?

- [✓] Tables
  - [✓] dbo
    - [✓] Course
    - [✓] Standard
    - [✓] Student
    - [✓] StudentAddress
    - [✓] StudentCourse
    - [✓] Teacher
- [✓] Views
- [✓] Stored Procedures and Functions

[✓] Pluralize or singularize generated object names

[✓] Include foreign key columns in the model

[✓] Import selected stored procedures and functions into the entity model

Model Namespace: SchoolDBModel

Note:

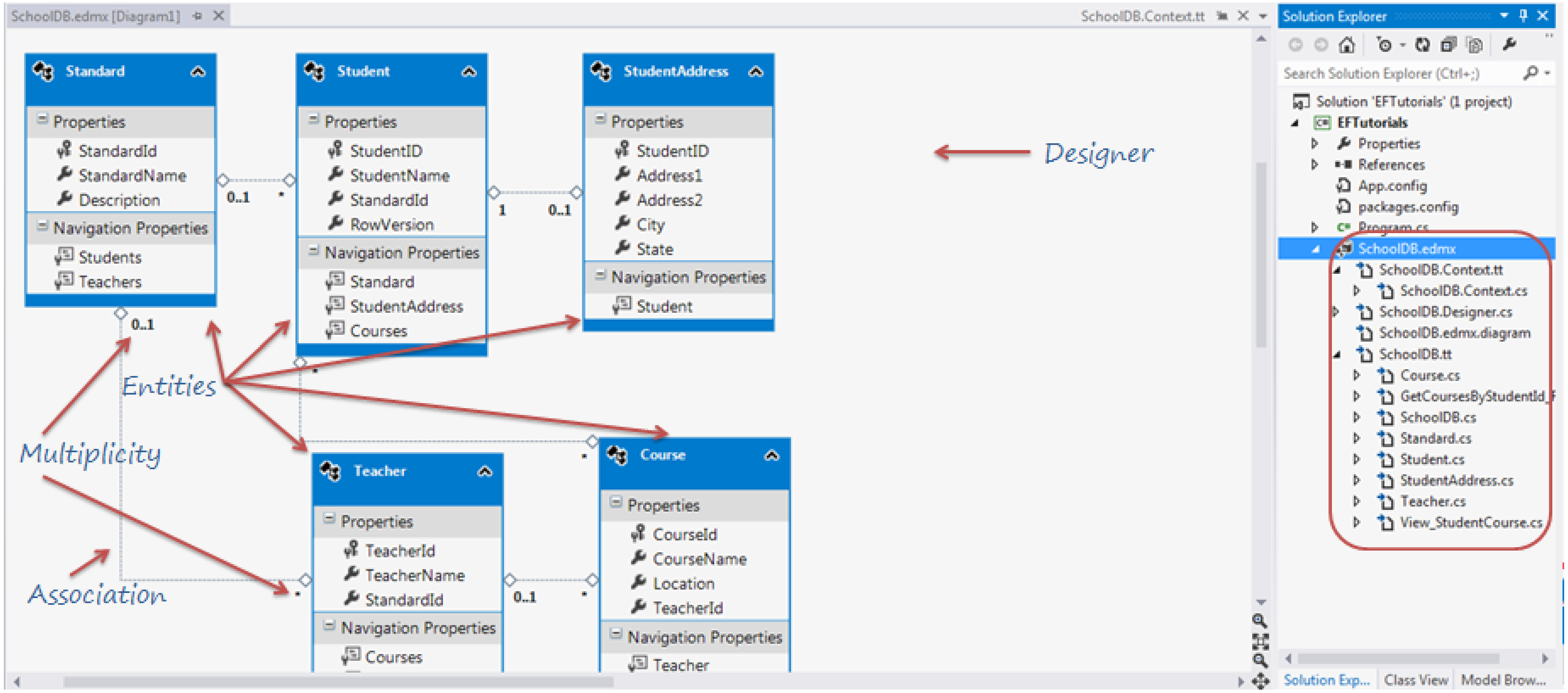
Pluralize or singularize generated object names checkbox singularizes an entityset name, if the table name in the database is plural. For example, if the `SchoolDB` database contains the `Students` table name, then entity set would be singular `Student`. Similarly, relationships between the models will be pluralized if the table has a one-to-many or a many-to-many relationship with other tables. For example, the `Student` table has many-to-many relationship with `Course` table, so the `Student` entity set will have plural name `Courses` for the collection navigation property of `Course` type.

The second checkbox, **Include foreign key columns in the model**, includes a foreign key property explicitly to represent the foreign key. For example, the `Student` table has a one-to-many relationship with the `Standard` table. To represent this in the model, the `Student` entityset includes a `StandardId` property with `Standard` reference navigation property. If this checkbox is unchecked, then it will only include the `Standard` reference navigation property, but not the `StandardId`.

The third checkbox, **Import selected stored procedures and functions into entity model**, automatically creates Function Imports for the stored procedures and functions. You don't need to import functions manually, like it was necessary prior to Entity Framework 6.0.

7. After clicking on **Finish**, a School.edmx file will be added into your project.

Open EDM designer by double clicking on School.edmx. This displays all the entities for the selected tables and the relationships between them, as shown below:



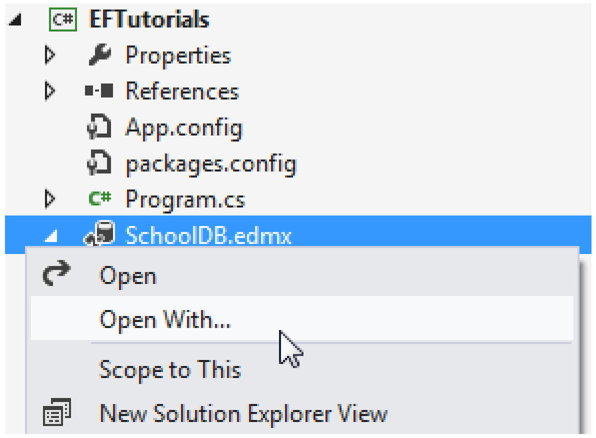
EDM adds the provider and connection string settings in the App.config file, as shown below:

```
.0"?>

s>
 more information on Entity Framework configuration, visit http://go.microsoft.com/fwlink/?
>
ion  name="entityFramework"  type="System.Data.Entity.Internal.ConfigFile.EntityFrameworkSection,
 Version=6.0.0.0, Culture=neutral, PublicKeyToken=b77a5c561934e089" requirePermission="false"/>
ns>

ntime version="v4.0" sku=".NETFramework,Version=v4.5"/>

rk>
ectionFactory type="System.Data.Entity.Infrastructure.SqlConnectionFactory, EntityFramework"/>

der  invariantName="System.Data.SqlClient"  type="System.Data.Entity.SqlServer.SqlProviderServices,
SqlServer"/>

ork>
ings>
                                                      <add                    name="SchoolDBEntities"
="metadata=res://*/SchoolDB.csdl|res://*/SchoolDB.ssdl|res://*/SchoolDB.msl;provider=System.Data.SqlClient;provider
on        string=&quot;data        source=.\sqlexpress;initial        catalog=SchoolDB;integrated
ltipleactiveresultsets=True;application                                   name=EntityFramework&quot;"
stem.Data.EntityClient"/>
rings>
```

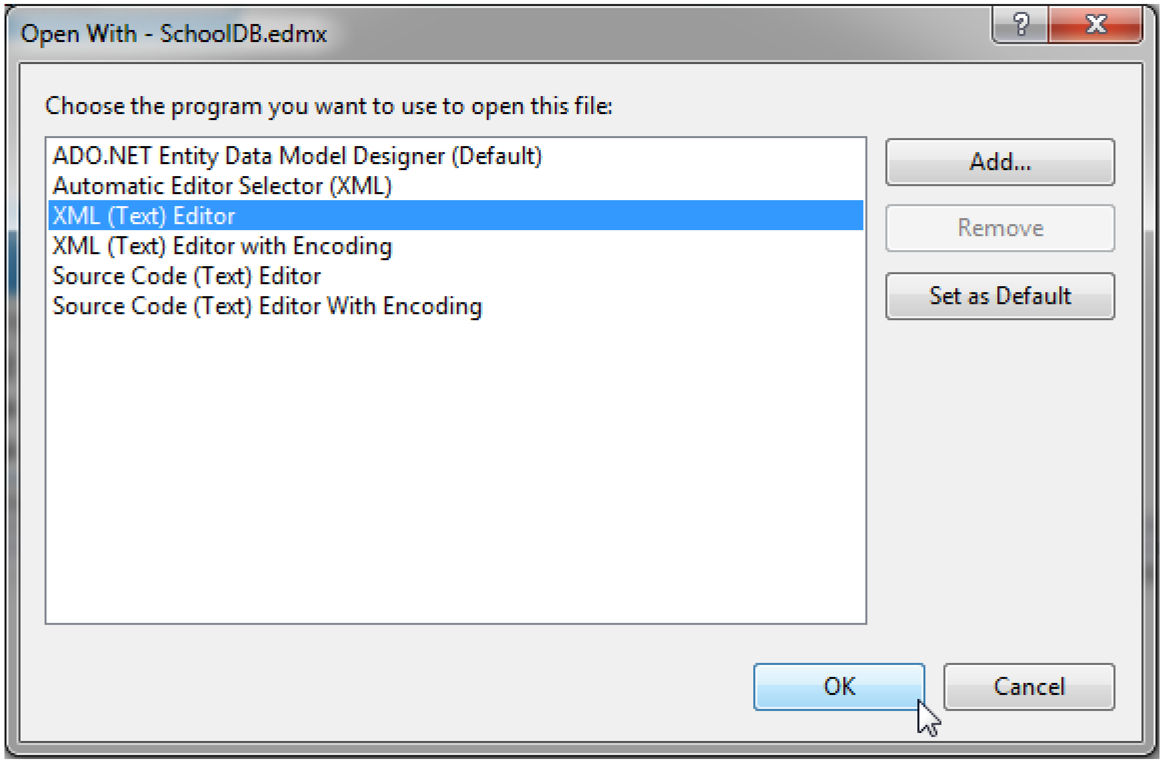
Thus, you can create an Entity Data Model file (.edmx) for your existing database.

You can open an EDM designer in XML view where you can see all the three parts of the EDM: Conceptual schema (CSDL), Storage schema (SSDL) and mapping schema (MSL), together in XML view.

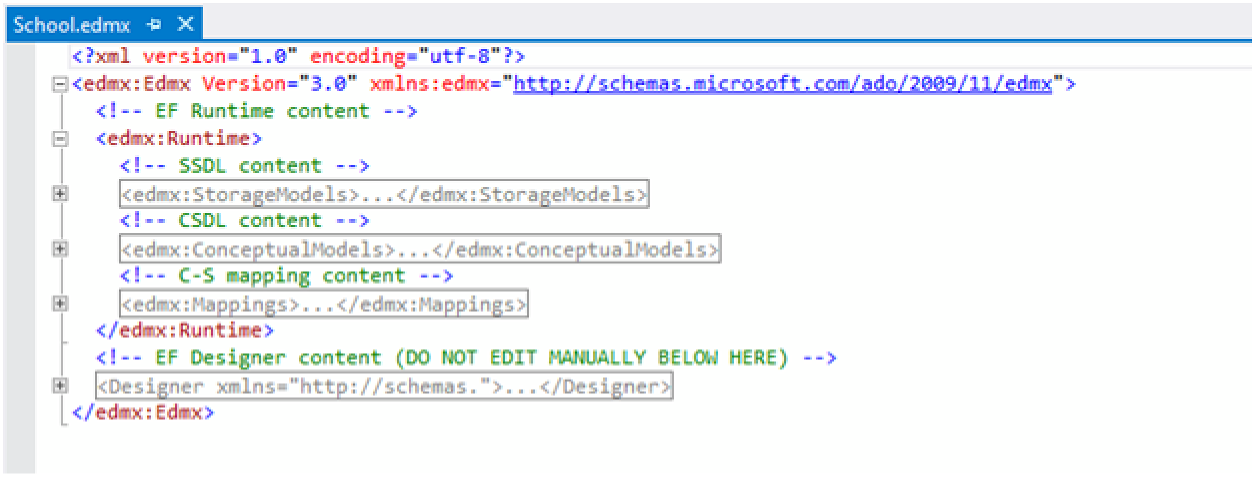
Right click on School.edmx -> click 'Open with..', this will open a popup window.



Select 'XML (text) Editor' in the popup window.


Open With - SchoolDB.edmx
Choose the program you want to use to open this file:
ADO.NET Entity Data Model Designer (Default)
Automatic Editor Selector (XML)
XML (Text) Editor
XML (Text) Editor with Encoding
Source Code (Text) Editor
Source Code (Text) Editor With Encoding
Add...
Remove
Set as Default
OK
Cancel

Visual Studio cannot display the model in Design view and in XML format at the same time, so you will see a message asking whether it's OK to close the Design view of the model, click **Yes**. This will open the XML format view. You can see the following XML view by toggling all outlining as shown below.



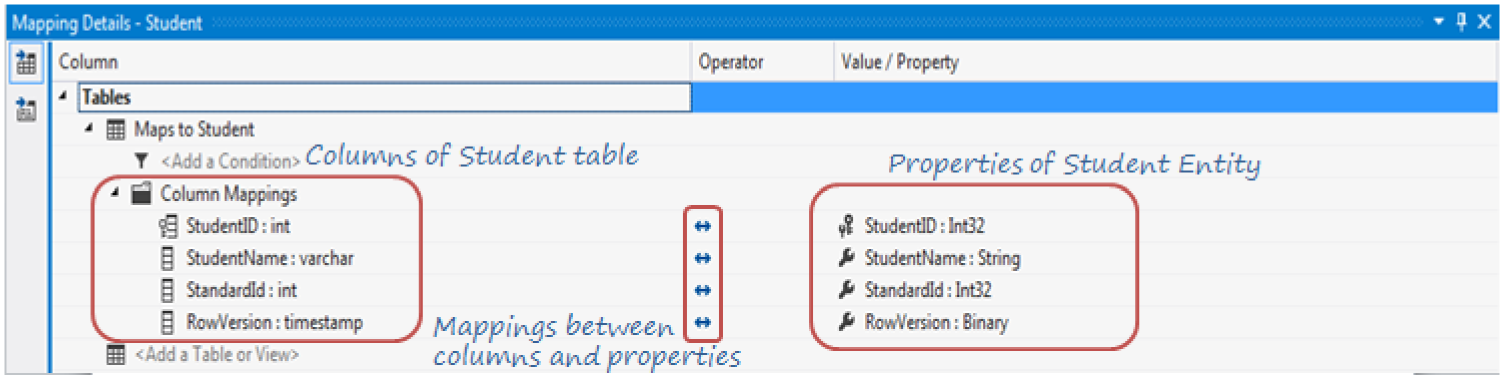
```
<?xml version="1.0" encoding="utf-8"?>
<edmx:Edmx Version="3.0" xmlns:edmx="http://schemas.microsoft.com/ado/2009/11/edmx">
  <!-- EF Runtime content -->
  <edmx:Runtime>
    <!-- SSDL content -->
    <edmx:StorageModels>...</edmx:StorageModels>
    <!-- CSDL content -->
    <edmx:ConceptualModels>...</edmx:ConceptualModels>
    <!-- C-S mapping content -->
    <edmx:Mappings>...</edmx:Mappings>
  </edmx:Runtime>
  <!-- EF Designer content (DO NOT EDIT MANUALLY BELOW HERE) -->
  <Designer xmlns="http://schemas.">...</Designer>
</edmx:Edmx>
```

You can see the SSDL content, the CSDL content and the C-S mapping content here. If you expand the SSDL and CSDL, each one has some common XML node under each schema node. You don't need to edit the xml data because this can be accomplished easier in the Model Browser.

Now, let's examine all the building blocks of the generated EDM (School.edmx) as shown in the above figure.

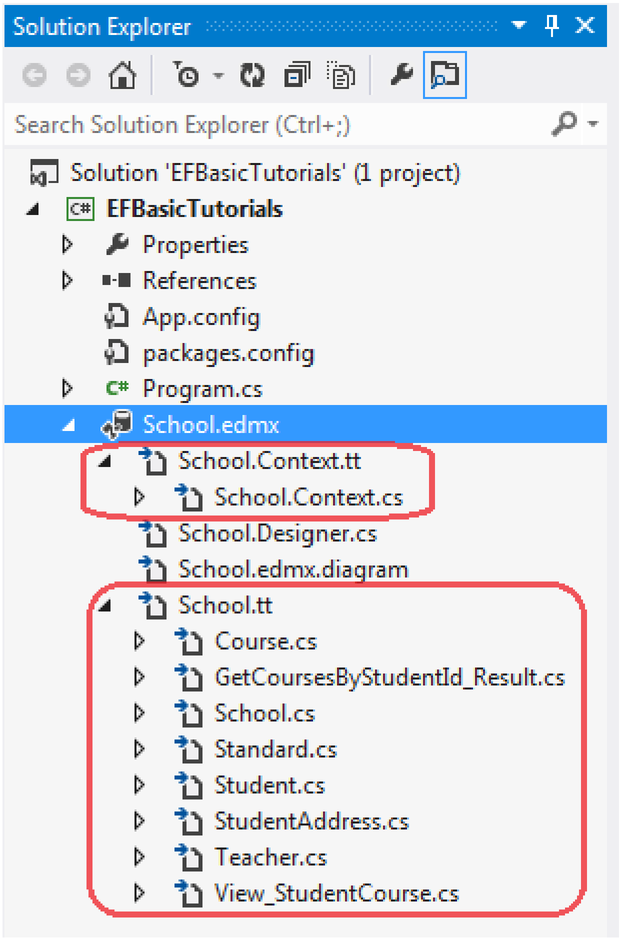
Entity-Table Mapping

Each entity in EDM is mapped with the database table. You can check the entity-table mapping by right clicking on any entity in the EDM designer -> select Table Mapping. Also, if you change any property name of the entity from designer then the table mapping would reflect that change automatically.



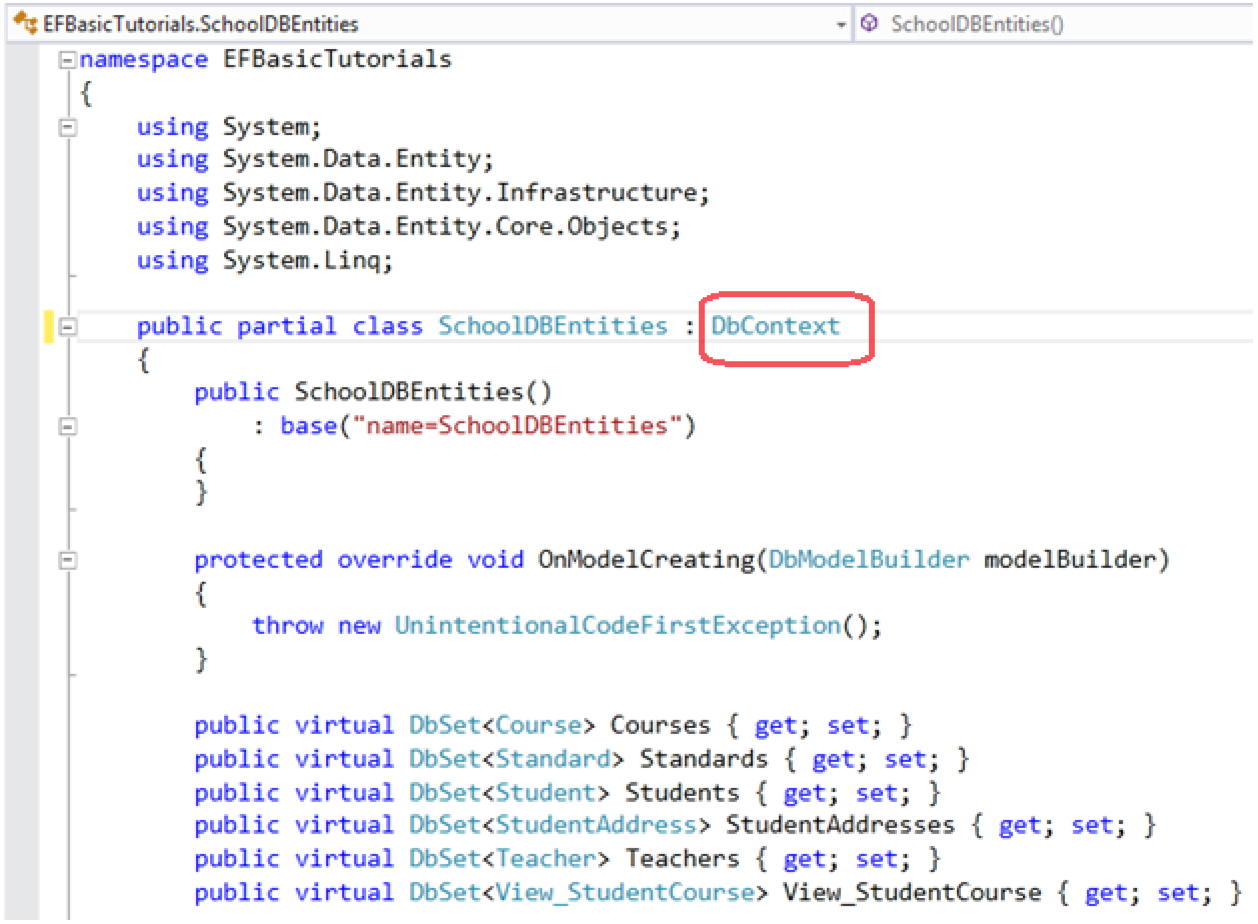
Context & Entity Classes

Every Entity Data Model generates a context and an entity class for each database table. Expand the `.edmx` file in the solution explorer and open two important files, `<EDM Name>.Context.tt` and `<EDM Name>.tt`, as shown below:



```
Solution 'EFBasicTutorials' (1 project)
  EFBasicTutorials
    Properties
    References
    App.config
    packages.config
    Program.cs
    School.edmx
      School.Context.tt
        School.Context.cs
      School.Designer.cs
      School.edmx.diagram
      School.tt
        Course.cs
        GetCoursesByStudentId_Result.cs
        School.cs
        Standard.cs
        Student.cs
        StudentAddress.cs
        Teacher.cs
        View_StudentCourse.cs
```

School.Context.tt: This T4 template file generates a context class whenever you change the Entity Data Model (.edmx file). You can see the context class file by expanding `School.Context.tt`. The context class resides in the `<EDM Name>.context.cs` file. The default context class name is `<DB Name>Entities`. For example, the context class name for SchoolDB is `SchoolDBEntities` and derived from the `DBContext` class.



```
namespace EFBasicTutorials
{
    using System;
    using System.Data.Entity;
    using System.Data.Entity.Infrastructure;
    using System.Data.Entity.Core.Objects;
    using System.Linq;

    public partial class SchoolDBEntities : DbContext
    {
        public SchoolDBEntities()
            : base("name=SchoolDBEntities")
        {
        }

        protected override void OnModelCreating(DbModelBuilder modelBuilder)
        {
            throw new UnintentionalCodeFirstException();
        }

        public virtual DbSet<Course> Courses { get; set; }
        public virtual DbSet<Standard> Standards { get; set; }
        public virtual DbSet<Student> Students { get; set; }
        public virtual DbSet<StudentAddress> StudentAddresses { get; set; }
        public virtual DbSet<Teacher> Teachers { get; set; }
        public virtual DbSet<View_StudentCourse> View_StudentCourse { get; set; }
```

School.tt: School.tt is a T4 template file that generates entity classes for each DB table. Entity classes are POCO (Plain Old CLR Object) classes. The following code snippet shows the Student entity.

```
public partial class Student
{
    public Student()
    {
        this.Courses = new HashSet<Course>();
    }

    public int StudentID { get; set; }
    public string StudentName { get; set; }
    public Nullable<int> StandardId { get; set; }
    public byte[] RowVersion { get; set; }

    public virtual Standard Standard { get; set; }
    public virtual StudentAddress StudentAddress { get; set; }
    public virtual ICollection<Course> Courses { get; set; }
}
```

Learn how to see all the objects of EDM using the Model Browser in the next section.

Download EF 6 DB-First Demo Project from Github

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