FIT5032 - Internet Applications Development

Week 03 - Pre-Week 04 Database First development (Entity Framework)

Last updated: 1st Aug 2018
Author: Jian Liew

Housekeeping

Before we begin, it is highly recommended for you to use your own personal computer for this subject. If you are planning to use the Monash computers, it is highly recommended to save all your work properly. Towards, the end of the semester, there will be a portfolio submission where you need to showcase all the work you have done so far. To prevent difficulties during this portfolio submission, it is suggested that you keep all your work neat and organised based on a **week by week structure.**

Tutorial Structure

The tutorials in this unit are designed to be of a **self-paced and self-taught structure.** So, the aim of your tutor is to aid you in your learning experience. He or she will not go through all the materials that are covered in the labs and will **not do the exercise one by one as a class**. If help is needed, you can either post on the Moodle forums or you can email your tutor asking for clarification. This is slightly different in comparison to other units, where your tutor will lead the discussions. **Please take note of this, you will only be provided help if you make it known that you need help.**

Objectives

Estimated Time To Complete - 1 hours
Upon the completion of this tutorial, you will gain a basic understanding of

- Database First Approach

DoubtFire Submission

- No Submissions, See Week 4 for submissions

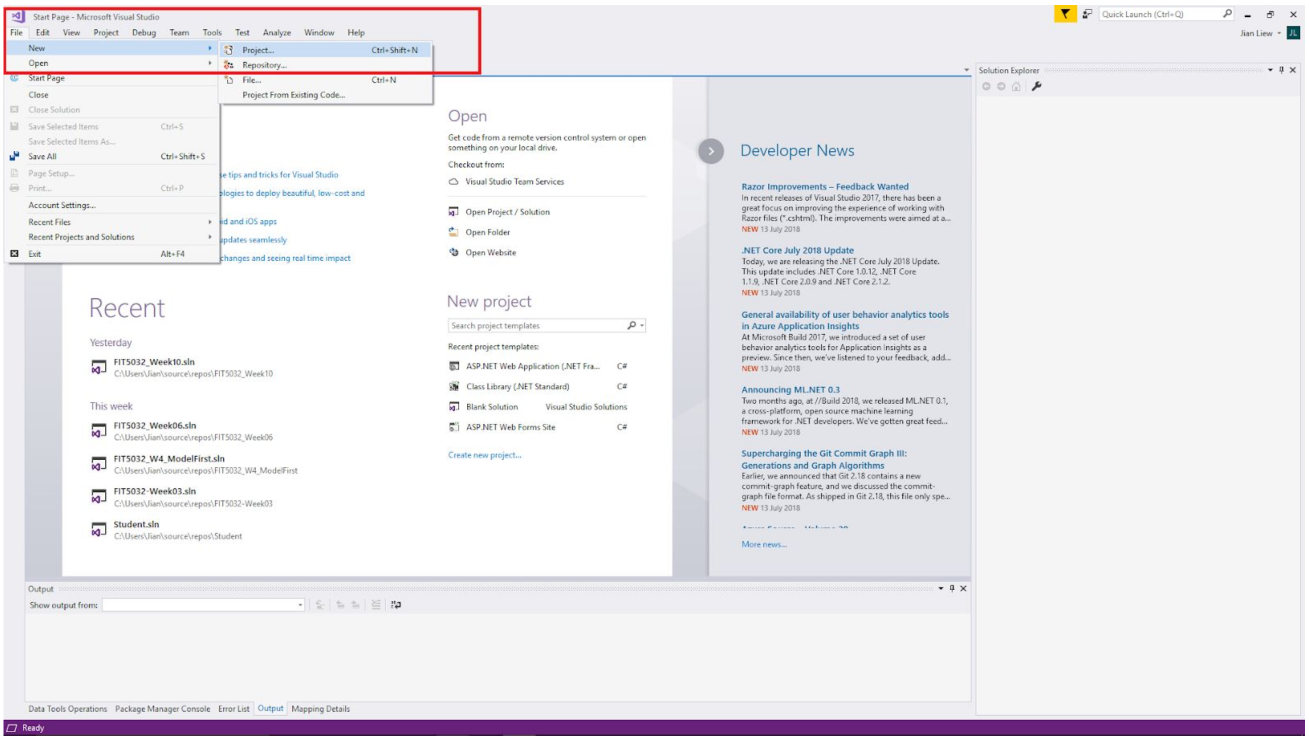
The Database First Approach

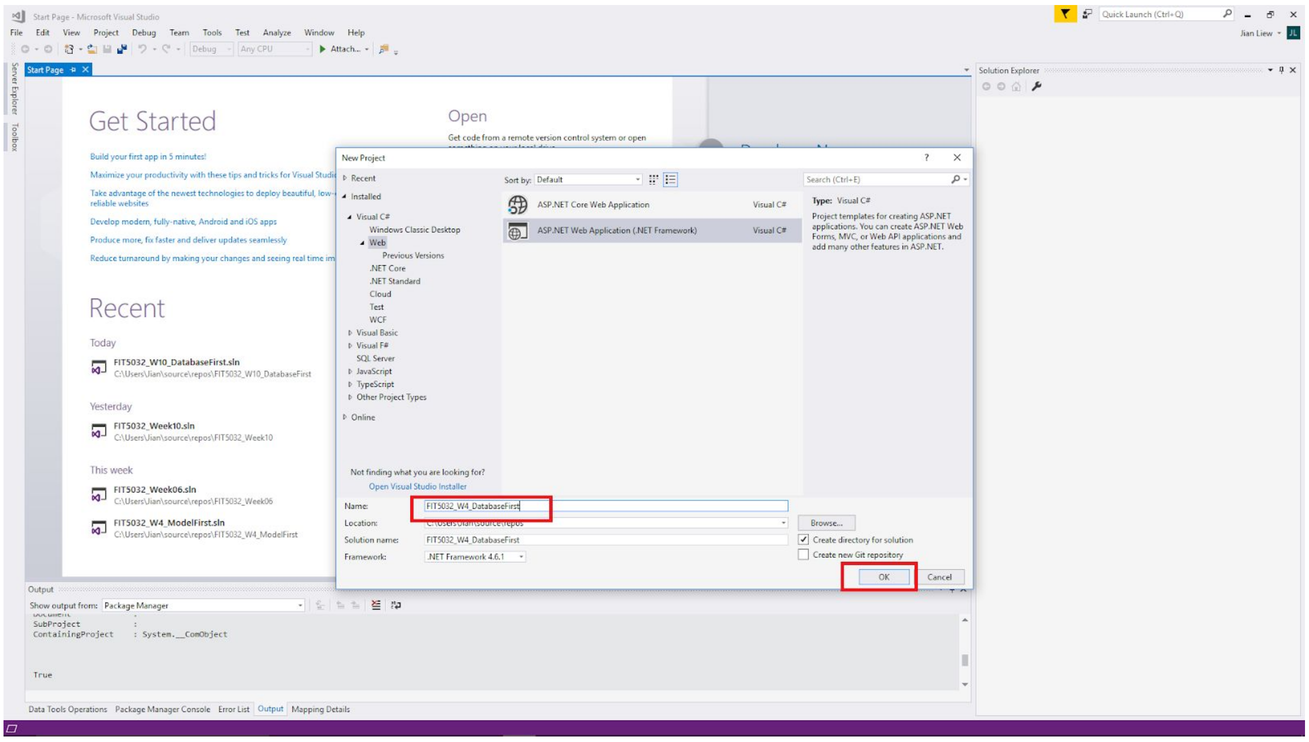
The database first approach involves writing Data Definition Language DDL first. So, you will need to use your knowledge of SQL. This is a common approach if there is an existing database design. Some developers that have an in depth knowledge in SQL prefer this way. This is one of the more common approaches as it is perceived to be easier.

Please remember that every database syntax is slightly different. Even though SQL follows an ISO standard there are syntax which are database specific.

Step 1

I will create a new project to demonstrate the database first approach.





New Project

ASP.NET Core Web Application — Visual C#

ASP.NET Web Application (.NET Framework) — Visual C#

Type: Visual C#

Project templates for creating ASP.NET applications. You can create ASP.NET Web Forms, MVC, or Web API applications and add many other features in ASP.NET.

Name: FIT5032_W4_DatabaseFirst

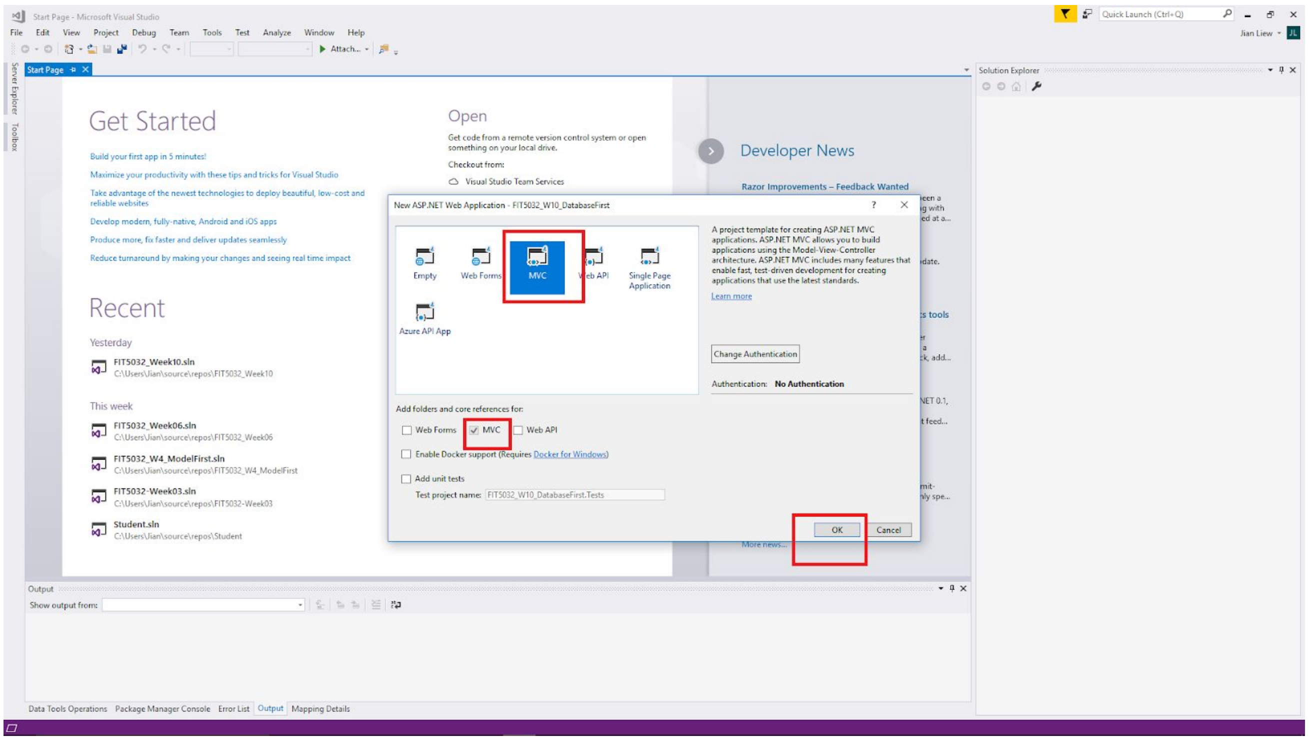
Location: C:\Users\Jian\source\repos

Solution name: FIT5032_W4_DatabaseFirst

Framework: .NET Framework 4.6.1

[✓] Create directory for solution

[ ] Create new Git repository



New ASP.NET Web Application - FIT5032_W10_DatabaseFirst

A project template for creating ASP.NET MVC applications. ASP.NET MVC allows you to build applications using the Model-View-Controller architecture. ASP.NET MVC includes many features that enable fast, test-driven development for creating applications that use the latest standards.

Authentication: **No Authentication**

Add folders and core references for:

[ ] Web Forms [✓] MVC [ ] Web API

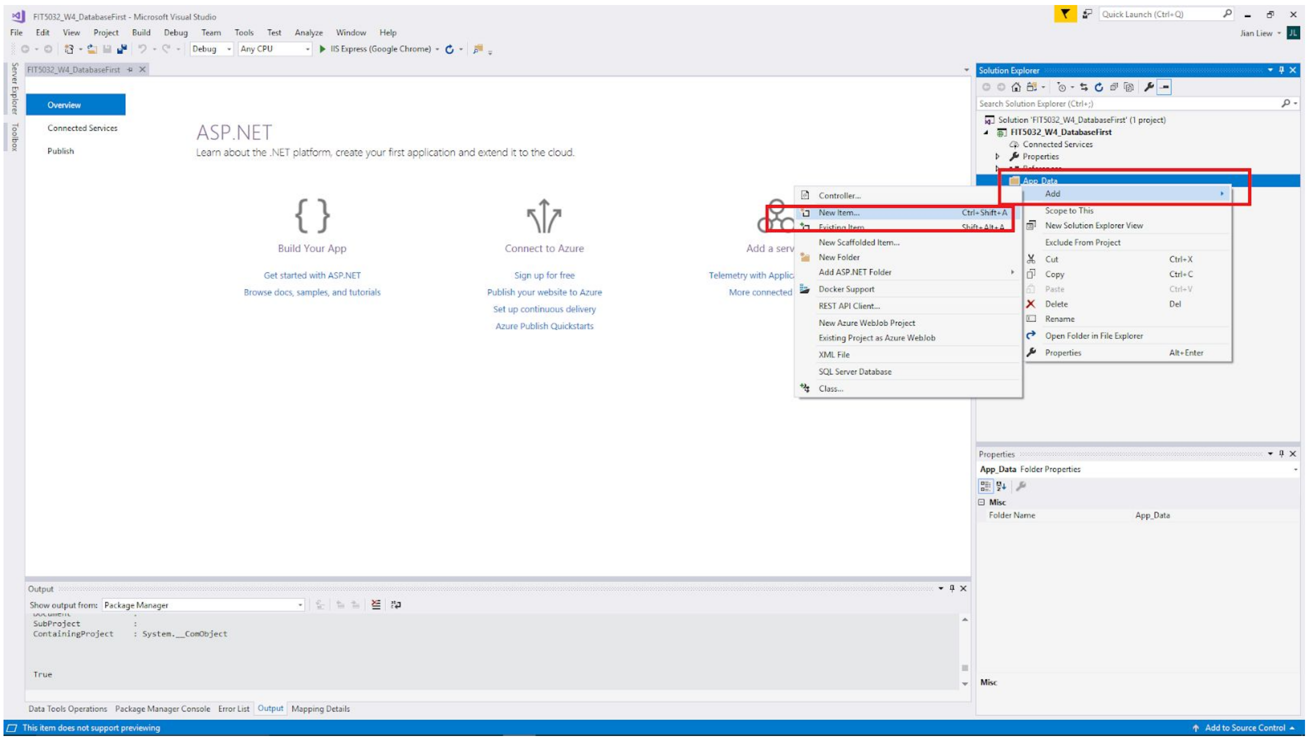
[ ] Enable Docker support (Requires Docker for Windows)

[ ] Add unit tests

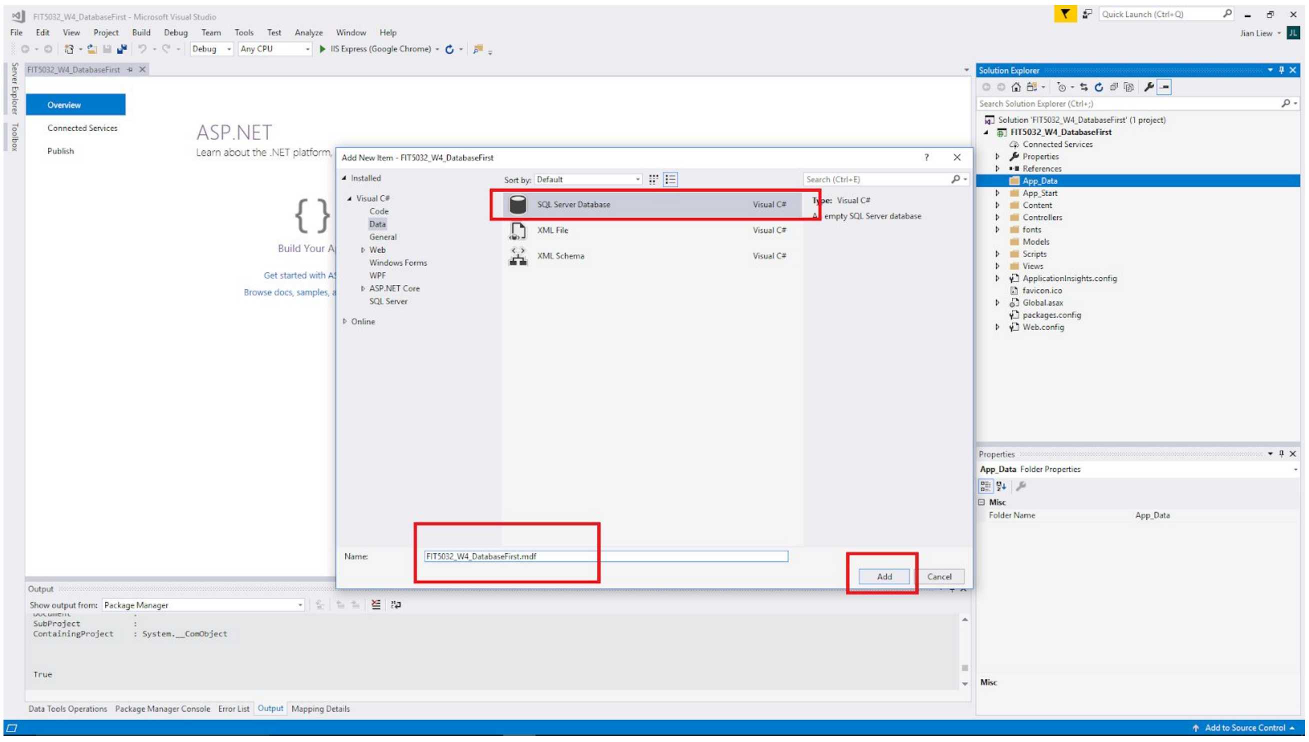
Test project name: FIT5032_W10_DatabaseFirst.Tests

Step 2

Right click App_Data and Select "New Item"



```
SubProject          :
ContainingProject   : System.__ComObject

True
```

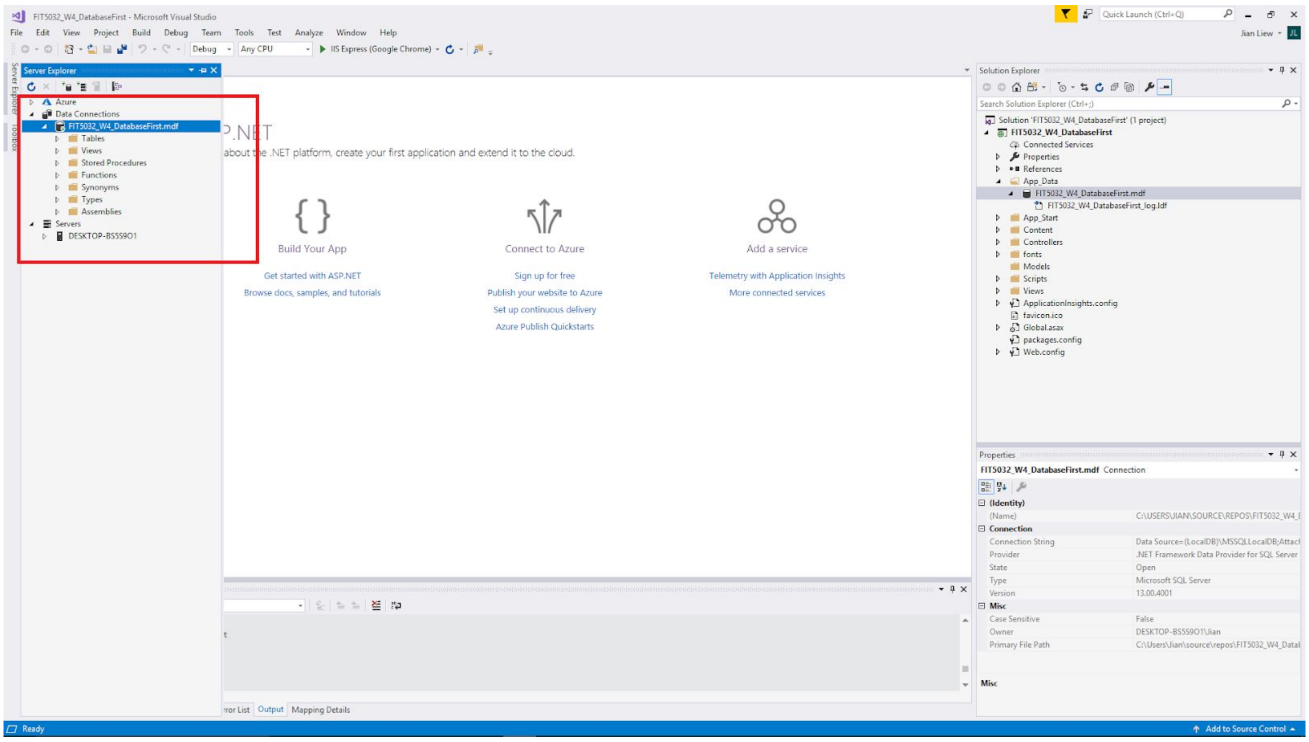


Name: FIT5032_W4_DatabaseFirst.mdf

```
SubProject          :
ContainingProject   : System.__ComObject

True
```

Step 3

You should see that the database first is created under the App_Data folder. Double click on it to open it.


FIT5032_W4_DatabaseFirst - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
Debug
Any CPU
IIS Express (Google Chrome)
Quick Launch (Ctrl+Q)
Jian Liew
Server Explorer
Azure
Data Connections
FIT5032_W4_DatabaseFirst.mdf
Tables
Views
Stored Procedures
Functions
Synonyms
Types
Assemblies
Servers
DESKTOP-BS5S9O1
about the .NET platform, create your first application and extend it to the cloud.
Build Your App
Get started with ASP.NET
Browse docs, samples, and tutorials
Connect to Azure
Sign up for free
Publish your website to Azure
Set up continuous delivery
Azure Publish Quickstarts
Add a service
Telemetry with Application Insights
More connected services
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'FIT5032_W4_DatabaseFirst' (1 project)
FIT5032_W4_DatabaseFirst
Connected Services
Properties
References
App_Data
FIT5032_W4_DatabaseFirst.mdf
FIT5032_W4_DatabaseFirst_log.ldf
App_Start
Content
Controllers
fonts
Models
Scripts
Views
ApplicationInsights.config
favicon.ico
Global.asax
packages.config
Web.config
Error List
Output
Mapping Details
Ready
Add to Source Control

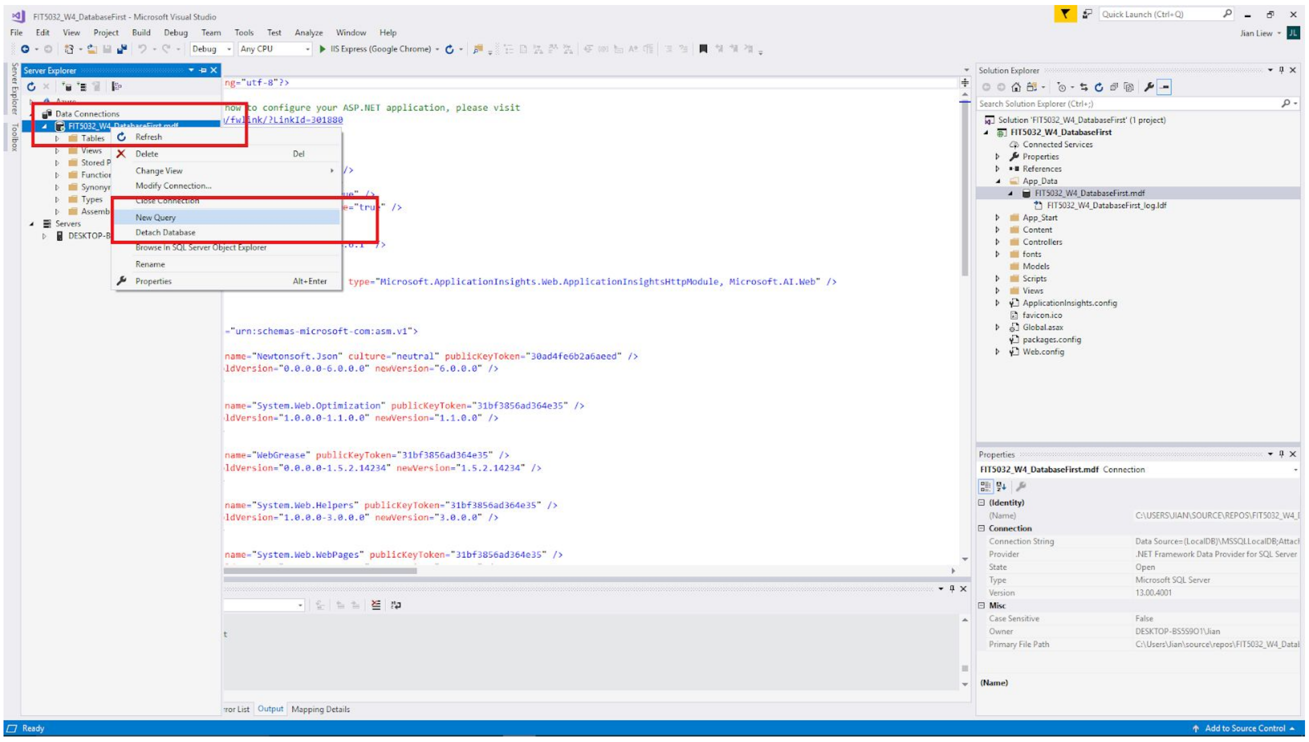
Properties

FIT5032_W4_DatabaseFirst.mdf Connection

(Identity)	
(Name)	C:\USERS\JIAN\SOURCE\REPOS\FIT5032_W4_I
Connection	
Connection String	Data Source=(LocalDB)\MSSQLLocalDB;Attacl
Provider	.NET Framework Data Provider for SQL Server
State	Open
Type	Microsoft SQL Server
Version	13.00.4001
Misc	
Case Sensitive	False
Owner	DESKTOP-BS5S9O1\Jian
Primary File Path	C:\Users\Jian\source\repos\FIT5032_W4_Datal

Misc

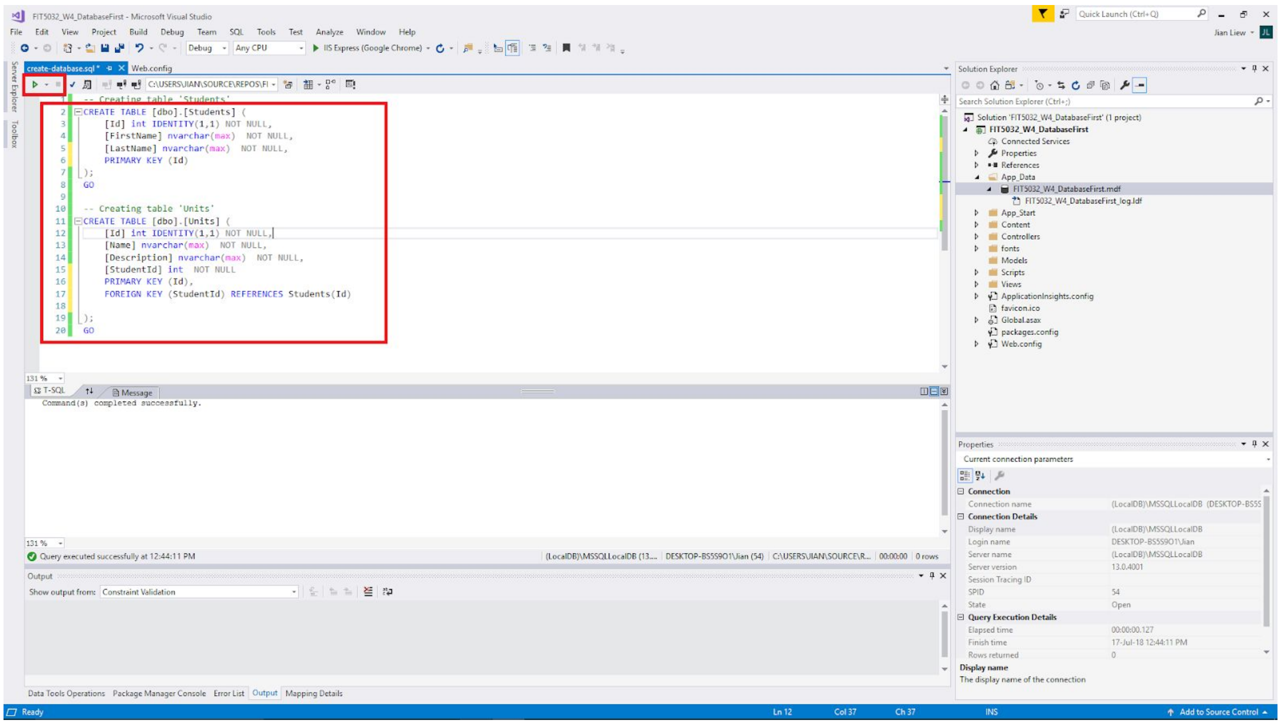
You can then run SQL queries on this database.



Step 4

The SQL needed to generate the tables are provided here.

```sql
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max)  NOT NULL,
    [LastName] nvarchar(max)  NOT NULL,
      PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max)  NOT NULL,
    [Description] nvarchar(max)  NOT NULL,
    [StudentId] int  NOT NULL
      PRIMARY KEY (Id),
      FOREIGN KEY (StudentId) REFERENCES Students(Id)

);
GO
```



```sql
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max)  NOT NULL,
    [LastName] nvarchar(max)  NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max)  NOT NULL,
    [Description] nvarchar(max)  NOT NULL,
    [StudentId] int  NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students(Id)

);
GO
```

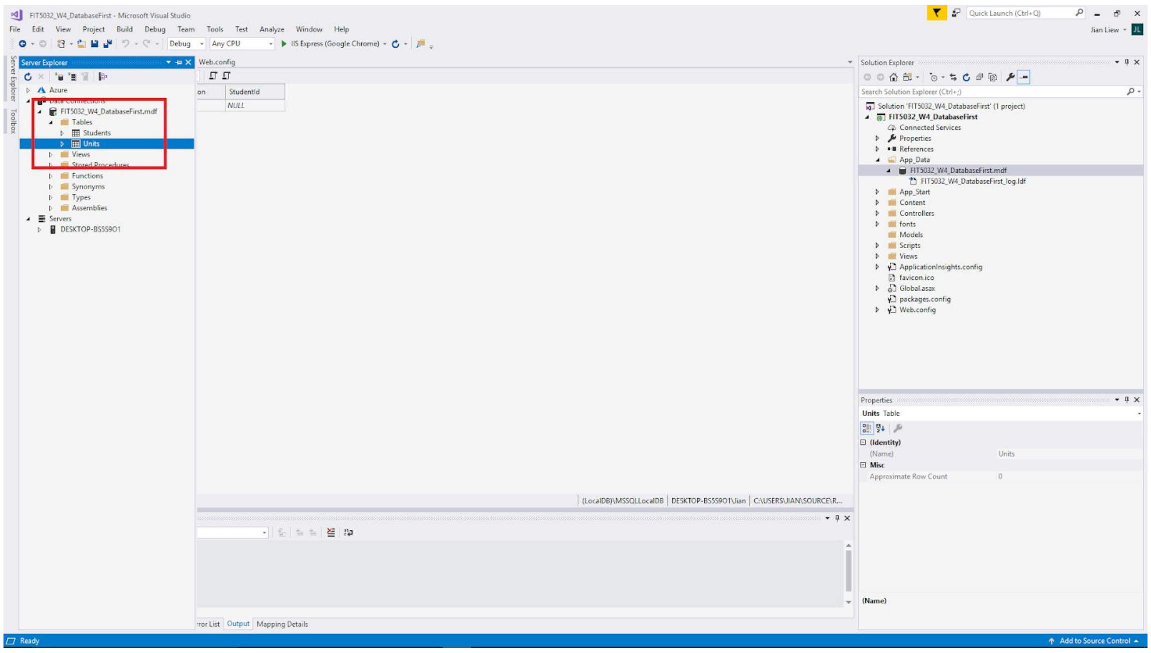
```
Command(s) completed successfully.
```

Query executed successfully at 12:44:11 PM

How do you think the nvarchar data type differs in comparison to the varchar? Also what do you think is the difference between a Primary Key and an Identity?

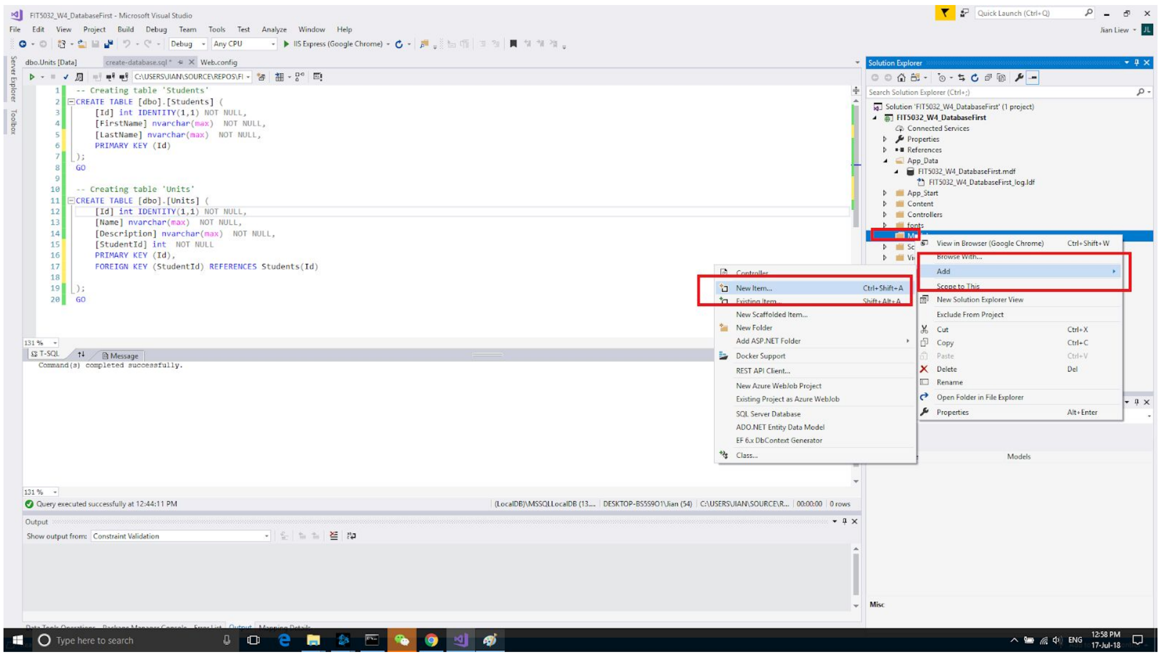
Step 5

You can now see that the tables are created.



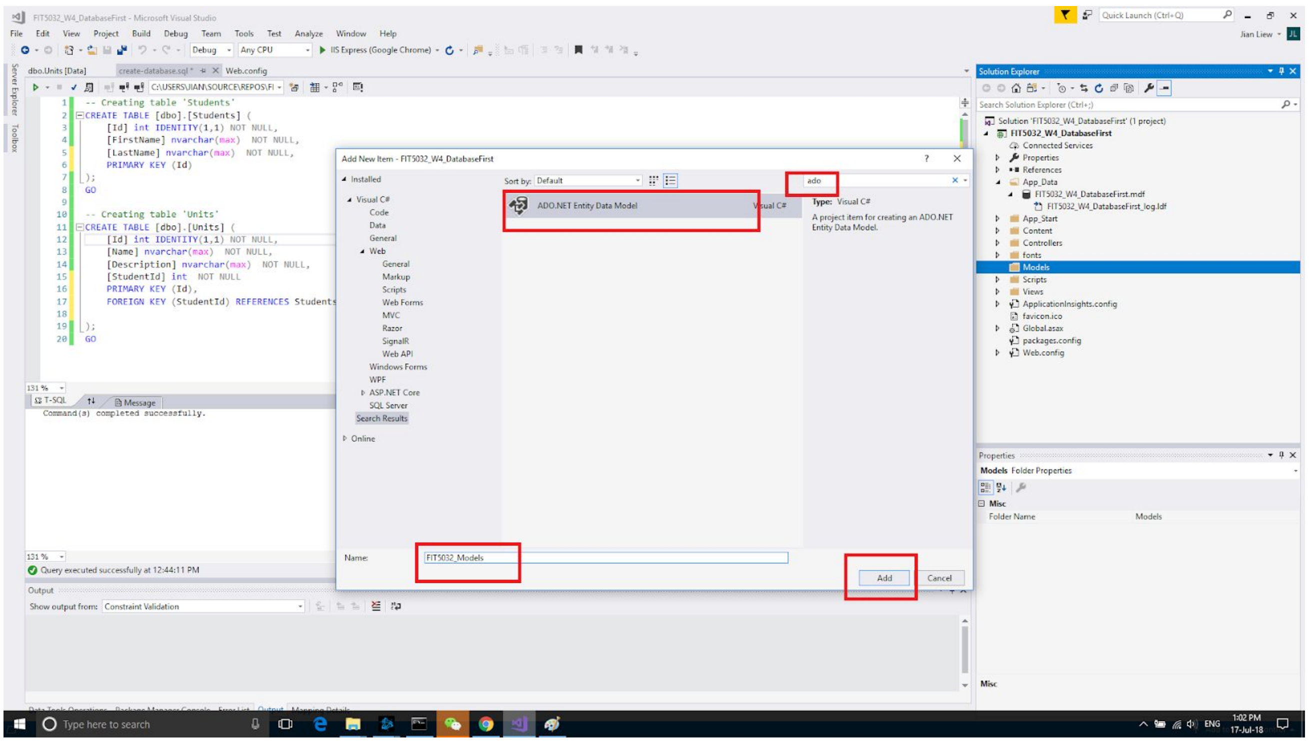
Step 6

We will now generate the models from the database which has been created. Right click model and add then add a "New Item"



```
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max)  NOT NULL,
    [LastName] nvarchar(max)  NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max)  NOT NULL,
    [Description] nvarchar(max)  NOT NULL,
    [StudentId] int  NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students(Id)

);
GO
```

```
Command(s) completed successfully.
```



FIT5032_W4_DatabaseFirst - Microsoft Visual Studio

```
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max)  NOT NULL,
    [LastName] nvarchar(max)  NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max)  NOT NULL,
    [Description] nvarchar(max)  NOT NULL,
    [StudentId] int  NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students

);
GO
```

```
Command(s) completed successfully.
```

Query executed successfully at 12:44:11 PM

Add New Item - FIT5032_W4_DatabaseFirst

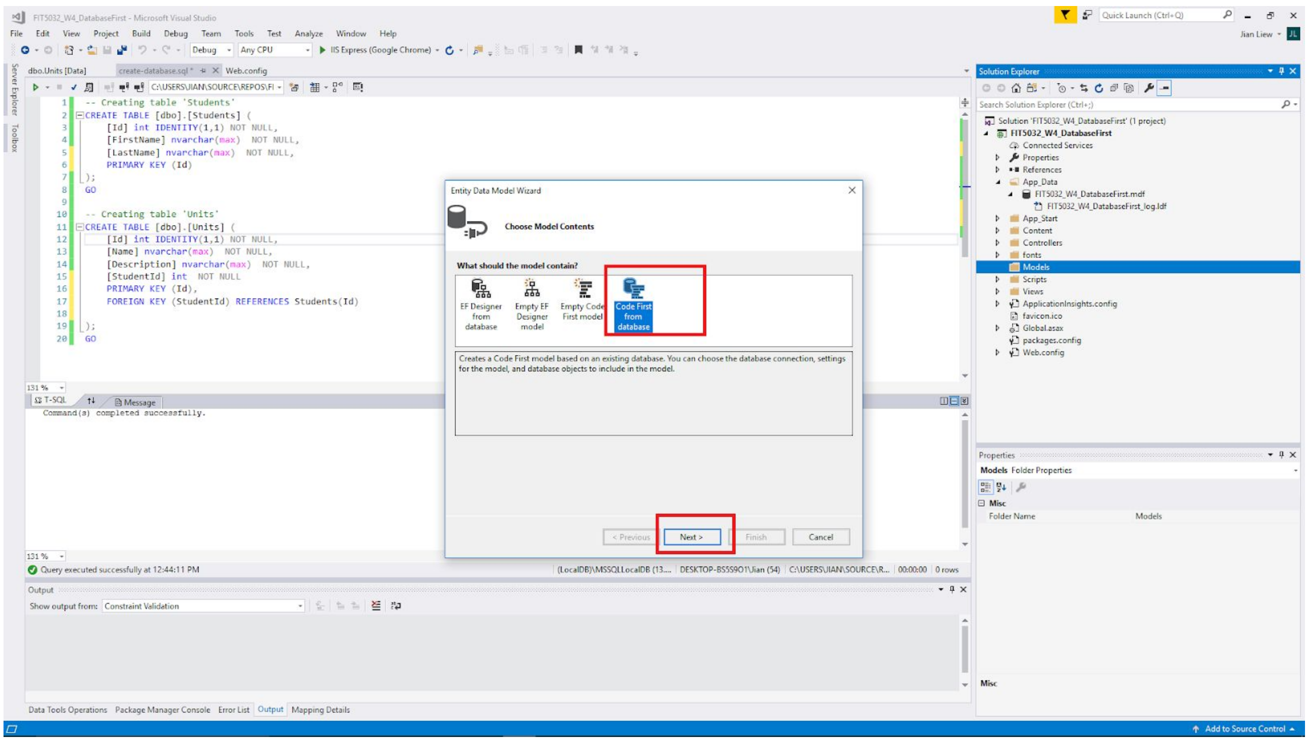
Search: ado

ADO.NET Entity Data Model — Visual C#

Type: Visual C#

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

Name: FIT5032_Models



```
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max)  NOT NULL,
    [LastName] nvarchar(max)  NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max)  NOT NULL,
    [Description] nvarchar(max)  NOT NULL,
    [StudentId] int  NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students(Id)

);
GO
```

Entity Data Model Wizard

Choose Model Contents

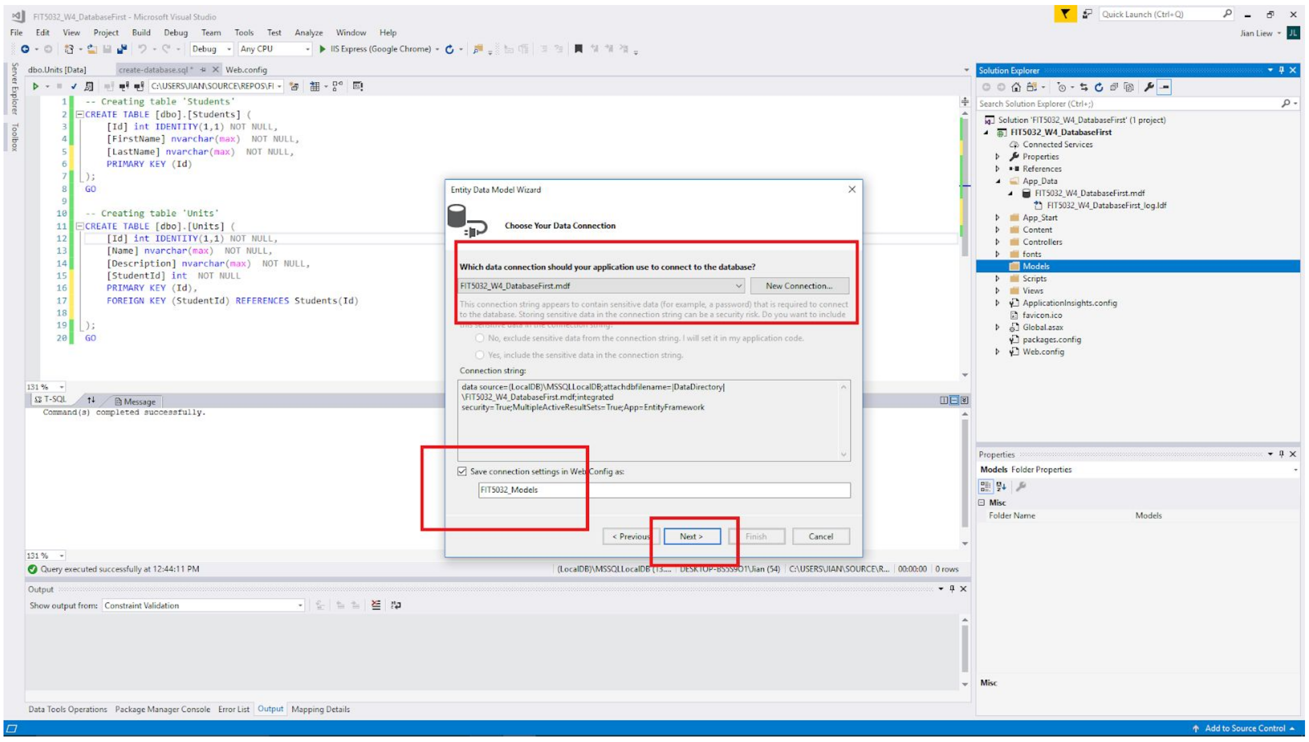
What should the model contain?

EF Designer from database | Empty EF Designer model | Empty Code First model | Code First from database

Creates a Code First model based on an existing database. You can choose the database connection, settings for the model, and database objects to include in the model.

(LocalDB)\MSSQLLocalDB (13.... | DESKTOP-BS5S9O1\Jian (54) | C:\USERS\JIAN\SOURCE\R... | 00:00:00 | 0 rows

This option means that, it will create a code first approach from the database itself. This approach is generally much cleaner.



FIT5032_W4_DatabaseFirst - Microsoft Visual Studio
dbo.Units [Data]
create-database.sql*
Web.config
Solution Explorer
Solution 'FIT5032_W4_DatabaseFirst' (1 project)
FIT5032_W4_DatabaseFirst
Models

```sql
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max) NOT NULL,
    [LastName] nvarchar(max) NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max) NOT NULL,
    [Description] nvarchar(max) NOT NULL,
    [StudentId] int NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students(Id)
);
GO
```

```
Command(s) completed successfully.
```

Entity Data Model Wizard

Choose Your Data Connection

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

FIT5032_W4_DatabaseFirst.mdf

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.

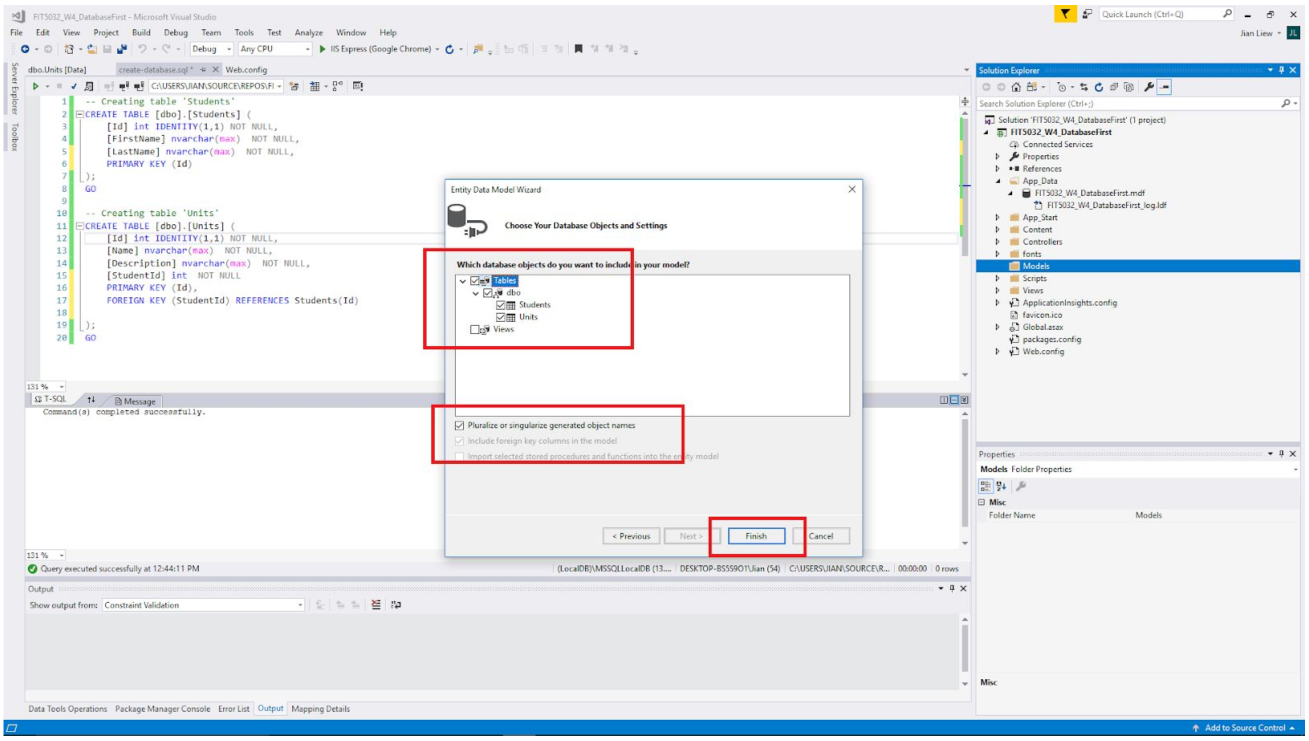
Connection string:

```
data source=(LocalDB)\MSSQLLocalDB;attachdbfilename=|DataDirectory|
\FIT5032_W4_DatabaseFirst.mdf;integrated
security=True;MultipleActiveResultSets=True;App=EntityFramework
```

[✓] Save connection settings in Web.Config as: FIT5032_Models

< Previous | Next > | Finish | Cancel

Query executed successfully at 12:44:11 PM



```sql
-- Creating table 'Students'
CREATE TABLE [dbo].[Students] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [FirstName] nvarchar(max) NOT NULL,
    [LastName] nvarchar(max) NOT NULL,
    PRIMARY KEY (Id)
);
GO

-- Creating table 'Units'
CREATE TABLE [dbo].[Units] (
    [Id] int IDENTITY(1,1) NOT NULL,
    [Name] nvarchar(max) NOT NULL,
    [Description] nvarchar(max) NOT NULL,
    [StudentId] int NOT NULL
    PRIMARY KEY (Id),
    FOREIGN KEY (StudentId) REFERENCES Students(Id)
);
GO
```

Entity Data Model Wizard

Choose Your Database Objects and Settings

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

- [✓] Tables
  - [✓] dbo
    - [✓] Students
    - [✓] Units
- [ ] Views

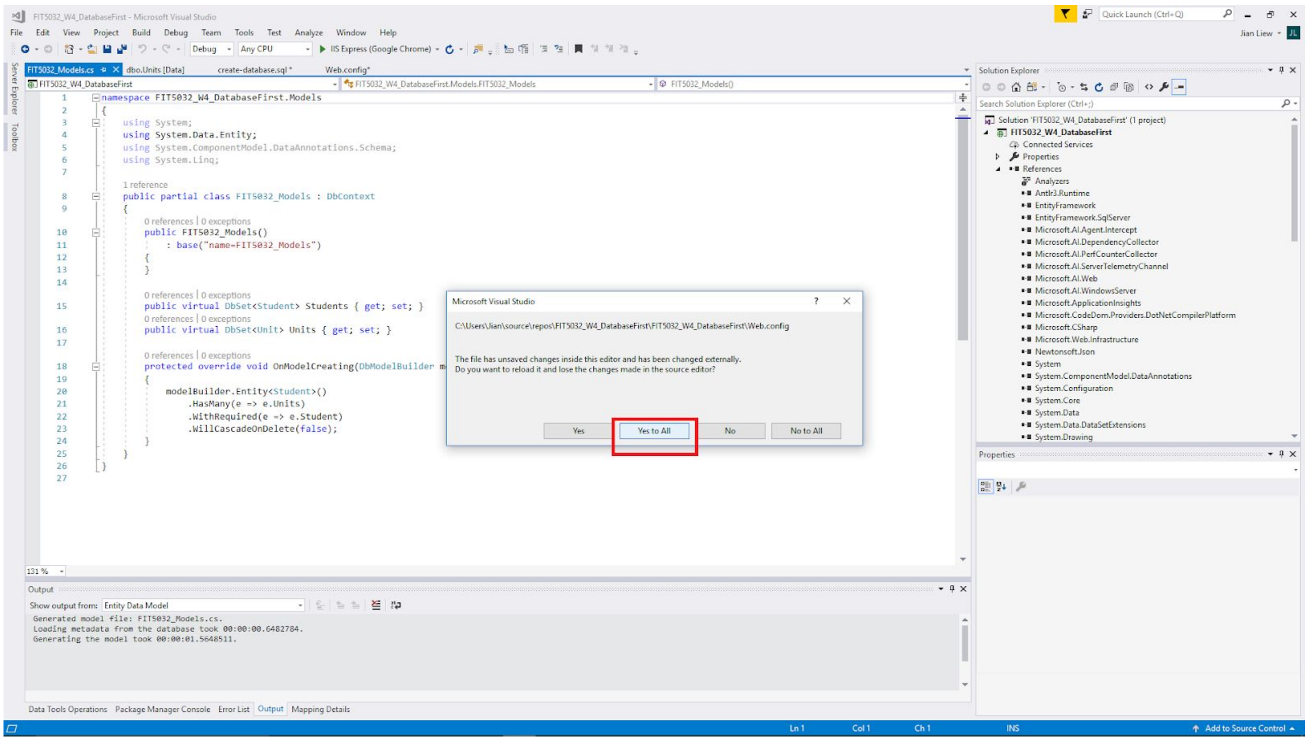
[✓] Pluralize or singularize generated object names

[✓] Include foreign key columns in the model

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

< Previous | Next > | Finish | Cancel

Query executed successfully at 12:44:11 PM



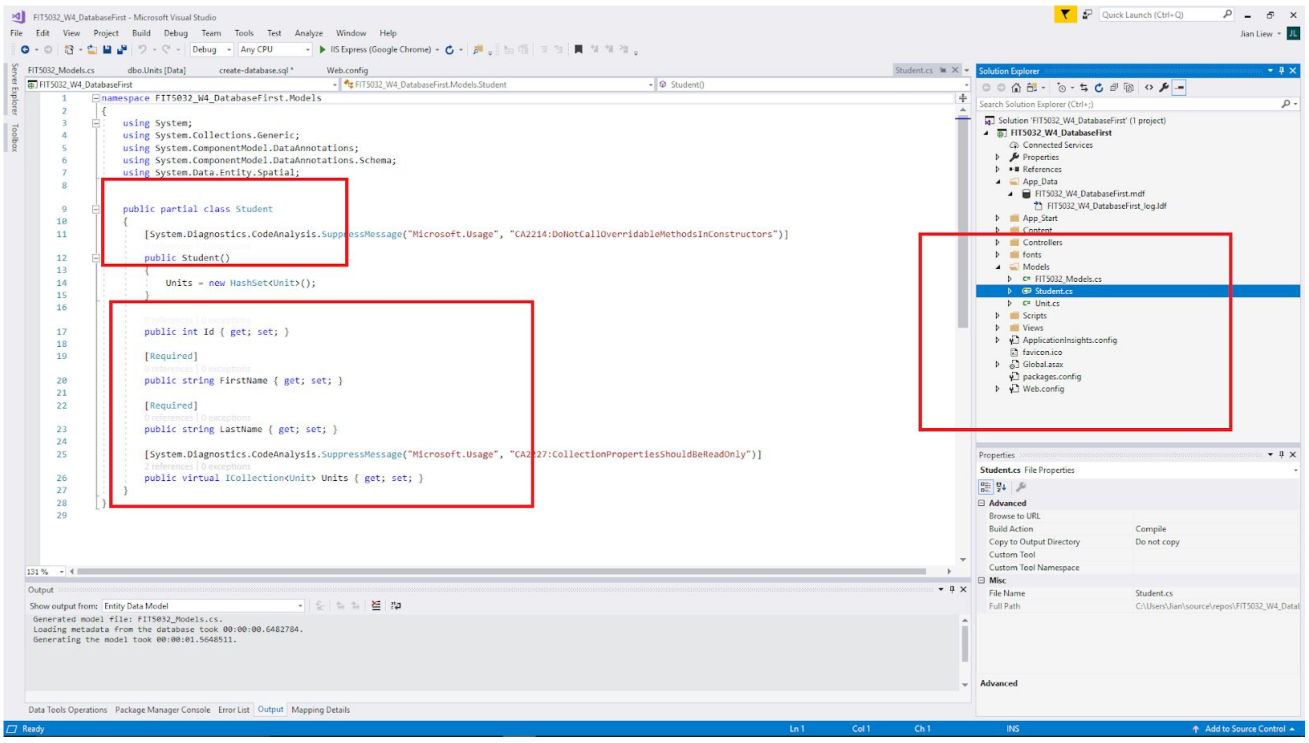
```
namespace FIT5032_W4_DatabaseFirst.Models
{
    using System;
    using System.Data.Entity;
    using System.ComponentModel.DataAnnotations.Schema;
    using System.Linq;

    public partial class FIT5032_Models : DbContext
    {
        public FIT5032_Models()
            : base("name=FIT5032_Models")
        {
        }

        public virtual DbSet<Student> Students { get; set; }
        public virtual DbSet<Unit> Units { get; set; }

        protected override void OnModelCreating(DbModelBuilder m
        {
            modelBuilder.Entity<Student>()
                .HasMany(e => e.Units)
                .WithRequired(e => e.Student)
                .WillCascadeOnDelete(false);
        }
    }
}
```

Microsoft Visual Studio

C:\Users\Jian\source\repos\FIT5032_W4_DatabaseFirst\FIT5032_W4_DatabaseFirst\Web.config

The file has unsaved changes inside this editor and has been changed externally.
Do you want to reload it and lose the changes made in the source editor?

```
Generated model file: FIT5032_Models.cs.
Loading metadata from the database took 00:00:00.6482784.
Generating the model took 00:00:01.5648511.
```



```
namespace FIT5032_W4_DatabaseFirst.Models
{
    using System;
    using System.Collections.Generic;
    using System.ComponentModel.DataAnnotations;
    using System.ComponentModel.DataAnnotations.Schema;
    using System.Data.Entity.Spatial;

    public partial class Student
    {
        [System.Diagnostics.CodeAnalysis.SuppressMessage("Microsoft.Usage", "CA2214:DoNotCallOverridableMethodsInConstructors")]
        public Student()
        {
            Units = new HashSet<Unit>();
        }

        public int Id { get; set; }

        [Required]
        public string FirstName { get; set; }

        [Required]
        public string LastName { get; set; }

        [System.Diagnostics.CodeAnalysis.SuppressMessage("Microsoft.Usage", "CA2227:CollectionPropertiesShouldBeReadOnly")]
        public virtual ICollection<Unit> Units { get; set; }
    }
}
```

```
Generated model file: FIT5032_Models.cs.
Loading metadata from the database took 00:00:00.6482784.
Generating the model took 00:00:01.5648511.
```

After you have completed this task, you scaffold the controllers to generate the views.

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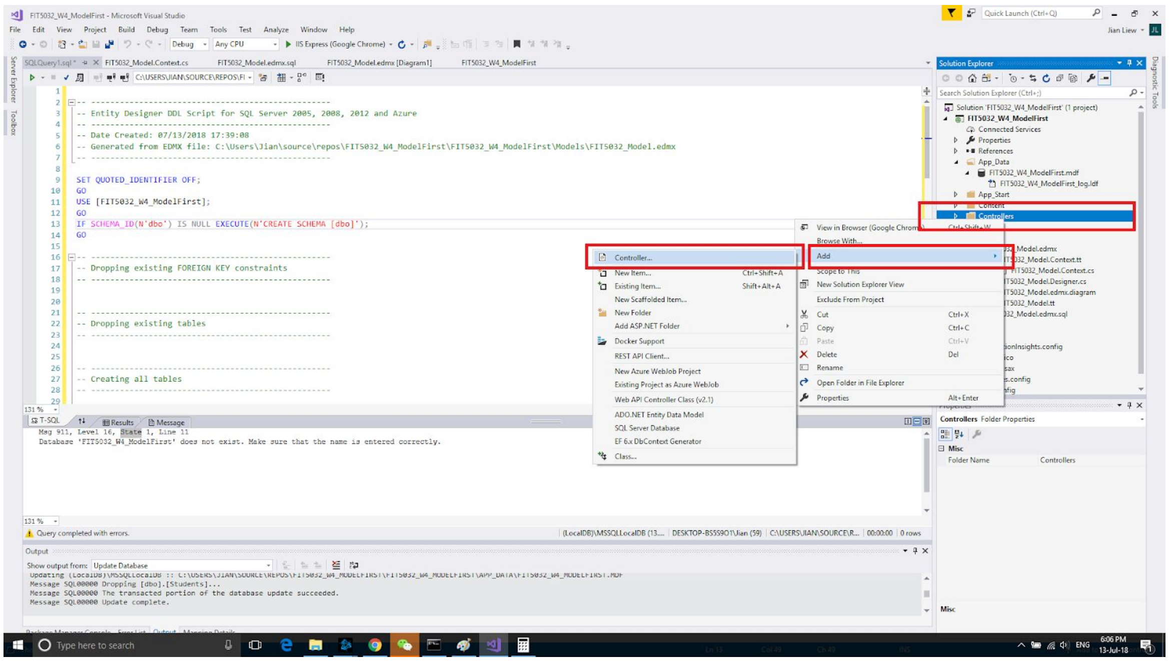
Scaffolding Controllers

One of more interesting features in Visual Studio is that you can automatically generate certain parts of your codes to short cut development. **Please remember to "Rebuild" your project before this. This can be done by selecting the project, right click and rebuild. ASK YOUR TUTOR HOW IF YOU DO NOT KNOW.** At the end of the day, developers like to take shortcuts. **However, this feature is not perfect and should be tested out.**

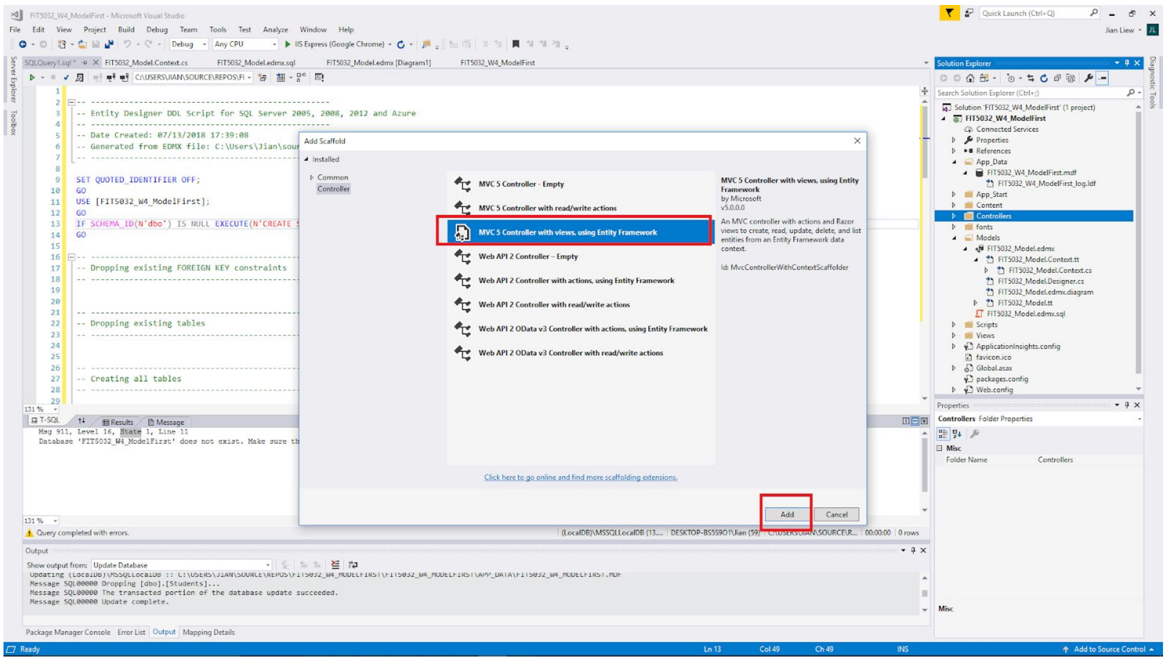


```
-- --------------------------------------------------
-- Entity Designer DDL Script for SQL Server 2005, 2008, 2012 and Azure
-- --------------------------------------------------
-- Date Created: 07/13/2018 17:39:08
-- Generated from EDMX file: C:\Users\Jian\source\repos\FIT5032_W4_ModelFirst\FIT5032_W4_ModelFirst\Models\FIT5032_Model.edmx
-- --------------------------------------------------

SET QUOTED_IDENTIFIER OFF;
GO
USE [FIT5032_W4_ModelFirst];
GO
IF SCHEMA_ID(N'dbo') IS NULL EXECUTE(N'CREATE SCHEMA [dbo]');
GO

-- --------------------------------------------------
-- Dropping existing FOREIGN KEY constraints
-- --------------------------------------------------



-- --------------------------------------------------
-- Dropping existing tables
-- --------------------------------------------------



-- --------------------------------------------------
-- Creating all tables
-- --------------------------------------------------
```

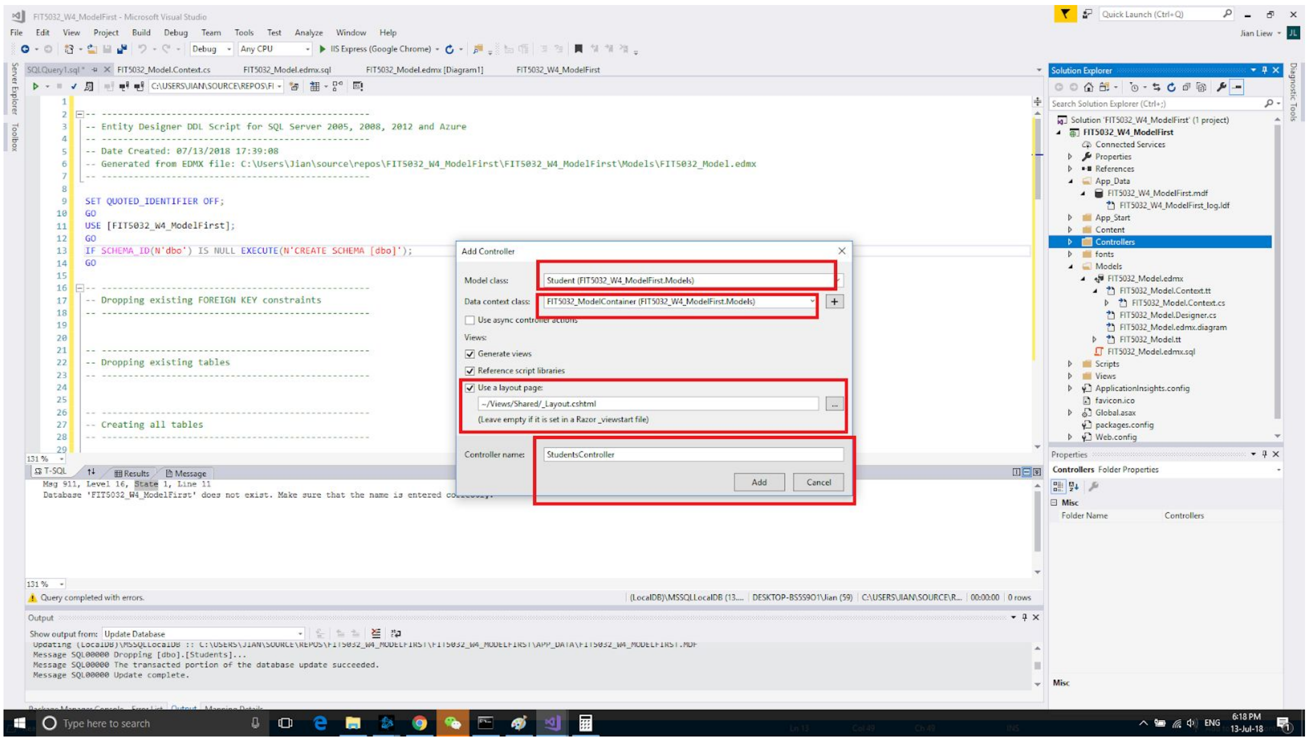
```
Msg 911, Level 16, State 1, Line 11
Database 'FIT5032_W4_ModelFirst' does not exist. Make sure that the name is entered correctly.
```

Query completed with errors.

```
Updating (LocalDB)\MSSQLLocalDB :: C:\USERS\JIAN\SOURCE\REPOS\FIT5032_W4_MODELFIRST\FIT5032_W4_MODELFIRST\APP_DATA\FIT5032_W4_MODELFIRST.MDF
Message SQL00000 Dropping [dbo].[Students]...
Message SQL00000 The transacted portion of the database update succeeded.
Message SQL00000 Update complete.
```


Add Scaffold
Installed
Common
Controller
MVC 5 Controller - Empty
MVC 5 Controller with read/write actions
MVC 5 Controller with views, using Entity Framework
Web API 2 Controller – Empty
Web API 2 Controller with actions, using Entity Framework
Web API 2 Controller with read/write actions
Web API 2 OData v3 Controller with actions, using Entity Framework
Web API 2 OData v3 Controller with read/write actions
Click here to go online and find more scaffolding extensions.
Add
Cancel

MVC 5 Controller with views, using Entity Framework
by Microsoft
v5.0.0.0
An MVC controller with actions and Razor views to create, read, update, delete, and list entities from an Entity Framework data context.
Id: MvcControllerWithContextScaffolder



```
-- --------------------------------------------------
-- Entity Designer DDL Script for SQL Server 2005, 2008, 2012 and Azure
-- --------------------------------------------------
-- Date Created: 07/13/2018 17:39:08
-- Generated from EDMX file: C:\Users\Jian\source\repos\FIT5032_W4_ModelFirst\FIT5032_W4_ModelFirst\Models\FIT5032_Model.edmx
-- --------------------------------------------------

SET QUOTED_IDENTIFIER OFF;
GO
USE [FIT5032_W4_ModelFirst];
GO
IF SCHEMA_ID(N'dbo') IS NULL EXECUTE(N'CREATE SCHEMA [dbo]');
GO

-- --------------------------------------------------
-- Dropping existing FOREIGN KEY constraints
-- --------------------------------------------------



-- --------------------------------------------------
-- Dropping existing tables
-- --------------------------------------------------



-- --------------------------------------------------
-- Creating all tables
-- --------------------------------------------------
```

```
Msg 911, Level 16, State 1, Line 11
Database 'FIT5032_W4_ModelFirst' does not exist. Make sure that the name is entered correctly.
```

Add Controller

Model class: Student (FIT5032_W4_ModelFirst.Models)

Data context class: FIT5032_ModelContainer (FIT5032_W4_ModelFirst.Models)

Use async controller actions [ ]

Views:

[✓] Generate views

[✓] Reference script libraries

[✓] Use a layout page:

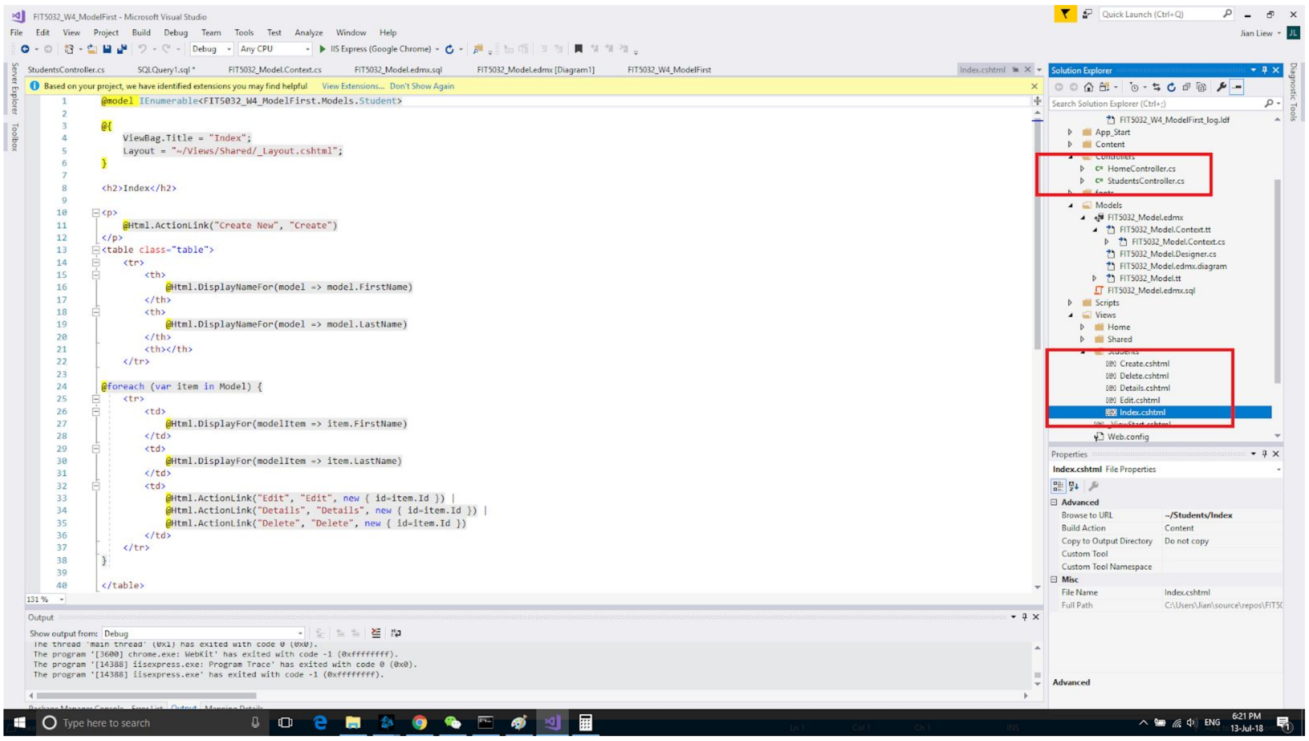
~/Views/Shared/_Layout.cshtml

(Leave empty if it is set in a Razor _viewstart file)

Controller name: StudentsController

```
Updating (LocalDB)\MSSQLLocalDB :: C:\USERS\JIAN\SOURCE\REPOS\FIT5032_W4_MODELFIRST\FIT5032_W4_MODELFIRST\APP_DATA\FIT5032_W4_MODELFIRST.MDF
Message SQL00000 Dropping [dbo].[Students]...
Message SQL00000 The transacted portion of the database update succeeded.
Message SQL00000 Update complete.
```

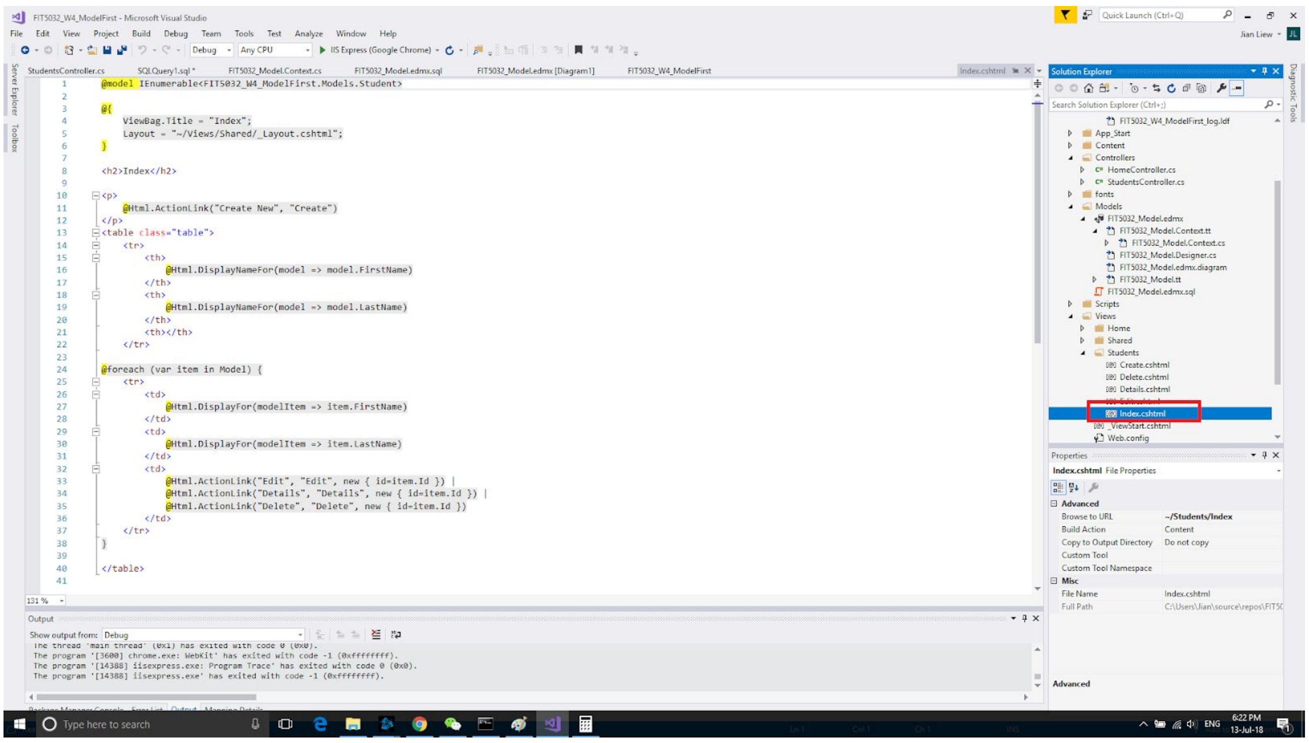
FIT5032_W4_ModelFirst - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
Debug
Any CPU
IIS Express (Google Chrome)
SQLQuery1.sql*
FIT5032_Model.Context.cs
FIT5032_Model.edmx.sql
FIT5032_Model.edmx [Diagram1]
FIT5032_W4_ModelFirst
Add
Cancel
Query completed with errors.
Solution Explorer
Solution 'FIT5032_W4_ModelFirst' (1 project)
Controllers
Models
Views
Properties
Controllers Folder Properties
Folder Name
Controllers



```
@model IEnumerable<FIT5032_W4_ModelFirst.Models.Student>

@{
    ViewBag.Title = "Index";
    Layout = "~/Views/Shared/_Layout.cshtml";
}

<h2>Index</h2>

<p>
    @Html.ActionLink("Create New", "Create")
</p>
<table class="table">
    <tr>
        <th>
            @Html.DisplayNameFor(model => model.FirstName)
        </th>
        <th>
            @Html.DisplayNameFor(model => model.LastName)
        </th>
        <th></th>
    </tr>

@foreach (var item in Model) {
    <tr>
        <td>
            @Html.DisplayFor(modelItem => item.FirstName)
        </td>
        <td>
            @Html.DisplayFor(modelItem => item.LastName)
        </td>
        <td>
            @Html.ActionLink("Edit", "Edit", new { id=item.Id }) |
            @Html.ActionLink("Details", "Details", new { id=item.Id }) |
            @Html.ActionLink("Delete", "Delete", new { id=item.Id })
        </td>
    </tr>
}

</table>
```

```
The thread 'main thread' (0x1) has exited with code 0 (0x0).
The program '[3600] chrome.exe: WebKit' has exited with code -1 (0xffffffff).
The program '[14388] iisexpress.exe: Program Trace' has exited with code 0 (0x0).
The program '[14388] iisexpress.exe' has exited with code -1 (0xffffffff).
```

By doing this, Visual Studio is able to automatically generate stub codes for the Student Controller and as well as the Student View.

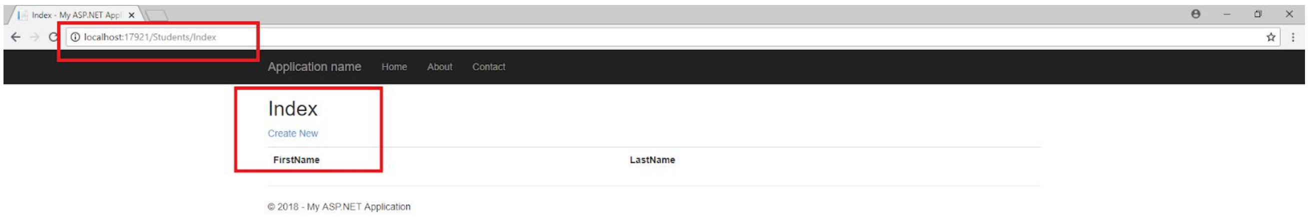


```
@model IEnumerable<FIT5032_W4_ModelFirst.Models.Student>

@{
    ViewBag.Title = "Index";
    Layout = "~/Views/Shared/_Layout.cshtml";
}

<h2>Index</h2>

<p>
    @Html.ActionLink("Create New", "Create")
</p>
<table class="table">
    <tr>
        <th>
            @Html.DisplayNameFor(model => model.FirstName)
        </th>
        <th>
            @Html.DisplayNameFor(model => model.LastName)
        </th>
        <th></th>
    </tr>

@foreach (var item in Model) {
    <tr>
        <td>
            @Html.DisplayFor(modelItem => item.FirstName)
        </td>
        <td>
            @Html.DisplayFor(modelItem => item.LastName)
        </td>
        <td>
            @Html.ActionLink("Edit", "Edit", new { id=item.Id }) |
            @Html.ActionLink("Details", "Details", new { id=item.Id }) |
            @Html.ActionLink("Delete", "Delete", new { id=item.Id })
        </td>
    </tr>
}

</table>
```

```
The thread 'main thread' (0x1) has exited with code 0 (0x0).
The program '[3600] chrome.exe: WebKit' has exited with code -1 (0xffffffff).
The program '[14388] iisexpress.exe: Program Trace' has exited with code 0 (0x0).
The program '[14388] iisexpress.exe' has exited with code -1 (0xffffffff).
```

Double Click on the Index.cshtml inside of the Student View.

After that you can hit Run and you will notice that some pages have been created for us.



localhost:17921/Students/Index

Application name Home About Contact

Index

Create New

FirstName LastName

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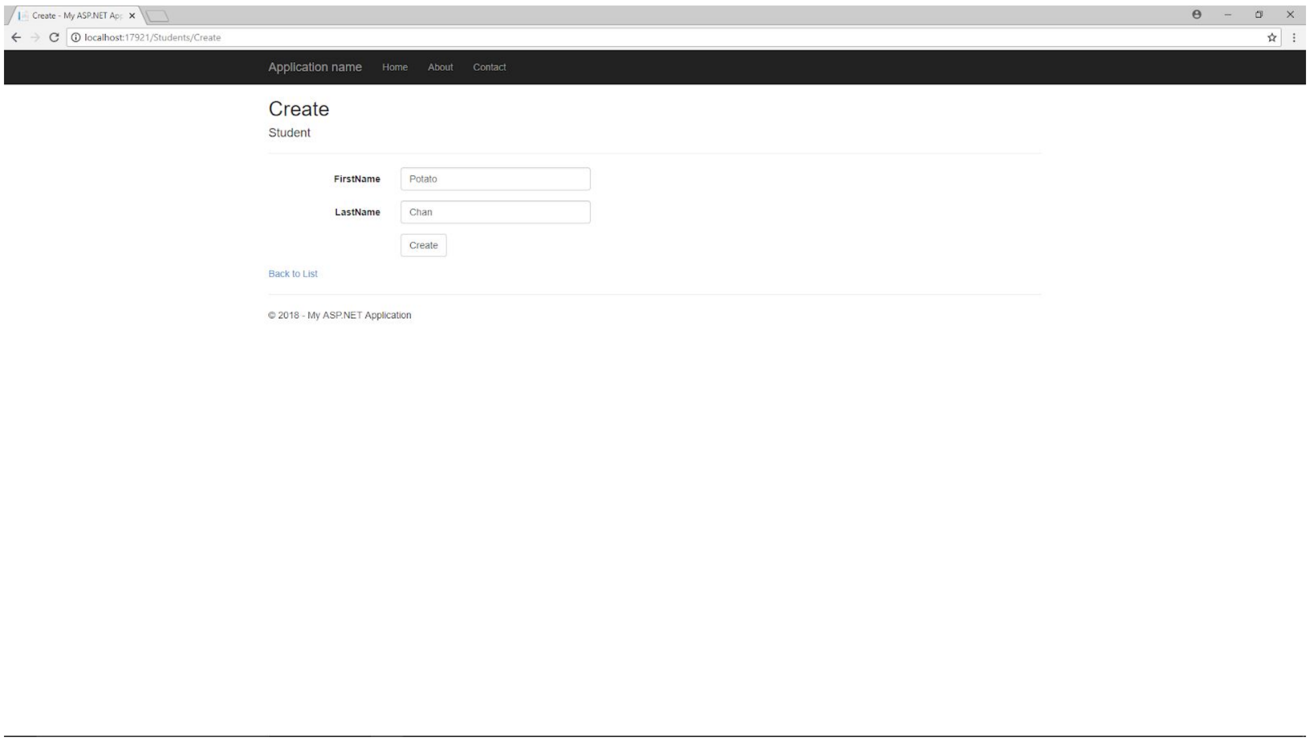
I will then go ahead and try it out.

I will create a student whose First Name is Potato and Last Name is Chan and hit the create button.



Create

Student

FirstName: Potato

LastName: Chan

Create

Back to List

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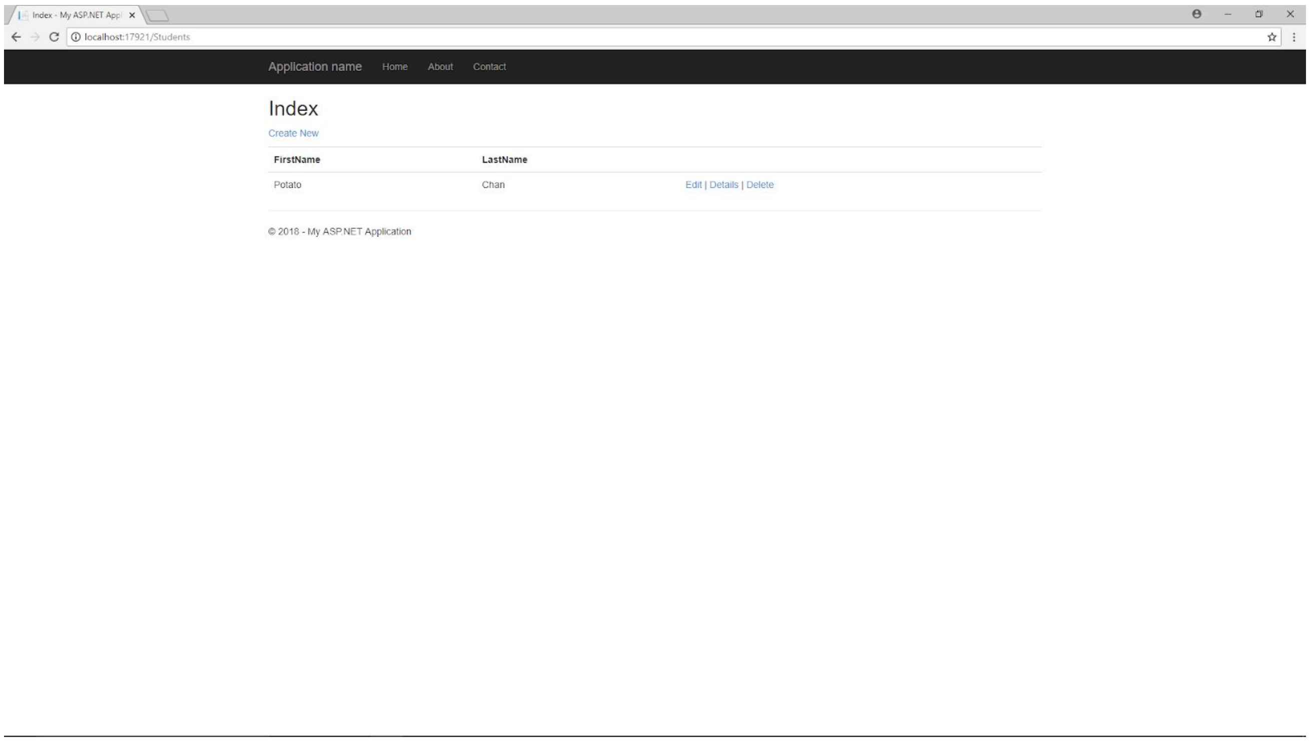

Index

Create New

FirstName	LastName	
Potato	Chan	Edit | Details | Delete

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Notice that the student has now been created. In summary, what I can do is, I can automatically create the Controller and Views with minimal coding at best.