

# ENTITY FRAMEWORK

## Entity Framework

The Microsoft ADO.NET Entity Framework is an Object/Relational Mapping (ORM) framework that enables developers to work with relational data as domain-specific objects, eliminating the need for most of the data access plumbing code that developers usually need to write. Using the Entity Framework, developers issue queries using LINQ, then retrieve and manipulate data as strongly typed objects.

ORM is a tool for storing data from domain objects to relational database like MS SQL Server in an automated way without much programming. ORM includes three main parts: Domain class objects, Relational database objects and Mapping information on how domain objects maps to relational database objects (tables, views & stored procedures). ORM helps us to keep our database design separate from our domain class design. This makes application maintainable and extendable. It also automates standard CRUD operation (Create, Read, Update & Delete) so developer doesn't need to write it manually.

There are many ORM frameworks for .net in the market like DataObjects.Net, NHibernate, OpenAccess, SubSonic etc. ADO.NET Entity Framework is from Microsoft.

## Entity Framework vs LINQ-to-SQL

There are some differences between Entity Framework and LINQ to SQL.

- Entity framework has a full provider model. It supports not only SQL Server but also other database like Oracle, DB2, MySQL etc.
- Most of the time LINQ to SQL classes must be one-to-one with database objects e.g. Customer class can be mapped only with Customer table. Where as in Entity Framework you can map your domain class with multiple tables using various inheritance strategies like table per type (class) or table per hierarchy of classes etc.
- You can have multiple modeling techniques using Entity Framework 4.1 like code first, model first or database first.
- Microsoft has long term strategy to support and integrate Entity Framework with multiple Microsoft products.

## Development with Entity Framework

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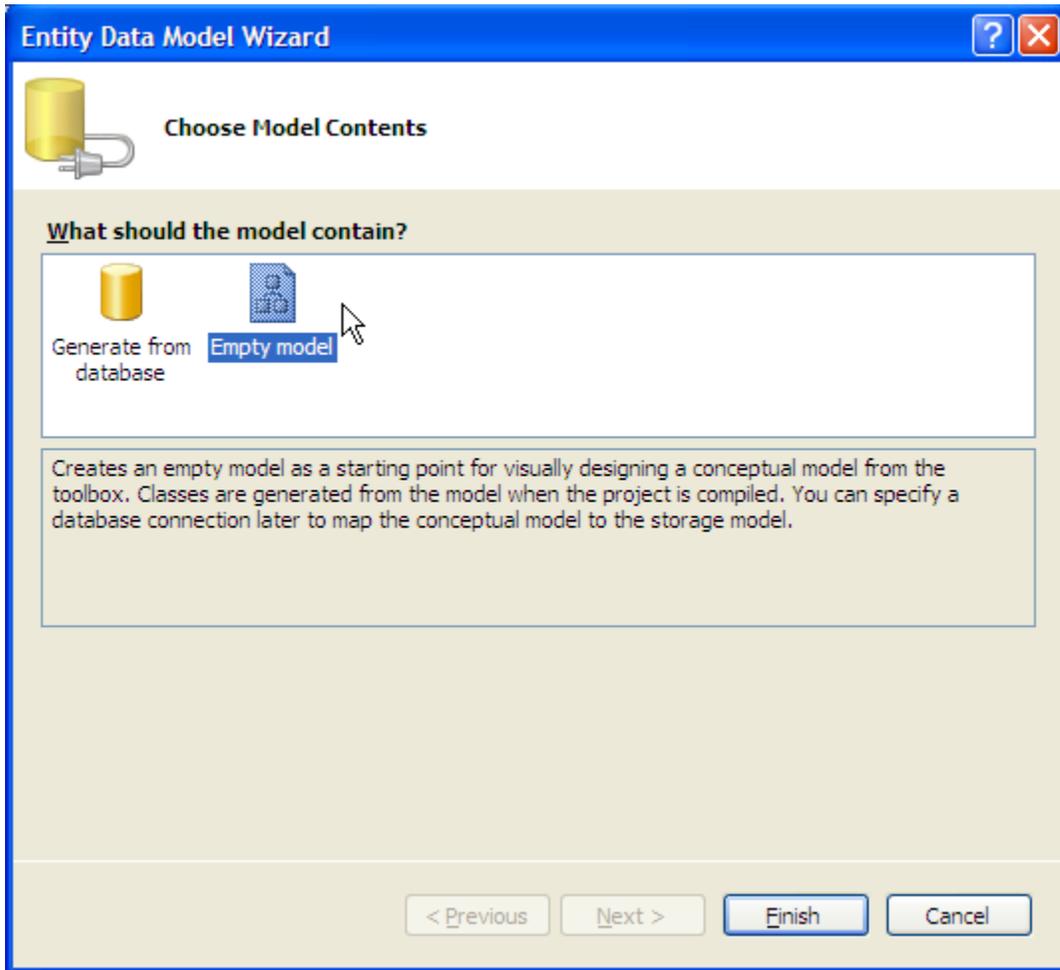
Three approaches to modeling for Entity Framework 4.1:

1. Code First
2. Model First
3. Database first

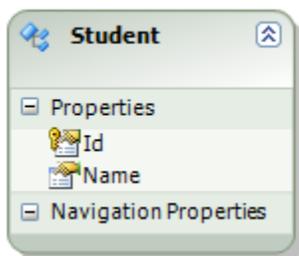
**Code First:** In Code First approach, you avoid working with visual model designer (EDMX) completely. You write your POCO classes first and then create database from these POCO classes. Developers who follow the path of Domain-Driven Design (DDD) principles prefer to begin by coding their classes first and then generating the database required to persist their data.

One important thing to understand is that there are two new types introduced for Code First approach, DbContext and DbSet. DbContext is a simplified alternative toObjectContext and is the primary object for interacting with a database using a specific model. DbSet(Of TEntity) is a simplified alternative to ObjectSet(Of TEntity) and is used to perform CRUD operations against a specific type from the model in Code First approach.

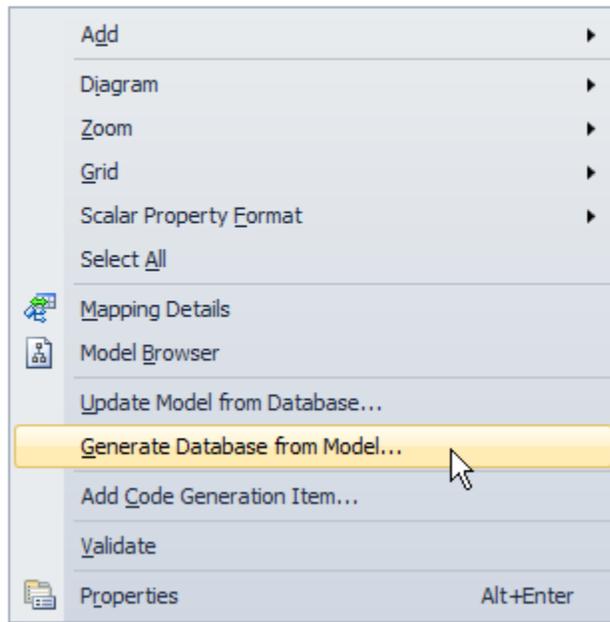
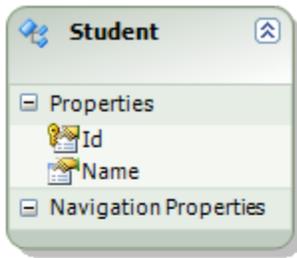
**Model First:** In Model First approach, you create Entities, relationships, and inheritance hierarchies directly on the design surface of EDMX. So in Model First approach, when you add ADO.NET Entity Data Model, you should select 'Empty Model' instead of 'Generate from database'.



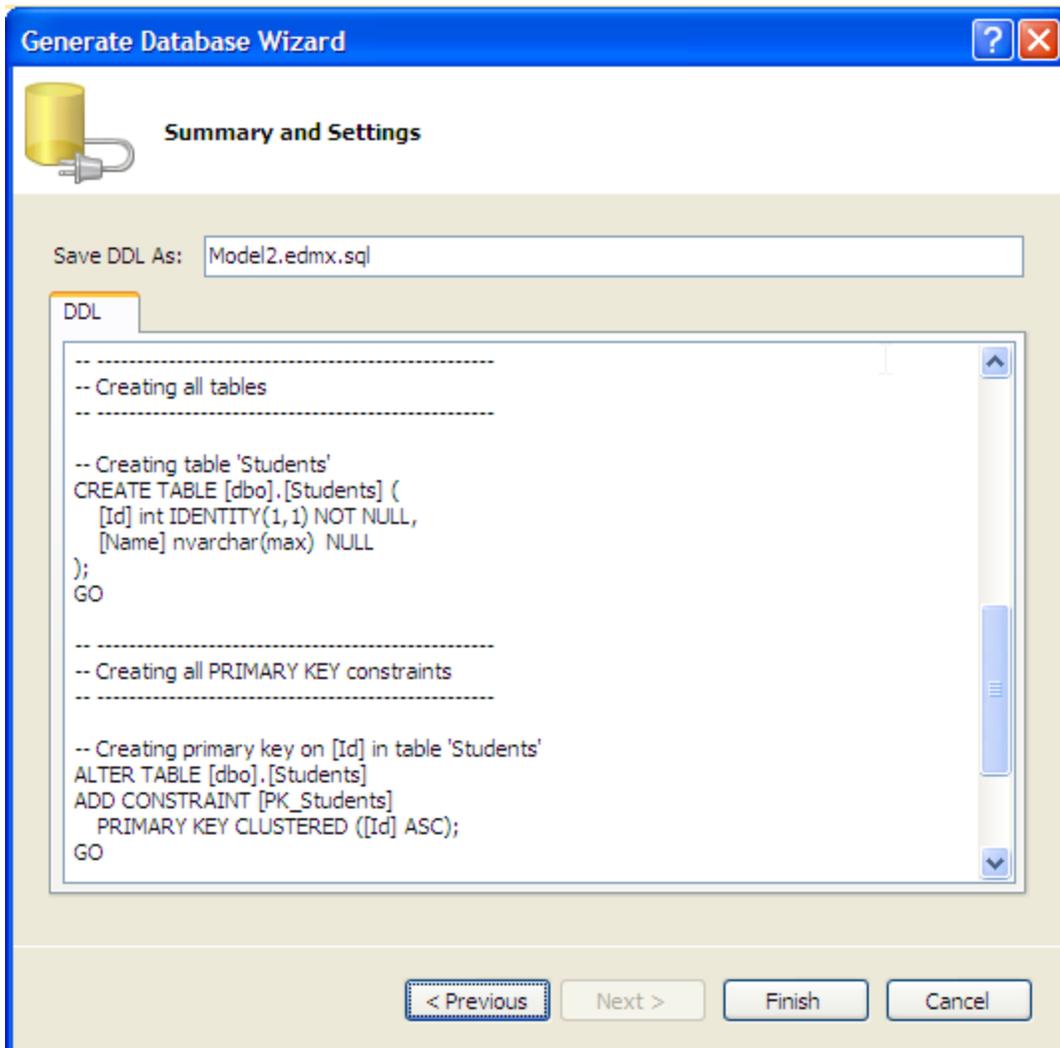
After creating required entities, associations and inheritance on design surface of the empty model, you can use designer's context menu option 'Generate database from model'. However don't get confused with name. it will not generate new database from model. It will only give you DDL to execute in existing database. For example, I have created simple student model with id and name properties as per following figure.



Now I will generate the database from model using context menu.



I will then select existing database connection and then it will display DDL for the student entity and it is up to you to execute this DDL.



So this is called 'Model First' approach.

**Database First** We have seen this approach in our first EDM sample where we created model and classes from existing database. So when you generate EDMX from existing database then it is a Database First approach.

## **Create the First simple Entity Data Model (.edmx file)**

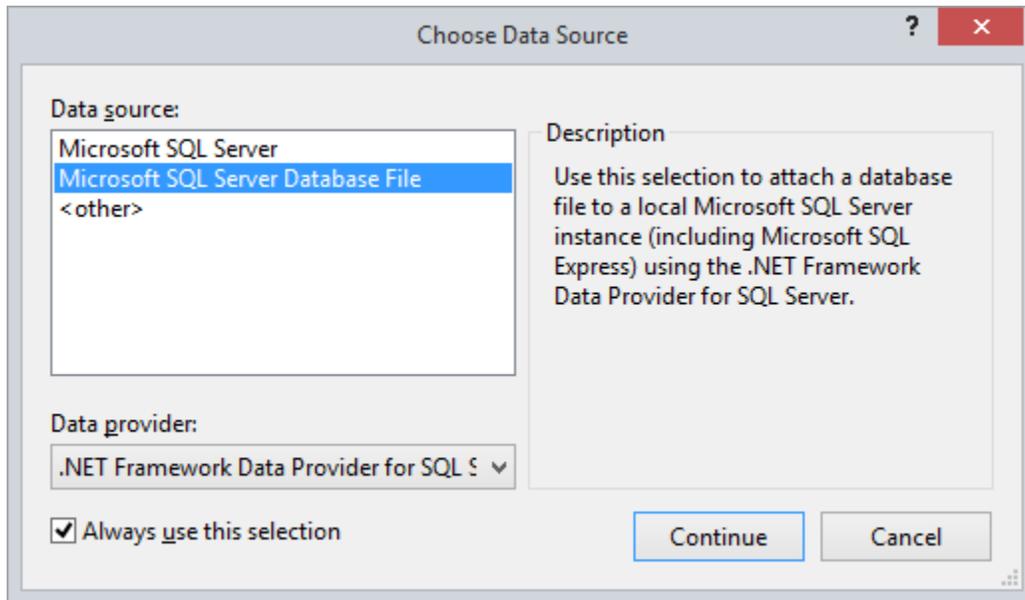
Let's create first simple ADO.Net entity data model for Books database.

1. Open or create the project for which you want to create an .edmx file.
2. Right-click the project name in **Solution Explorer**, point to **Add**, and then click **New Item**.
3. Select **ADO.NET Entity Data Model** in the **Templates** pane.
4. Enter the name for the file (<project name>.edmx), and then click **Add**.

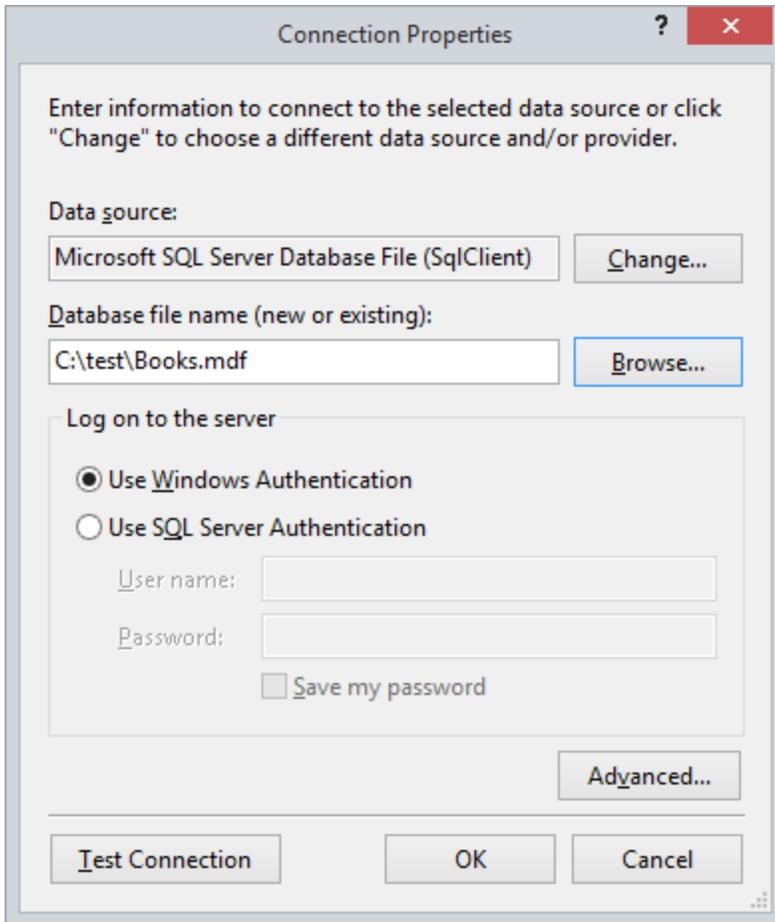
The first page of the **Entity Data Model Wizard** appears.

5. Select **Generate from database** in the **Choose Model Contents** dialog box, and then click **Next**.
6. Click the **New Connection** button.

The **Connection Properties** dialog box appears.



7. Enter the server name, select the authentication method, and enter the name of the database for which the model is being created. Click **OK**.

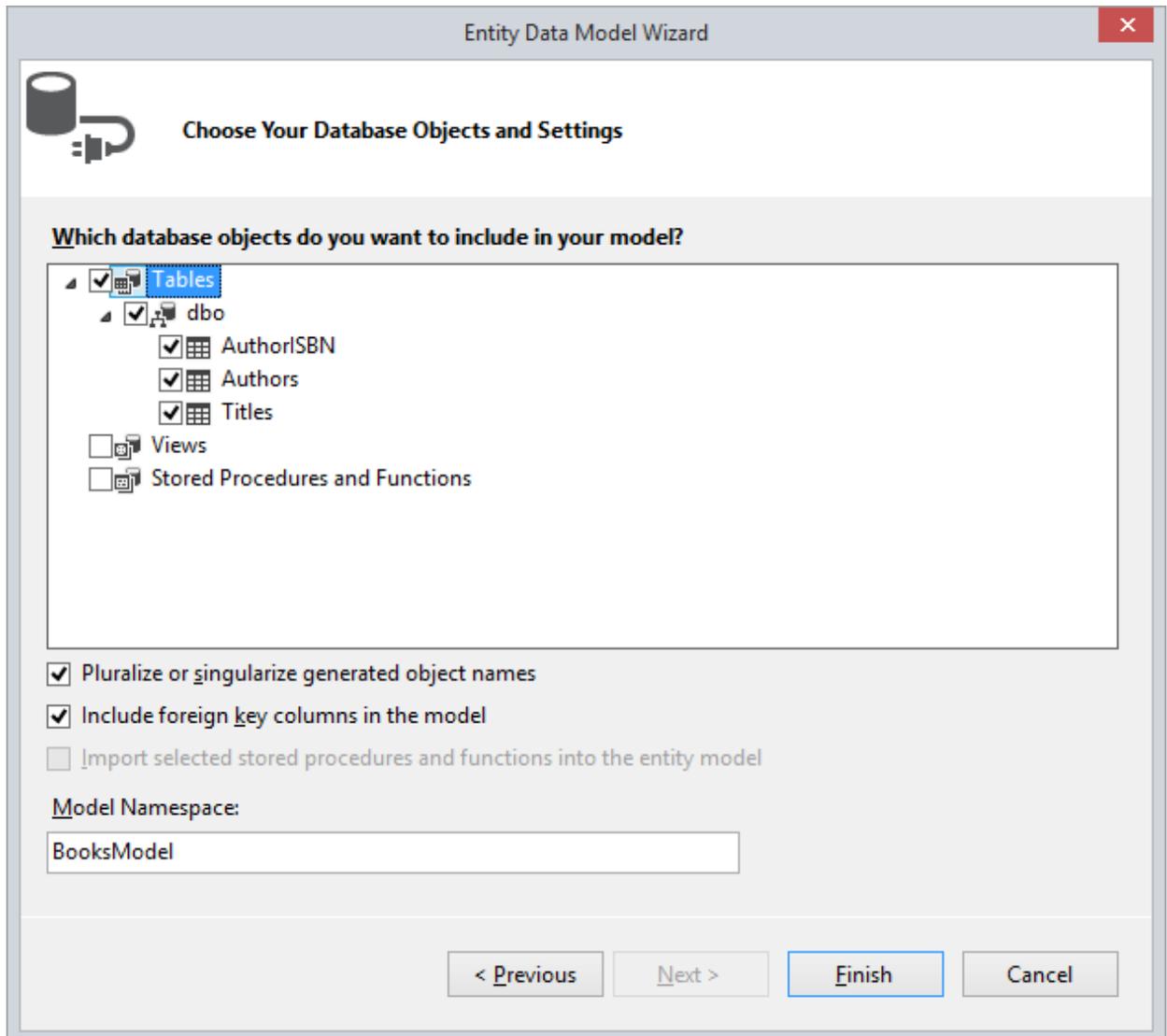


The **Choose Your Data Connections** dialog box is updated with the database connection settings.

8. Click **Next** to continue.

The **Choose Your Database Objects** dialog box appears. By default, no objects in the database are selected for inclusion in the .edmx file.

9. Expand the nodes for Tables, Views, and Stored Procedures. Cancel the selection of any tables, views, and stored procedures that you do not want included in the .edmx file.



10. Click **Finish** to create the .edmx file.

The Entity Data Model Wizard does the following:

- Adds references to the System.Data, System.Data.Entity, System.Core, System.Security, and System.Runtime.Serialization assemblies to the project, if they do not already exist.
- Generates an .edmx file that encapsulates the storage model, the conceptual model, and mappings.
- Creates a source code file that contains classes generated from the conceptual model. You can view the source code file by expanding the .edmx node in **Solution Explorer**.

## Entity Lifecycle:

Before we work on CRUD operation (Create, Read, Update, Delete), it's important to understand entity lifecycle and how it's being managed by EntityFramework 4.0.

During entity's lifetime, each entity has an entity state based on operation performed on it via Context (ObjectContext). The entity state is an enum of type System.Data.EntityState that declares the following values:

1. Added
2. Deleted
3. Modified
4. Unchanged
5. Detached

The Context not only holds the reference to all the objects retrieved from the database but also it holds the entity states and maintains modifications to the properties of the entity. This feature is known as *Change Tracking*.

The change in entity state from the Unchanged to the Modified state is the only state that's automatically handled by the context. All other changes must be made explicitly using proper methods of ObjectContext:

Sr.	ObjectContext Methods	Description	EntityState
1	AddObject	Adds an entity to the context	Added
2	Attach	Attaches an entity to the context	Unchanged
3	ApplyCurrentValues	Replace currently attached entity's scalar value with the property values of detached entity.	Modified
4	ApplyOriginalValues	It applies original database values to attached entity's properties.	Unchanged
5	DeleteObject	Delete the object from context.	Deleted
6	AcceptAllChanges	pushes the current values of every attached entity into the original values.	Unchanged
7	ChangeState or ChangeObjectState	Change an entity from one state to another without any restrictions (except for Detached)	Based on passed state
8	Detach	Removes an entity from the context.	Detached

You can query EDM mainly by three ways, 1) LINQ to Entities 2) Entity SQL 3) Native SQL.

**1) LINQ to Entities:** L2E query syntax is easier to learn than Entity SQL. You can use your LINQ skills for querying with EDM. Following code snippet shows how you can query with EDM created in previous step.

```
//Querying with LINQ to Entities
using (var objCtx = new SchoolDBEntities())
{
    var schoolCourse = from cs in objCtx.Courses
                        where cs.CourseName == "Course1"
                        select cs;
    Course mathCourse = schoolCourse.FirstOrDefault<Course>();
    IList<Course> courseList = schoolCourse.ToList<Course>();

    string courseName = mathCourse.CourseName;
}
```

First, you have to create object of context class which is SchoolDBEntities. You should initialize it in “using()” so that once it goes out of scope then it will automatically call Dispose() method of context class. Now, you can use LINQ with context object. LINQ query will return IQueryable<> object but underlying type of var will be ObjectQuery. You can then get single object using FirstOrDefault<>() or list of objects by using ToList<>().

**2) Entity SQL:** Another way to create a query, instead of LINQ to Entities, is by using the Entity Framework’s Object Services directly. You can create an ObjectQuery directly combined with the Entity Framework’s T-SQL-like query language, called Entity SQL, to build the query expression.

Following code snippet shows same query result as L2E query above.

```
//Querying with Object Services and Entity SQL
using (var objCtx = new SchoolDBEntities())
{
    string sqlString = "SELECT VALUE cs FROM
SchoolDBEntities.Courses
                        AS cs WHERE cs.CourseName == 'Maths'";
    ObjectQuery<Course> course =
objCtx.CreateQuery<Course>(sqlString);
    Course courseName1 = course.FirstOrDefault<Course>();
}
```

Here also, you have to create object of context class. Now you have to write SQL query as per Entity to SQL syntax and pass it in CreateQuery<>() method of context object. It will return ObjectQuery<> result. You can then single object using FirstOrDefault<>() or list of object by using ToList<>().

**3) Native SQL**In the Entity Framework v4 new methods ExecuteFunction(), ExecuteStoreQuery() and

ExecuteStoreCommand() were added to the classObjectContext. So you can use these methods to execute Native SQL to the database as following:

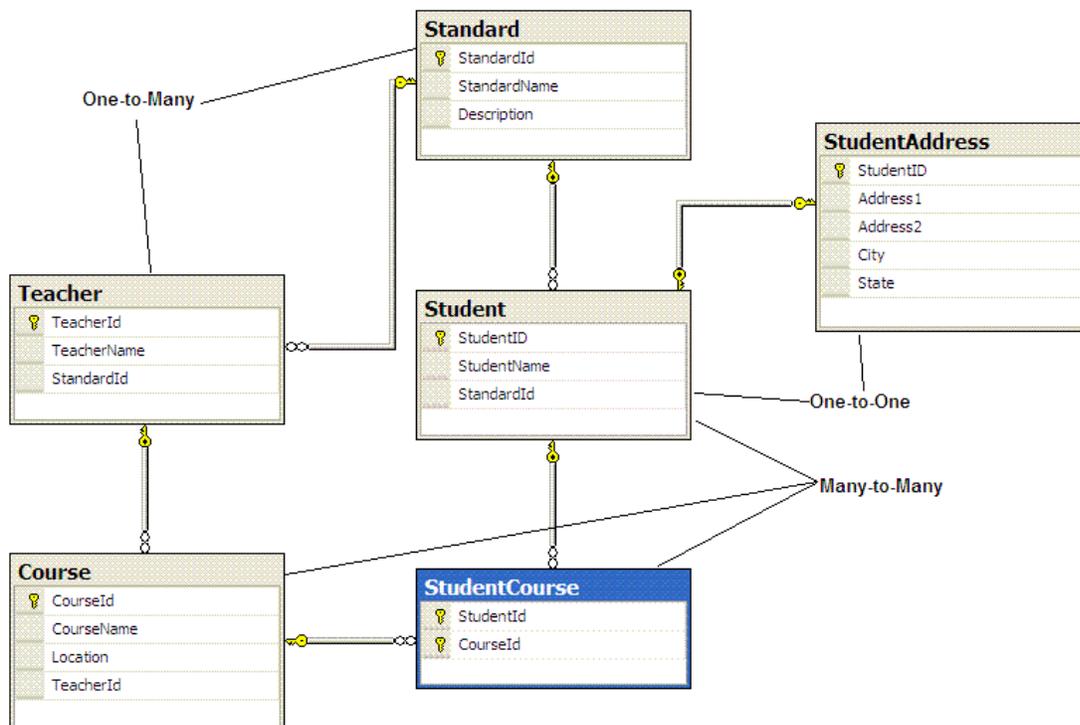
```
//Querying with native sql
using (var objCtx = new SchoolDBEntities())
{
    //Inserting Student using ExecuteStoreCommand
    int InsertedRows = objCtx.ExecuteStoreCommand("Insert into
Student(StudentName,StandardId) values('StudentName1',1)");

    //Fetching student using ExecuteStoreQuery
    var student = objCtx.ExecuteStoreQuery<Student>("Select *
from Student where StudentName = 'StudentName1'", null).ToList();
}
```

## Entity Relationships:

You can have three types of relations in EDM as in database. 1) One to One 2) One to Many 3) Many to Many.

Let's examine database table design before going into relationships in EDM. Following figure is a database diagram of SchoolDB used in this tutorial.

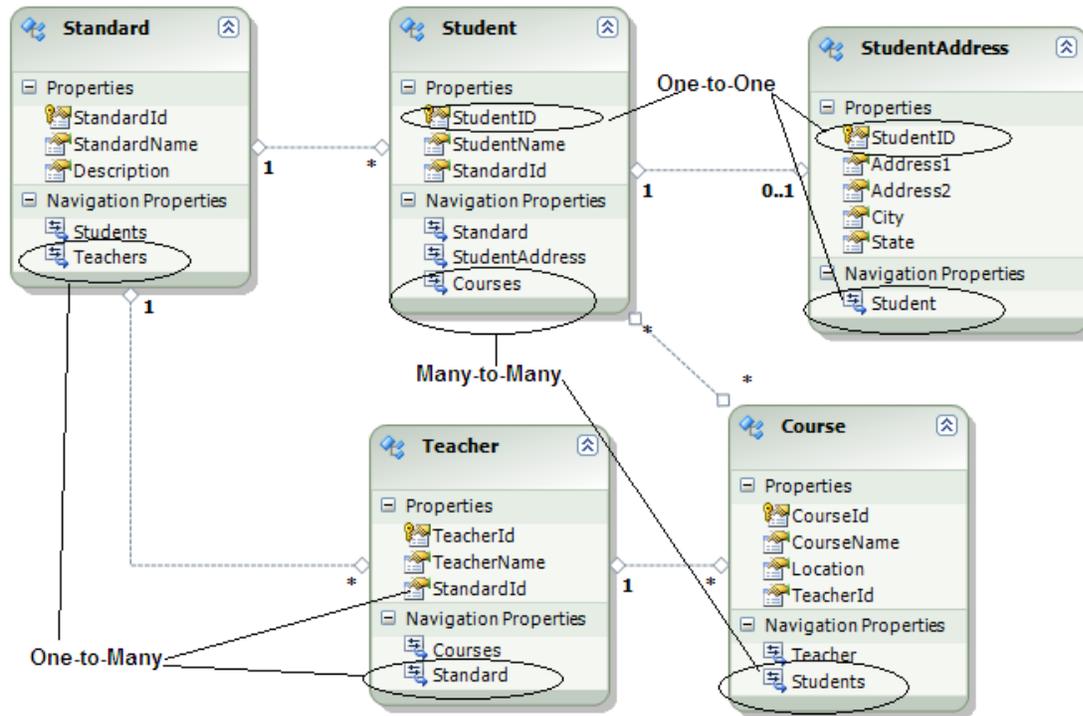


As you can see in the figure, student and StudentAddress have One-to-One relationship where each student has zero or one address.

Standard and Teacher has One-to-Many relationship where one standard can have many teachers but one teacher can't go to many standard (Standard is a classroom).

Student and Course has Many-to-Many relationships by using StudentCourse table. StudentCourse consists primary key of both the tables and thus it makes relation Many-to-Many.

When you create ADO.NET Entity Data Model from this database using 'Generate from existing database' option, it will create following entities and relationships into EDM:



As you can see in the above figure, Student and StudentAddress has One to One relationship (zero or one). StudentAddress entity has StudentId property as PK which makes it One-to-One relationship. Standard and teach has One-to-Many relation marked by multiplicity where 1 is for One and \* is for Many.

Standard entity has navigation property "Teachers" which indicates that one Standard can have list of teachers and Teacher entity has "Standard" navigation property which indicates that Teacher is associated with one Standard. This makes it One-to-Many relationship.

Student and Course have Many-to-Many relationships marked by \* multiplicity, but it doesn't display entityset for middle table "StudentCourse" where primary key of both tables will be stored. This is because The EDM represents many-to-many relationships by not having entityset for the joining table in CSDL, instead it manages through mapping. It can do this only when the join table has just the relevant keys and no additional fields. If the join tables had additional properties, such as DateCreated, the EDM would have created entities for them and you have to manage Many-to-Many relationship entities manually.

So now let's see how Many-to-Many relationship is being managed in EDM.

Open EDM in XML view. You can see that SSDL has StudentCourse entityset but CSDL doesn't have StudentCourse entityset instead it's being mapped in navigation property of Student and Course entity. In MSL (C-S Mapping), it has a mapping between Student and Course into StudentCourse table in <AssociationSetMapping/>

```

<AssociationSetMapping Name="StudentCourse" TypeName="SchoolDBModel.StudentCourse" StoreEntitySet="StudentCourse">
  <EndProperty Name="Course">
    <ScalarProperty Name="CourseId" ColumnName="CourseId" />
  </EndProperty>
  <EndProperty Name="Student">
    <ScalarProperty Name="StudentID" ColumnName="StudentId" />
  </EndProperty>
</AssociationSetMapping>

```

Thus Many-to-Many relationship is being managed in C-S mapping in EDM. So when you add student in course or Course in Student entity and when you save it then it will insert PK of added student and course in StudentCourse table. So this mapping not only enables a convenient association directly between the two entities, but also manages querying, inserts, and updates across this join.

But remember EDM does this only when joining table has PK columns for both tables. If you have some other columns in joining table then EDM will treat as normal entity and you have to use 'Join' in your query to fetch the data.

### Entity Graph:

When an entity has relation with other entities then it called entity graph because more entities are involved, for example Student entity graph includes many other entities like Standard, StudentAddress & Course.

## Querying Entity Graph:

### Projection:

Projection is a process of selecting data in different shape rather than specific entity being queried. There are many ways of projection. Let's see some projection style:

If you want to get the single student object when there are many students whose name is "Student1" in the database then use FirstOrDefault<>

```

var student = (from s in ctx.Students
               where s.StudentName == "Student1"
               select s).FirstOrDefault<Student>();

```

If you want to list of all students whose name is "Student1" (provided there are many students has same name) then use ToList<>:

```

var studentList = (from s in ctx.Students
                  where s.StudentName == "Student1"
                  select s).ToList<Student>();

```

If you want to group students by standardId then use group:

```

var students = from s in ctx.Students
               groupby s.StandardId into studentsByStandard
               select studentsByStandard;

```

If you want to get the list of students sorted by StudentName then use OrderBy:

```


```

```
var student1 = from s in ctx.Students
               orderby s.StudentName ascending
               select s;
```

If you want to get only StudentName, StandardName and list of Courses for that student in single object then write following projection:

```
var projectionResult = from s in ctx.Students
                       where s.StudentName == "Student1"
                       select new {
s.Courses                s.StudentName, s.Standard.StandardName,
                       };
```

Type of projectionResult in above query will be anonymous type because there is no class/entity which has these properties. So compiler will mark it as anonymous.

So this way you can do projection of result the way you want data. There are different other ways of projection but all projection styles requires knowledge of LINQ.

### Significance of SaveChanges:

SaveChanges method ofObjectContext is a gateway to persist all changes made to entities to the database. When you call ObjectContext.SaveChanges(), it performs insert, update or delete operation on the database based on EntityState of the entities.

Following code shows how you can persist modification made to the Student entities of SchoolDB EDM created either with EntityObject entities or POCO Proxy entities.

```
//Update entity using SaveChanges method
using (SchoolEntities ctx = new SchoolDBEntities())
{
    var stud = (from s in ctx.Students
                where s.StudentName == "Student1"
                select s).FirstOrDefault();

    stud.StudentName = "Student2";

    int num = ctx.SaveChanges();
}
```

As you can see in above code, we fetch the single Student entity whose name is "Student1" and then we change the StudentName property to "Student2". It saves this modification to the database when we do ctx.SaveChanges(). This method also returns the number of rows updated in the database.

SaveChanges also accepts SaveOptions parameter. SaveOption is an Enum which has three values:

1. AcceptAllChangesAfterSave: After saving entities values to the database, context change entity states. Added and Modified entities become Unchanged and deleted entities are removed from the context.
2. DetectChangesBeforeSave: It tells context to detect changes before saving.
3. None: Neither AcceptAllChangesAfterSave or DetectChangesBeforeSave occurs

So this way SaveChanges method is the most important method in the EntityFramework.

In this chapter we will learn how to add and save single entity using DbContext which in-tern insert single row in database table.

We will see how to add single 'Standard' entity:

```
// create new Standard entity object
var newStandard = new Standard();

// Assign standard name
newStandard.StandardName = "Standard 1";

//create DbContext object
using (var dbContext = new SchoolDBEntities())
{
    //Add standard object into Standard DBset
    dbContext.Standards.Add(newStandard);
    // call SaveChanges method to save standard into database
    dbContext.SaveChanges();
}
```

## Delete Entity using DbContext

As we have learned about DbContext.Entry method in one of the previous chapters. Entry method is useful to get any DBEntityEntry for given Entity. DBEntityEntry provides access to information and control of entities that are being tracked by the DbContext.

As a general rule, we can add any existing Entity and mark it as deleted as following:

```
using (var dbContext = new SchoolDBEntities())
{
    //if already loaded in existing DbContext then use
    Set().Remove(entity) to delete it.
    var newtchr = dbContext.Teachers.Where(t => t.TeacherName ==
    "New teacher4")
        .FirstOrDefault<Teacher>();
    dbContext.Set(Teacher).Remove(newtchr);

    //Also, you can mark an entity as deleted
}
```

```

        //dbCtx.Entry(tchr).State =
System.Data.EntityState.Deleted;

        //if not loaded in existing DbContext then use following.
        //dbCtx.Teachers.Remove(newtchr);

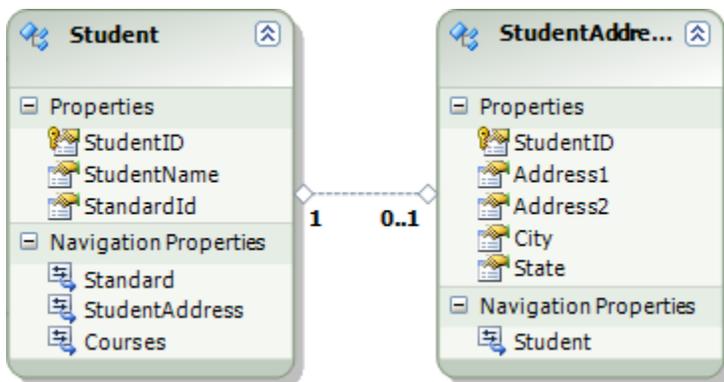
        dbCtx.SaveChanges();
    }

```

Above code results in following delete query which deletes the row from Teacher table.

## Add One-to-One Relationship Entity Graph using DbContext

We will see how to add new Student and StudentAddress entities which has One-to-One relationship that results in new rows in Student and StudentAddress table.



[Student and StudentAddress has One-to-One relationship]

```

        // create new student entity object
        var student = new Student();

        // Assign student name
        student.StudentName = "New Student1";

        // Create new StudentAddress entity and assign it to
student entity
        student.StudentAddress = new StudentAddress() { Address1 =
"Student1's Address1",
                Address2 = "Student1's Address2", City =
"Student1's City",
                State = "Student1's State" };
        //create DbContext object
        using (var dbCtx = new SchoolDBEntities())
        {
            //Add student object into Student's EntitySet
            dbCtx.Students.Add(student);
        }
    }

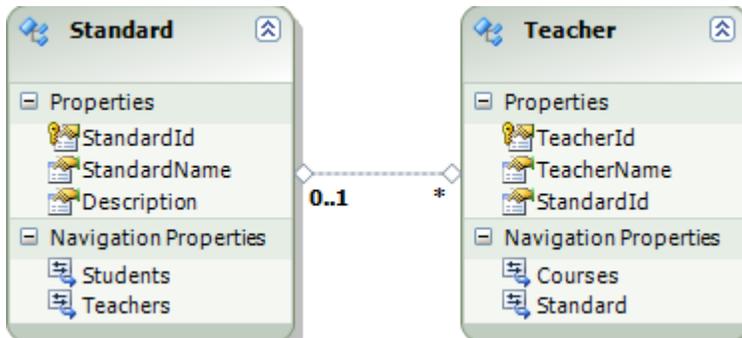
```

```

        // call SaveChanges method to save student &
        StudentAddress into database
        dbContext.SaveChanges();
    
```

## Add One-to-Many Relationship Entity Graph using DbContext

We will see how to add new Standard and Teacher entities which has One-to-Many relationship which results in single entry in 'Standard' database table and multiple entry in 'Teacher' table.



[Standard and Teacher has One-to-Many relationship]

```

//Create new standard
var standard = new Standard();
standard.StandardName = "Standard1";

//create three new teachers
var teacher1 = new Teacher();
teacher1.TeacherName = "New Teacher1";

var teacher2 = new Teacher();
teacher2.TeacherName = "New Teacher2";

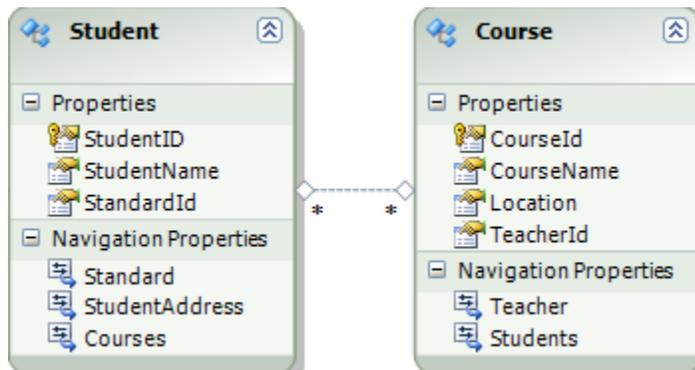
var teacher3 = new Teacher();
teacher3.TeacherName = "New Teacher3";

//add teachers for new standard
standard.Teachers.Add(teacher1);
standard.Teachers.Add(teacher2);
standard.Teachers.Add(teacher3);

using (var dbContext = new SchoolDBEntities())
{
    //add standard entity into standards entitySet
    dbContext.Standards.Add(standard);
    //Save whole entity graph to the database
    dbContext.SaveChanges();
}
    
```

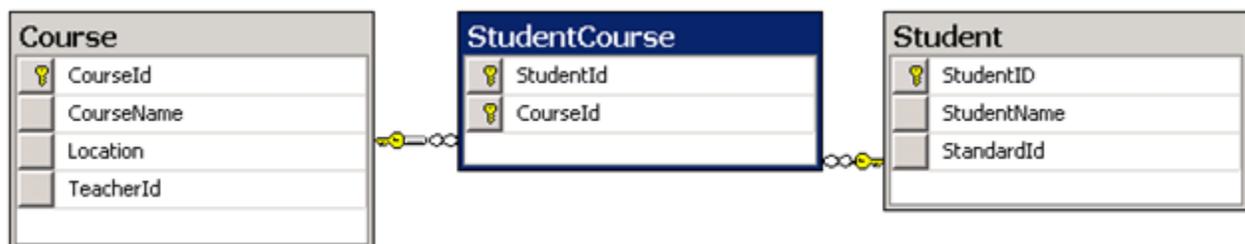
## Add Many-to-Many Relationship Entity Graph using DbContext

We will see how to add new courses in student's course collection. Student and Course has Many-to-Many relationship which results in insert new rows in Student and StudentCourse tables.



[Student and Course has Many-to-Many relationship]

If you see database design, actually there are three tables participates in Many-to-Many relationship between Student and Course, Student, Course and StudentCourse tables. StudentCourse table consist StudentID and CourseId where both StudentId and CourseId is composite key (combined primary key).



Now let's see code to add these entities into DbContext:

```
//Create student entity
var student1 = new Student();
student1.StudentName = "New Student2";

//Create course entities
var course1 = new Course();
course1.CourseName = "New Course1";
course1.Location = "City1";

var course2 = new Course();
course2.CourseName = "New Course2";
course2.Location = "City2";

var course3 = new Course();
course3.CourseName = "New Course3";
course3.Location = "City1";

// add multiple courses for student entity
student1.Courses.Add(course1);
```

```

student1.Courses.Add(course2);
student1.Courses.Add(course3);

using (var dbCtx = new SchoolDBEntities())
{
    //add student into DbContext
    dbCtx.Students.Add(student1);
    //call SaveChanges
    dbCtx.SaveChanges();
}

```

SaveChanges results in seven inserts query, 1 for student, 3 for Course and 3 for StudentCourse table.

## Update Entity using DbContext

As we have learned about DbContext.Entry method in previous chapter, Entry method is useful to get any DBEntityEntry for given Entity. DBEntityEntry provides access to information and control of entities that are being tracked by the DbContext.

As a general rule, we can add any existing modified Entity and mark it as modified as following:

```
dbCtx.Entry(Entity).State = System.Data.EntityState.Modified;
```

Let's see how to update an existing single 'Standard' entity:

```

Student stud ;
// Get student from DB
using (var ctx = new SchoolDBEntities())
{
    stud = ctx.Students.Where(s => s.StudentName == "New
Student1").FirstOrDefault<Student>();
}

// change student name in disconnected mode (out of DbContext
scope)
if (stud != null)
{
    stud.StudentName = "Updated Student1";
}

//save modified entity using new DbContext
using (var dbCtx = new SchoolDBEntities())
{
    //Mark entity as modified
    dbCtx.Entry(stud).State = System.Data.EntityState.Modified;
    dbCtx.SaveChanges();
}

```

As you see in the above code snippet, we are doing following steps:

1. Get the existing student
2. Change student name out of DbContext scope (disconnected mode)
3. We pass modified entity into Entry method to get its DBEntityEntry object and then marking its state as Modified
4. Calling SaveChanges to update student information into the database.

## Update One-to-Many Entities

### Connected Scenario:

Following code shows how we can save modified Standard and Teachers entity graph which has One-to-Many relationship to the database in connected scenario:

```
using (var ctx = new SchoolDBEntities())
{
    //fetching existing standard from the db
    Standard std = (from s in ctx.Standards
                    where s.StandardName == "standard3"
                    select s).FirstOrDefault<Standard>();
    std.StandardName = "Updated standard3";
    std.Description = "Updated standard";
    //getting first teacher to be removed
    Teacher tchr = std.Teachers.FirstOrDefault<Teacher>();
    //removing teachers (enable cascading delete for the teacher)
    if (tchr != null)
        ctx.Teachers.DeleteObject(tchr);
    Teacher newTeacher = new Teacher();
    newTeacher.TeacherName = "New Teacher";
    std.Teachers.Add(newTeacher);

    std.Teachers.Add(existingTeacher);
    ctx.SaveChanges();
}
```

## Update Many-to-Many Entities

### Connected Scenario:

Following code saves modified Student and Courses (for that student) to the database:

```
using (var ctx = new SchoolDBEntities())
{
    Student student = (from s in ctx.Students
                       where s.StudentName == "Student3"s
                       select s).FirstOrDefault<Student>();

    student.StudentName = "Updated Student3";

    Course cours = student.Courses.FirstOrDefault<Course>();
    //removing course from student
    student.Courses.Remove(cours);

    ctx.SaveChanges();
}
```

## Delete One-to-One Entities

```
using (var ctx = new SchoolDBEntities())
{
    Student student = (from s in ctx.Students
                       where s.StudentName == "Student1"
                       select s).FirstOrDefault<Student>();
;

    StudentAddress sAddress = student.StudentAddress;
```

```
        ctx.StudentAddresses.DeleteObject(sAddress);

        ctx.SaveChanges();
    }
```

## Delete One-to-Many Entities

### Connected Scenario:

Following code deletes the teacher for standard which has One-to-Many relationship from the database in connected scenario:

```
using (var ctx = new SchoolDBEntities())
{
    //fetching existing standard from the db
    Standard std = (from s in ctx.Standards
                    where s.StandardName == "standard3"
                    select s).FirstOrDefault<Standard>();

    //getting first teacher to be removed
    Teacher tchr = std.Teachers.FirstOrDefault<Teacher>();
    //removing teachers
    if (tchr != null)
        ctx.Teachers.DeleteObject(tchr);
    ctx.SaveChanges();
}
```

DeleteObject deletes a parent object and also deletes all the child objects in the constraint relationship.

## Delete Many-to-Many Entities

### Connected Scenario:

Following code deletes the course from student's courses in connected scenario. This will delete row in StudentCourse table but not delete the actual course from Course table in the database:

```

using (SchoolDBContext ctx = new SchoolDBContext())
{
    Student student = (from s in ctx.Students
                       where s.StudentName == "Student3"
                       select s).FirstOrDefault<Student>();

    Course cours = student.Courses.FirstOrDefault<Course>(
);

    //removing course from student
    student.Courses.Remove(cours);

    ctx.SaveChanges();
}

```

## View Generated SQL Statements

You may wonder what the actual SQL statements used by LINQ to Entities to interact with the databases are. In this section, we will explain two ways to view the generated SQL statements used by LINQ to Entities queries.

There are two ways to view the generated LINQ to Entities SQL statements. The first one is to use the **ObjectQuery.ToTraceString** method, and the second one is to use SQL Pro

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Data.Objects;
namespace TestLINQToEntitiesApp
{
    class Program
    {
        static void Main(string[] args)
        {
            // CRUD operations on tables
            //TestTables();
            ViewGeneratedSQL();
            Console.WriteLine("Press any key to continue ...");
            Console.ReadKey();
        }
    }
}

```

```

static void TestTables()
{
    // the body of this method is omitted to save space
}
static void ViewGeneratedSQL()
{
    NorthwindEntities NWEntities = new NorthwindEntities();
    IQueryable<Product> beverages =
        from p in NWEntities.Products
        where p.Category.CategoryName == "Beverages"
        orderby p.ProductName
        select p;
    // view SQL using ToTraceString method
    Console.WriteLine("The SQL statement is:\n" +
        beverages.ToTraceString());
    NWEntities.Dispose();
}
}
public static class MyExtensions
{
    public static string ToTraceString<T>(this IQueryable<T> t)
    {
        string sql = "";
        ObjectQuery<T> oqt = t as ObjectQuery<T>;
        if (oqt != null)
            sql = oqt.ToTraceString();
        return sql;
    }
}
}

```

Run this program, and you will see the following output:

```

C:\Windows\system32\cmd.exe
The SQL statement is:
SELECT
[Extent1].[ProductID] AS [ProductID],
[Extent1].[ProductName] AS [ProductName],
[Extent1].[SupplierID] AS [SupplierID],
[Extent1].[CategoryID] AS [CategoryID],
[Extent1].[QuantityPerUnit] AS [QuantityPerUnit],
[Extent1].[UnitPrice] AS [UnitPrice],
[Extent1].[UnitsInStock] AS [UnitsInStock],
[Extent1].[UnitsOnOrder] AS [UnitsOnOrder],
[Extent1].[ReorderLevel] AS [ReorderLevel],
[Extent1].[Discontinued] AS [Discontinued]
FROM [dbo].[Products] AS [Extent1]
INNER JOIN [dbo].[Categories] AS [Extent2] ON [Extent1].[CategoryID] = [Extent2]
.[CategoryID]
WHERE N'Beverages' = [Extent2].[CategoryName]
ORDER BY [Extent1].[ProductName] ASC
Press any key to continue ...

```

## View SQL Statements Using Profiler

With the `ToTraceString` method, we can view the generated SQL statements for some LINQ to Entities expressions, but not all of them. For example, when we add a new product to the database, or when we execute a Stored Procedure in the database, there is no `IQueryable` object for us to use

to view the generated SQL statements. In this case, we can use the SQL profiler to view the SQL statements. But if you go to view the generated SQL statements for the above query, you may be confused, as there is no SQL statement displayed in SQL profiler. So we will not explain the steps to view the SQL statements in the Profiler here, but we will explain it in the next section, together with the explanation of another important LINQ to Entities feature, deferred execution.