

Build an ASP.NET Core Service and App with .NET (Core) 5.0 Two-Day Hands-On Lab

Lab 3

This lab walks you through creating the `DbContext` and the `DbContextFactory` as well as running your first migration. Prior to starting this lab, you must have completed Lab 2.

Part 1: Create the `DbContext`

The derived `DbContext` class is the hub of using EF Core with C#. The lab works on the `AutoLot.Dal` project.

Step 1: Create the `ApplicationDbContext` file and its constructor

- Create a new folder in the `AutoLot.Dal` project named `EfStructures`. Add a new class to the folder named `ApplicationDbContext.cs`.
- Add the following using statements to the class:

```
using System;
using AutoLot.Models.Entities;
using AutoLot.Models.Entities.Owned;
using AutoLot.Models.ViewModels;
using Microsoft.EntityFrameworkCore;
using Microsoft.EntityFrameworkCore.Storage;
using Microsoft.EntityFrameworkCore.ChangeTracking;
```

- Make the class public, sealed, and inherit from `DbContext`. Add in a constructor that takes an instance of `DbContextOptions` and passes it to the base class:

```
namespace AutoLot.Dal.EfStructures
{
    public sealed class ApplicationDbContext : DbContext
    {
        public ApplicationDbContext(DbContextOptions<ApplicationDbContext> options)
            : base(options)
        {
        }
    }
}
```

Step 2: Add the public property for query filters

- Add a property to hold the `MakeId` for the global query filters:

```
public int MakeId { get; set; }
```

Step 3: Add the DbSet<T> properties

- Add a DbSet<T> for each of the model classes.

```
public DbSet<SerilogEntry>? LogEntries { get; set; }
public DbSet<CreditRisk>? CreditRisks { get; set; }
public DbSet<Customer>? Customers { get; set; }
public DbSet<Make>? Makes { get; set; }
public DbSet<Car>? Cars { get; set; }
public DbSet<Order>? Orders { get; set; }
public DbSet<CustomerOrderViewModel>? CustomerOrderViewModels { get; set; }
```

Step 4: Add the OnModelCreating method and Fluent API Calls

- Add the override for OnModelCreating. This method is where the Fluent API code provides additional model information.

```
protected override void OnModelCreating(ModelBuilder modelBuilder)
{
}
```

a) Configure the SerilogEntry entity

```
modelBuilder.Entity<SerilogEntry>(entity =>
{
    entity.Property(e => e.Properties).HasColumnType("Xml");
    entity.Property(e => e.TimeStamp).HasDefaultValueSql("GetDate()");
});
```

- If you want to exclude the table from migrations, change the code to this:

```
modelBuilder.Entity<SerilogEntry>(entity =>
{
    entity.ToTable("Serilog", "Logging", t => t.ExcludeFromMigrations());
});
```

Note: Comment this out if you add it, as you will need the Serilog table later in this HOL.

b) Add the query filters for Make

```
modelBuilder.Entity<Car>().HasQueryFilter(c => c.MakeId == MakeId);
//New in EF Core 5 are bi-directional query filters
modelBuilder.Entity<Order>().HasQueryFilter(e => e.CarNavigation!.MakeId == MakeId);
```

c) Map the CustomerOrderViewModel to a SQL Server View

The view will be created in the next lab

```
modelBuilder.Entity<CustomerOrderViewModel>().HasNoKey().ToView("CustomerOrderView", "dbo");
```

- Optionally, instead of using a view, you can map the view model directory to a SQL statement:

```
modelBuilder.Entity<CustomerOrderViewModel>(entity =>
{
    entity.HasNoKey()
        .ToSqlQuery(@"SELECT c.FirstName, c.LastName, i.Color, i.PetName, m.Name AS Make
FROM dbo.Orders o
INNER JOIN dbo.Customers c ON o.CustomerId = c.Id
INNER JOIN dbo.Inventory i ON o.CarId = i.Id
INNER JOIN dbo.Makes m ON m.Id = i.MakeId
");
});
```

Note: Comment this out, as you will be using the view to load the data.

d) Configure the FK Cascade rules and Person owned class for CreditRisk

```
modelBuilder.Entity<CreditRisk>(entity =>
{
    entity.HasOne(d => d.CustomerNavigation)
        .WithMany(p => p!.CreditRisks)
        .HasForeignKey(d => d.CustomerId)
        .HasConstraintName("FK_CreditRisks_Customers");

    entity.OwnsOne(o => o.PersonalInformation, pd =>
    {
        pd.Property<string>(nameof(Person.FirstName))
            .HasColumnName(nameof(Person.FirstName))
            .HasColumnType("nvarchar(50)");
        pd.Property<string>(nameof(Person.LastName))
            .HasColumnName(nameof(Person.LastName))
            .HasColumnType("nvarchar(50)");
    });
});
```

e) Configure the Person owned class for Customer

```
modelBuilder.Entity<Customer>(entity =>
{
    entity.OwnsOne(o => o.PersonalInformation, pd =>
    {
        pd.Property(p => p.FirstName).HasColumnName(nameof(Person.FirstName));
        pd.Property(p => p.LastName).HasColumnName(nameof(Person.LastName));
    });
});
```

f) Configure the FK Cascade rules for Makes and Orders

```

modelBuilder.Entity<Make>(entity =>
{
    entity.HasMany(e => e.Cars)
        .WithOne(c => c.MakeNavigation!)
        .HasForeignKey(k => k.MakeId)
        .OnDelete(DeleteBehavior.Restrict)
        .HasConstraintName("FK_Make_Inventory");
});

modelBuilder.Entity<Order>(entity =>
{
    entity.HasOne(d => d.CarNavigation)
        .WithMany(p => p!.Orders)
        .HasForeignKey(d => d.CarId)
        .OnDelete(DeleteBehavior.ClientSetNull)
        .HasConstraintName("FK_Orders_Inventory");
    entity.HasOne(d => d.CustomerNavigation)
        .WithMany(p => p!.Orders)
        .HasForeignKey(d => d.CustomerId)
        .OnDelete(DeleteBehavior.Cascade)
        .HasConstraintName("FK_Orders_Customers");
    entity.HasIndex(cr => new {cr.CustomerId, cr.CarId}).IsUnique(true);
});

```

Part 2: Create the DbContextFactory

The `IDesignTimeDbContextFactory` is used by the design time tools to instantiate a new instance of the `ApplicationDbContext`. The section of the lab works on the `AutoLot.Dal` project.

Step 1: Create the ApplicationDbContextFactory

- Add a new class named `ApplicationDbContextFactory.cs` to the `EfStructures` folder.
- Add the following using statements to the class:

```

using System;
using Microsoft.EntityFrameworkCore;
using Microsoft.EntityFrameworkCore.Design;

```

- Make the class public and inherit from `ApplicationDbContextFactory<T>` where `T` is the `DbContext` class

```

public class ApplicationDbContextFactory : IDesignTimeDbContextFactory<ApplicationDbContext>
{
}

```

Step 2: Add the CreateDbContext Method

- Add a new method named CreateDbContext.
- The method creates a new instance of ApplicationDbContext using a hard coded, development connection string:

```
public ApplicationDbContext CreateDbContext(string[] args)
{
    var optionsBuilder = new DbContextOptionsBuilder<ApplicationDbContext>();
    var connectionString = @"server=.,5433;Database=AutoLot50;User Id=sa;Password=P@ssw0rd;";
    optionsBuilder.UseSqlServer(connectionString);
    Console.WriteLine(connectionString);
    return new ApplicationDbContext(optionsBuilder.Options);
}
```

- **NOTE:** If you are not using the SQL Server Docker container created in Lab 0, update connection string as necessary.

Docker:

```
var connectionString =
@"Server=.,6433;Database=AutoLot50;User ID=sa;Password=P@ssw0rd;MultipleActiveResultSets=true;";
Console.WriteLine(connectionString);
```

LocalDb:

```
@"Server=(localdb)\mssqllocaldb;Database=AutoLot50;Integrated
Security=true;MultipleActiveResultSets=true;";
Console.WriteLine(connectionString);
```

Part 3: Update the Database Using Migrations

Migrations can be created and executed using the .NET Core EF Command Line Interface in a command window or the Package Manager Console in Visual Studio. With either option, the commands must be executed from the same directory as the AutoLot.Dal csproj file.

The NuGet style commands can be used in the Package Manager Console in Visual Studio if the Microsoft.EntityFrameworkCore.Tools package was installed.

Step 1: Create and Execute the Initial Migration

- Run the following command if you currently have EF Core Global Tool to uninstall the version on your machine:

```
dotnet tool uninstall --global dotnet-ef
```

- Run the following command to install the EF Core Global Tool 5.0:

```
dotnet tool install --global dotnet-ef --version 5.0.0
```

Step 2: Create and Execute the Initial Migration

- Open a command prompt in the same directory as the AutoLot.Dal project
OR

[Visual Studio]Open Package Manager Console (View -> Other Windows -> Package Manager Console) and navigate to the correct directory using:

[Windows]cd .\AutoLot.Dal

[Non-Windows]cd ./AutoLot.Dal

- Create the initial migration with the following command (-o = output directory, -c = Context File):

[Windows]

NOTE: The following lines must be entered as one line - copying and pasting from this document doesn't work

```
dotnet ef migrations add Initial -o EfStructures\Migrations -c  
AutoLot.Dal.EfStructures.ApplicationDbContext
```

NOTE: The above lines must be entered as one line - copying and pasting from this document doesn't work

[Non-Windows]

NOTE: The following lines must be entered as one line - copying and pasting from this document doesn't work

```
dotnet ef migrations add Initial -o EfStructures\Migrations -c  
AutoLot.Dal.EfStructures.ApplicationDbContext
```

NOTE: The above lines must be entered as one line - copying and pasting from this document doesn't work

- This creates three files in the EfStructures\Migrations (EfStructures\Migrations) Directory:
- A file named YYYYMMDDHHmmSS_Initial.cs (where date time is UTC)
- A file named YYYYMMDDHHmmSS_Initial.Designer.cs (same numbers)
- ApplicationDbContextModelSnapshot.cs
- Open up the YYYYMMDDHHmmSS_Initial.cs file. Check the Up and Down methods to make sure the database and table/column creation code is there
- Update the database with the following command:

```
dotnet ef database update
```

- Examine your database in SQL Server Management Studio to make sure the tables were created

Summary

In this lab, you created the ApplicationDbContext and the ApplicationDbContextFactory. The final step was creating the initial migration and updating the database.

Next steps

In the next part of this tutorial series, you will create the SQL Server objects, including a stored procedure, two views, and a user defined function. Then two computed columns will be added (to the Orders and OrderDetails tables), and finally add in all of the ViewModels as well as the DbQuery types.