LINQ

Language Integrated Query in Entity Framework Core

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#csharp-db

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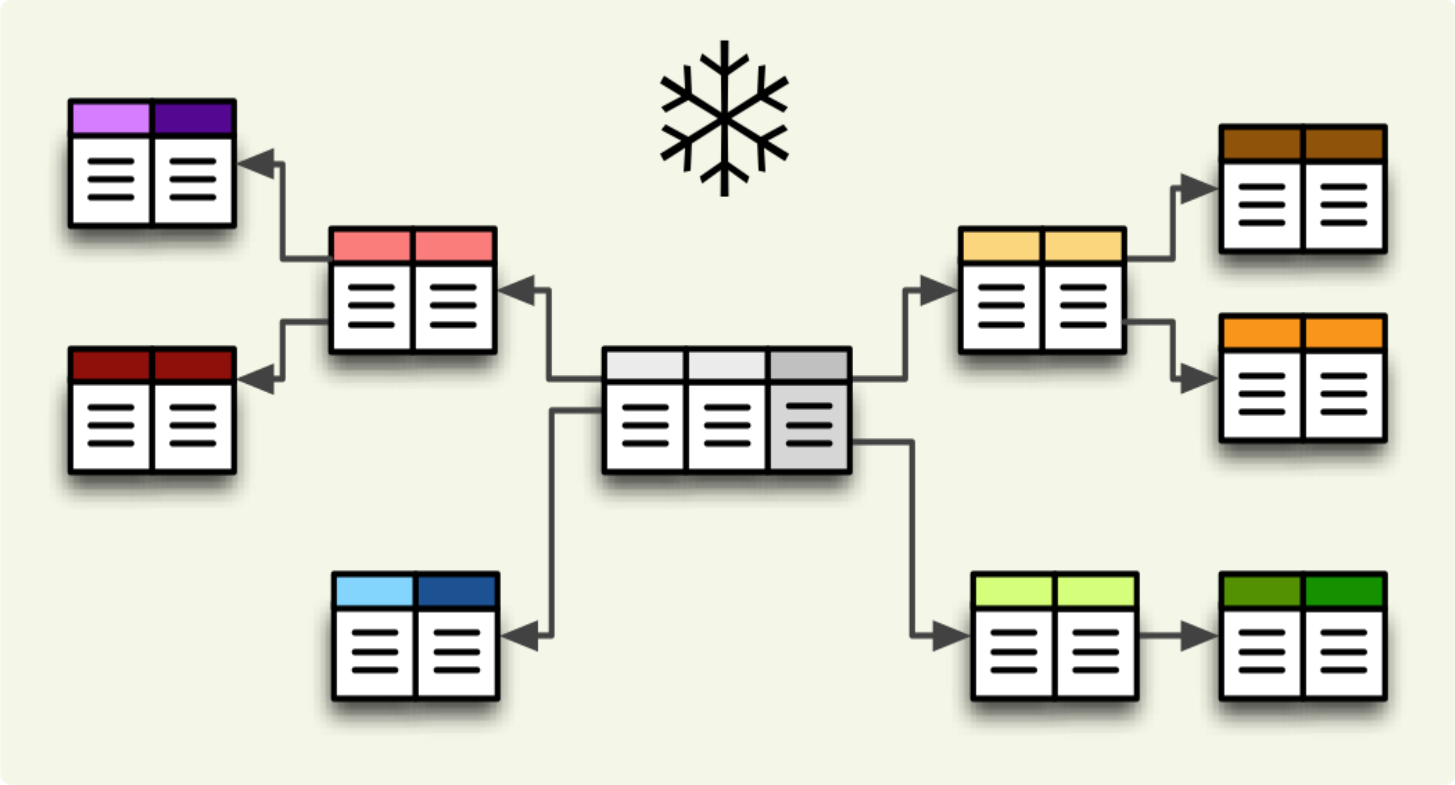


Filtering and Aggregating Tables

Select, Join and Group Data Using LINQ

Filtering

- **Where**
  - Selects values that are based on a predicate function
  - Syntax

```
string[] words = { "the", "quick", "brown", "fox", "jumps" };

IEnumerable<string> query =
      words.Where(word => word.Length == 3);
```

```
IEnumerable<string> query = from word in words
                            where word.Length == 3
                            select word;
```

Good Reasons to Use Select

- Limit network traffic by reducing the queried columns
- Syntax

```
var employeesWithTown = context
   .Employees
   .Select(employee => new
   {
      EmployeeName = employee.FirstName,
      TownName = employee.Address.Town.Name
   });
```

- SQL Server Profiler

```
   SELECT [employee].[FirstName] AS [EmployeeName], [employee.Address.Town].[Name] AS [TownName]
     FROM [Employees] AS [employee]
LEFT JOIN [Addresses] AS [employee.Address] ON [employee].[AddressID] = [employee.Address].[AddressID]
LEFT JOIN [Towns] AS [employee.Address.Town] ON [employee.Address].[TownID] =
          [employee.Address.Town].[TownID]
```

Good Reasons Not to Use Select

- Data that is selected is **not** of the **initial entity type**
  - **Anonymous type**, generated at runtime

```
(local variable) System.Collections.Generic.List<'a> employeesWithTown

Anonymous Types:
    'a is new { string EmployeeName, string TownName }

Local variable 'employeesWithTown' is never used
```

- **Data cannot be modified** (updated, deleted)
  - Entity is of a **different type**
  - Not associated with the **context** anymore

Aggregation

- Aggregate functions perform calculations on a set of input values and return a value
  - `Average` - Calculates the average value of a collection of values
  - `Count` - Counts the elements in a collection, optionally only those elements that satisfy a predicate function
  - `Max` and `Min` - Determine the maximum and the minimum value in a collection
  - `Sum` - Calculates the sum of the values in a collection

Joining Tables in EF: Using Join()

- Join tables in EF with **LINQ** / **extension methods** on `IEnumerable<T>` (like when joining collections)

```
var employees =
  softUniEntities.Employees.Join(
    softUniEntities.Departments,
    (e => e.DepartmentID),
    (d => d.DepartmentID),
    (e, d) => new {
      Employee = e.FirstName,
      JobTitle = e.JobTitle,
      Department = d.Name
    }
  );
```

Grouping Tables in EF

- Grouping also can be done by LINQ
  - The same way as with collections in LINQ
- Grouping with LINQ

```
var groupedEmployees =
  from employee in softUniEntities.Employees
  group employee by employee.JobTitle;
```

- Grouping with extension methods

```
var groupedCustomers = softUniEntities.Employees
  .GroupBy(employee => employee.JobTitle);
```

SelectMany – Example (1)

```
public class PhoneNumber
{
    public string Number { get; set; }
}
```

```
public class Person
{
    public IEnumerable<PhoneNumber> PhoneNumbers { get; set; }

    public string Name { get; set; }
}
```

SelectMany – Example (2)

```
IEnumerable<Person> people = new List<Person>();

// "Select" gets a list of lists of phone numbers
IEnumerable<IEnumerable<PhoneNumber>> phoneLists =
                    people.Select(p => p.PhoneNumbers);

// "SelectMany" flattens it to just a list of phone numbers
IEnumerable<PhoneNumber> phoneNumbers =
                    people.SelectMany(p => p.PhoneNumbers);

// To include data from the parent in the result pass an expression
// to the second parameter (resultSelector) in the overload
var directory = people.SelectMany(p => p.PhoneNumbers,
(parent, child) => new { parent.Name, child.Number });
```

IEnumerable vs IQueryable

IEnumerable<T>

- `IEnumerable<T>` is an interface that is available in the `System.Collection.Generic` namespace
- Implementation of the Iterator design pattern
- `IEnumerable` or `IEnumerable<T>` interface should be used only for **in-memory data objects**
- LINQ methods over `IEnumerable<T>` use `Func<>` parameters

IQueryable<T>

- `IQueryable<T>` is an interface and it is available in `System.Linq`
- Provides functionality to evaluate queries against a specific **data source** where the type of the data may not be specified
- The `IQueryable` interface is intended for implementation by query providers
- LINQ methods over `IQueryable<T>` use `Expression<Func<>>` parameters (expression trees)
  - Entity Framework can convert expression trees directly into SQL

Differences Between IEnumerable and IQueryable

- `IEnumerable<T>`
  - `System.Collections.Generic`
  - Base type for almost all .NET collections
  - LINQ methods works with `Func<>`
  - Good for **in-memory** data
- `IQueryable<T>`
  - `System.Linq` namespace
  - Derives the base interface from `IEnumerable<T>`
  - LINQ methods works with `Expression<Func<>>`
  - Good for queries over **data stores** such as databases

Result Models

Simplifying Models

Result Models (1)

- `Select()`, `GroupBy()` can work with **custom classes**
  - Allow you to **pass them** to methods and use them as a return type
  - Require some **extra code** (class definition)
- Sample Result Model

```
public class UserResultModel
{
   public string FullName { get; set; }
   public string Age { get; set; }
}
```

Result Models (2)

- Assign the fields as you would with an anonymous object

```
var currentUser = context.Users
  .Where(u => u.Id == 8)
  .Select(u => new UserResultModel
  {
    FullName = u.FirstName + " " + u.LastName,
    Age = u.Age
  })
  .SingleOrDefault();
```

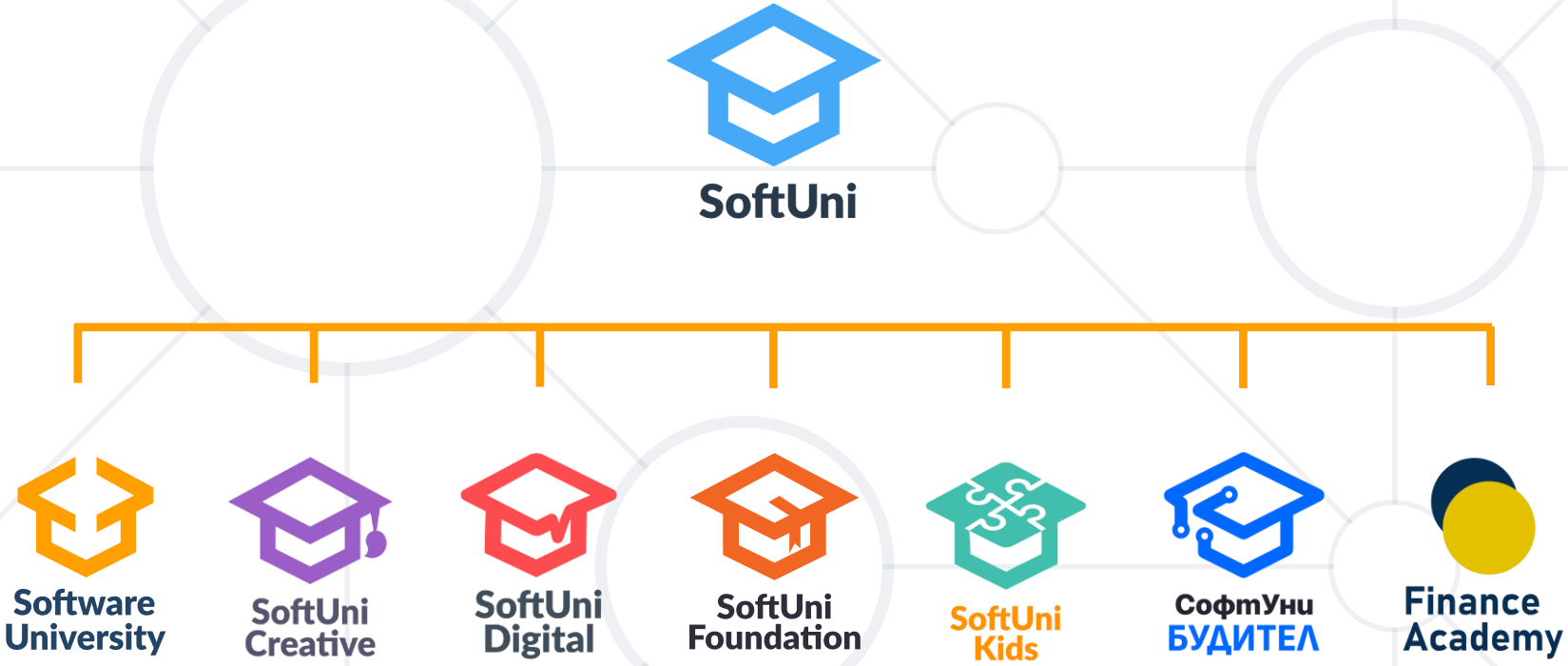
- The new type can be used in a method signature

```
public UserResultModel GetUserInfo(int Id) { … }
```

Summary

- **LINQ**
  - Filtering, Aggregation, SelectMany, Joins
- **IEnumerable**
- **IQueryable**
- **Differences** between IEnumerable and IQueryable
- Result Models

Questions?



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