2024

Migrations

WHAT ARE DATABASE MIGRATIONS?
CODE FIRST APPROACH

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I. Introduction

1. What is database migration?

- ☐ **Definition:** ***Database Migration*** *is the process of transferring data from one or multiple source databases to one or more target databases.*
- ☐ *This is typically done using a database migration service or tools.*
- ☐ *Once migration is complete, the dataset from the source databases is fully transferred, possibly with restructuring, to the target databases.*

2. Benefits of Database Migration

1) **Improved Performance:** *Database migration improves performance by optimizing hardware and infrastructure, optimizing database design and indexing strategies, segmenting and partitioning data, and utilizing advanced database features. These optimizations result in faster data retrieval, reduced query execution times, and improved overall database performance.*
2) **Cost Optimization:** *By migrating to the cloud, businesses can avoid significant upfront investments in hardware, infrastructure, and maintenance. Instead, they can leverage pay-as-you-go models, paying only for the resources they use.*
3) **Advanced Features and Functionality:** *Database migration enables organizations to leverage the advanced features and functionality provided by the new system. This may include support for new data types, improved data analytics, better concurrency control, built-in support for high availability, and disaster recovery.*
4) **Data Consolidation:** *In scenarios where multiple databases exist within an organization, migrating them into a single database helps consolidate data.*

3. Database Migration Challenges

1) **Data Loss***: The most common issue firms face is data loss during the DB migration.*
2) **Data Security**
3) **Migration strategy**

4. Why Use Database Migration?

- *Upgrading to the latest version of the database software to improve security and compliance.*
- *Moving existing data to a new database to reduce cost, improve performance, and achieve scalability.*
- *Moving from an on-premises database to a cloud-based database for better scalability and lower costs.*

II. Migrations in .NET

1. Migrations Overview

- **Definition:** *Migrations are used in **Entity Framework Core** to apply changes to the database schema as the data model changes.*
- *The migrations feature in **EF (Entity Framework)** Core provides a way to incrementally update the database schema to keep it in sync with the application's data model while preserving existing data in the database.*
- *When a data model change is introduced, the developer uses EF Core tools to add a corresponding migration describing the updates necessary to keep the database schema in sync.*
- *EF Core compares the current model against a snapshot of the old model to determine the differences and generates migration source files.*
- *Once a new migration has been generated**, it can be applied to a database in various ways.***
- *EF Core records all applied migrations in a special history table.*

2. Managing Migrations

1) **Add migration:** *After the model has been changed, a migration can be added for that change:*

Visual Studio

```
Add-Migration AddBlogCreatedTimestamp
```

- *The migration name can be used like a commit message in a version control system.*

2) **Remove migration:** *To remove the last migration, use this command:*

Visual Studio

```
Remove-Migration
```

3) **Listing migrations:**

Visual Studio

```
Get-Migration
```

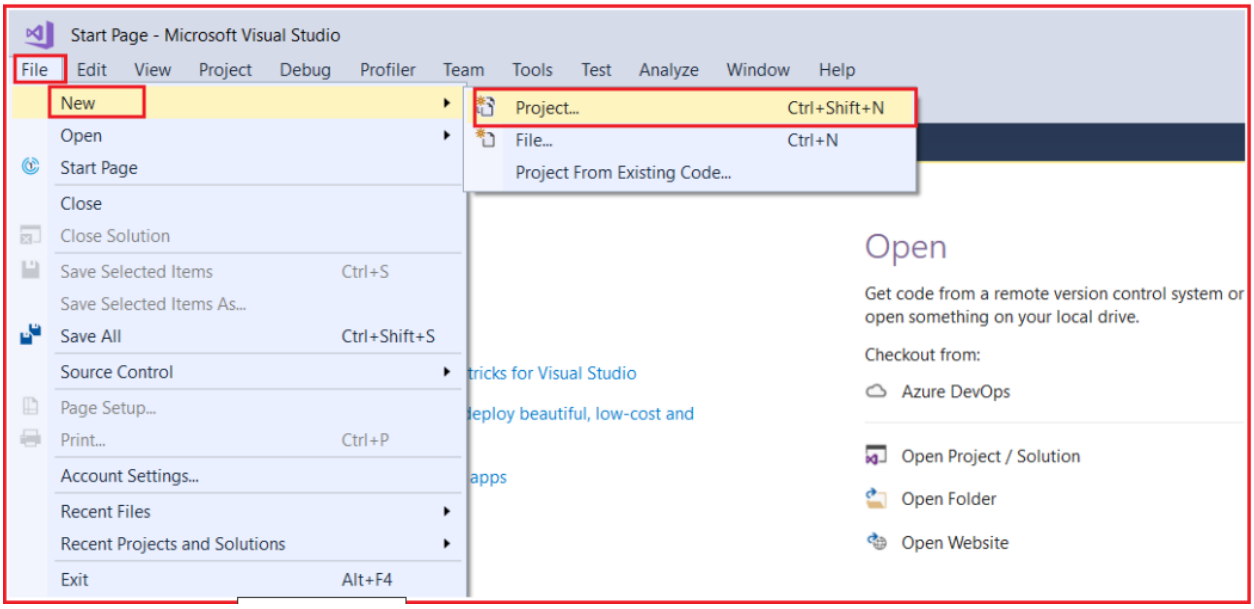
III. Entity Framework Code First Approach

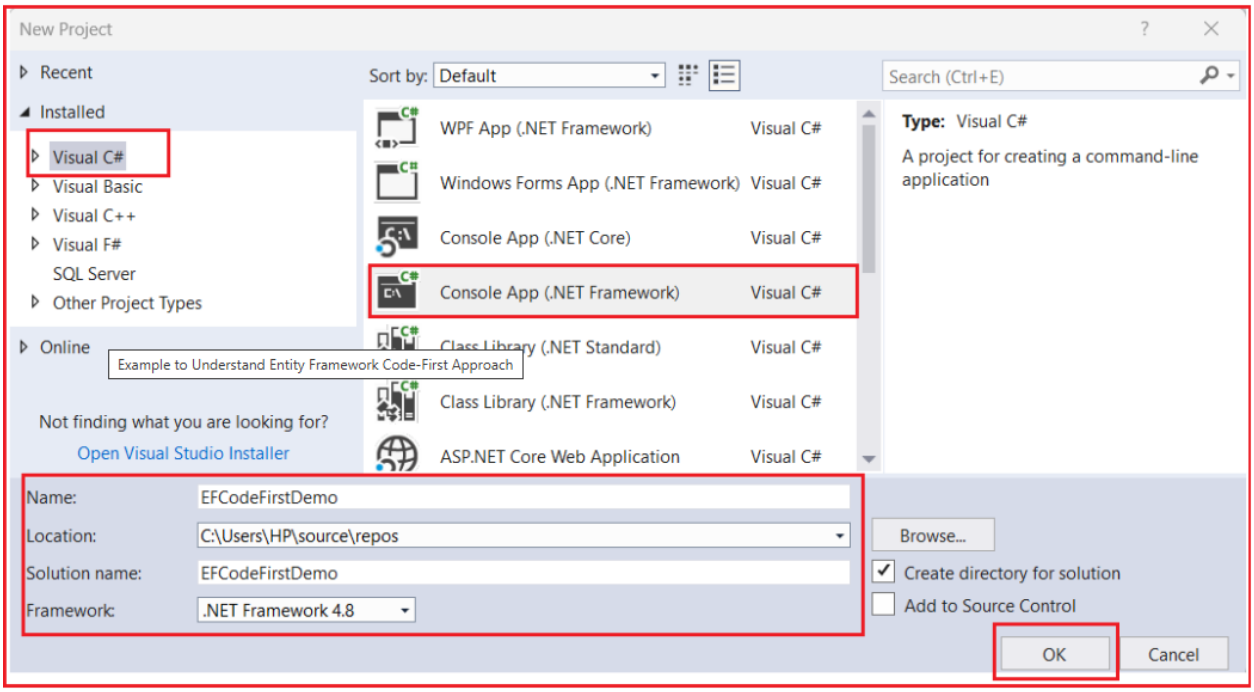
1. Overview

- ☐ **Application:** *This approach is best suited for applications that are highly domain-centric and will have the domain model classes created first.*
- ☐ *The Entity Framework Code First Approach targets a database that does not exist and Entity Framework Code First will create the database and related tables.*
- ☐ *Entity Framework Code First Approach can also be used with an empty database. In this case, Code First will add new tables to this empty database.*
- ☐ *It allows programmers to define domain models using C# or VB.NET classes.*
- ☐ *It allows additional configuration using attributes on classes and properties or by using a fluent API.*

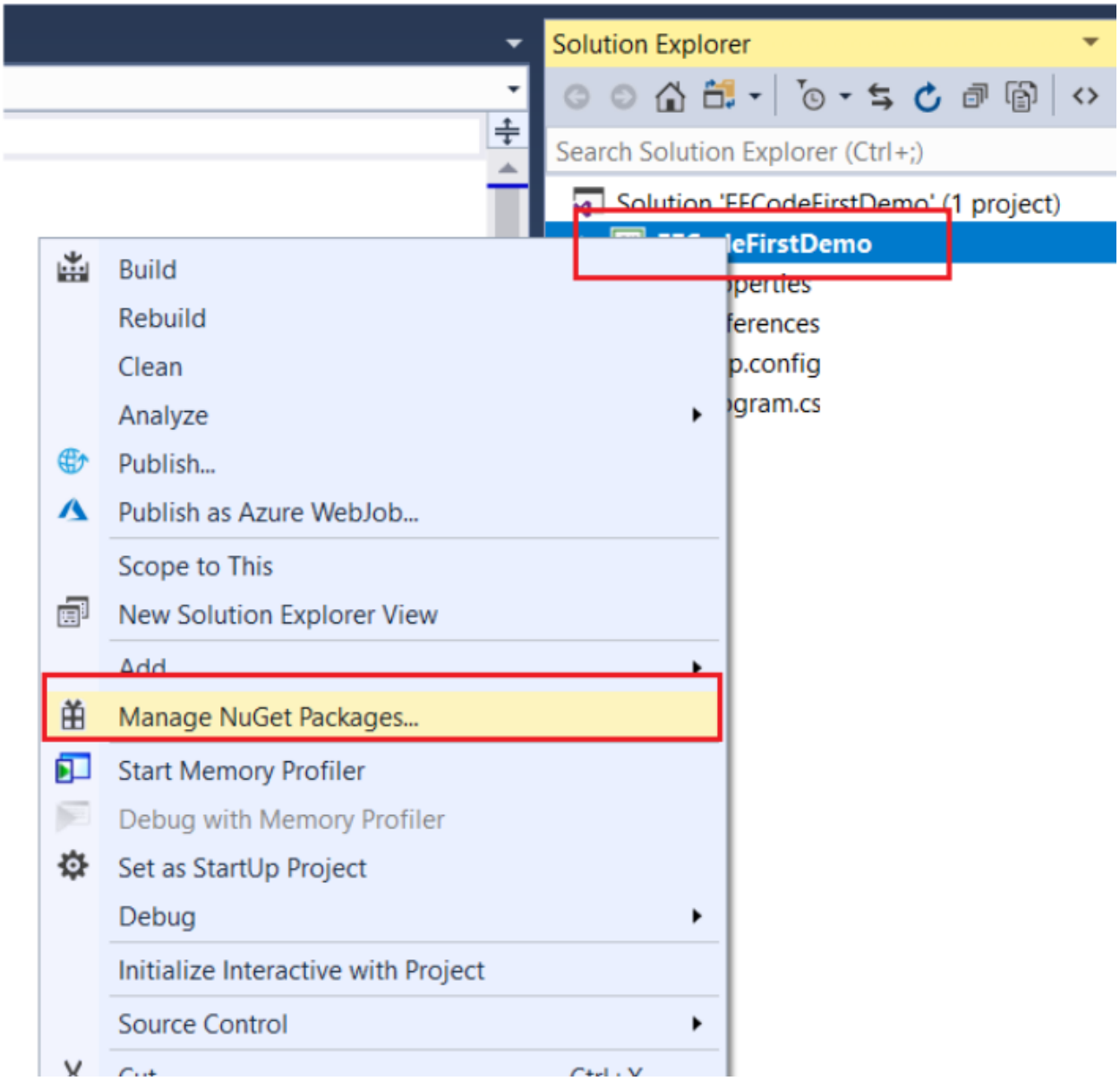
2. Installing Entity Framework:

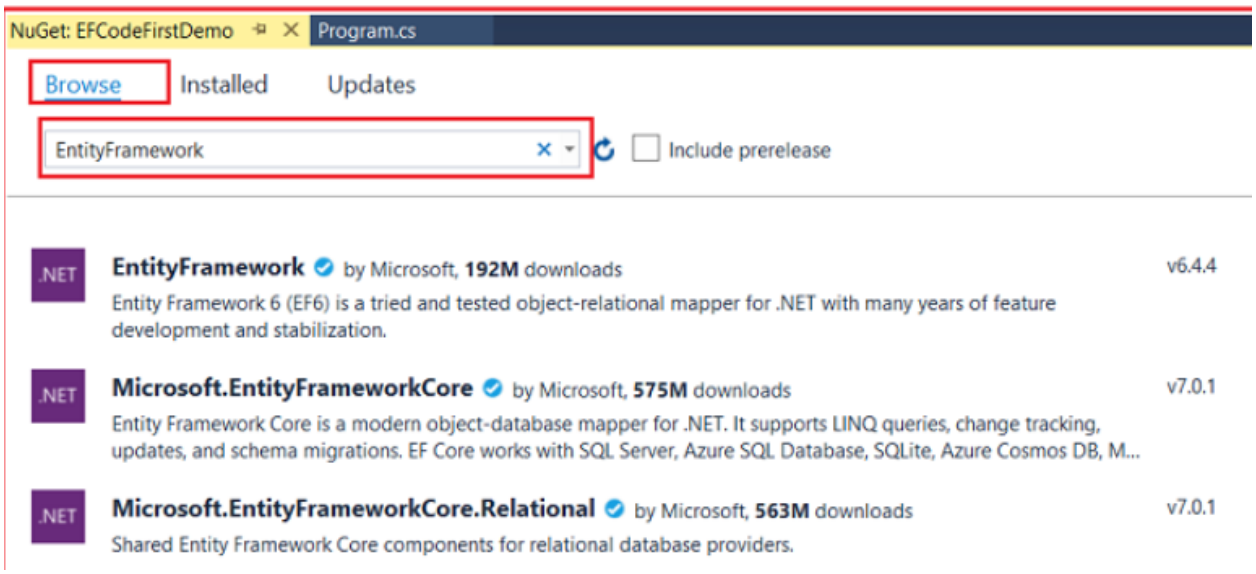
1) **Open Visual Studio:** *Create a Console Application and give it a name:*



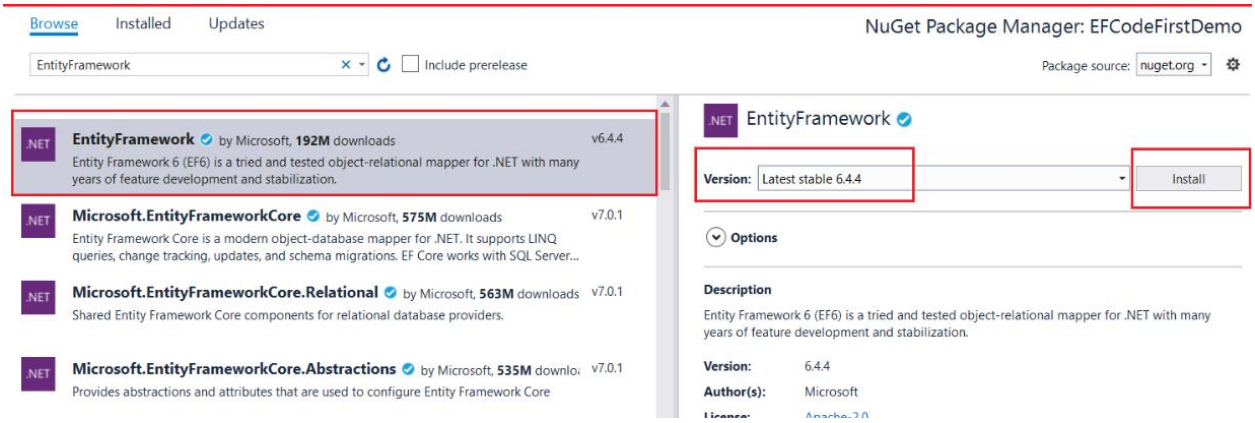


2) Install EF in the current project: *To do so, right-click on the project's name and choose* ***NuGet Package Manager:***


Solution Explorer
Search Solution Explorer (Ctrl+;)
Build
Rebuild
Clean
Analyze
Publish...
Publish as Azure WebJob...
Scope to This
New Solution Explorer View
Add
Manage NuGet Packages...
Start Memory Profiler
Debug with Memory Profiler
Set as StartUp Project
Debug
Initialize Interactive with Project
Source Control


NuGet: EFCodeFirstDemo
Program.cs
Browse
Installed
Updates
EntityFramework
Include prerelease
EntityFramework by Microsoft, 192M downloads
v6.4.4
Entity Framework 6 (EF6) is a tried and tested object-relational mapper for .NET with many years of feature development and stabilization.
Microsoft.EntityFrameworkCore by Microsoft, 575M downloads
v7.0.1
Entity Framework Core is a modern object-database mapper for .NET. It supports LINQ queries, change tracking, updates, and schema migrations. EF Core works with SQL Server, Azure SQL Database, SQLite, Azure Cosmos DB, M...
Microsoft.EntityFrameworkCore.Relational by Microsoft, 563M downloads
v7.0.1
Shared Entity Framework Core components for relational database providers.

*Now, select **EntityFramework**, provided by Microsoft. Then, select the latest or any version, and finally click on the Install button.*



Resources

- [ ] https://www.astera.com/type/blog/database-migration-what-it-is-and-how-it-is-done/
- [ ] https://learn.microsoft.com/en-us/ef/core/managing-schemas/migrations/managing?tabs=vs#listing-migrations
- [ ] https://dotnettutorials.net/lesson/introduction-to-entity-framework-code-first-approach/
- [ ] https://medium.com/@josiahmahachi/entity-framework-code-first-with-migrations-8d1a197d2bd4