# C# Programming Language Fundamentals

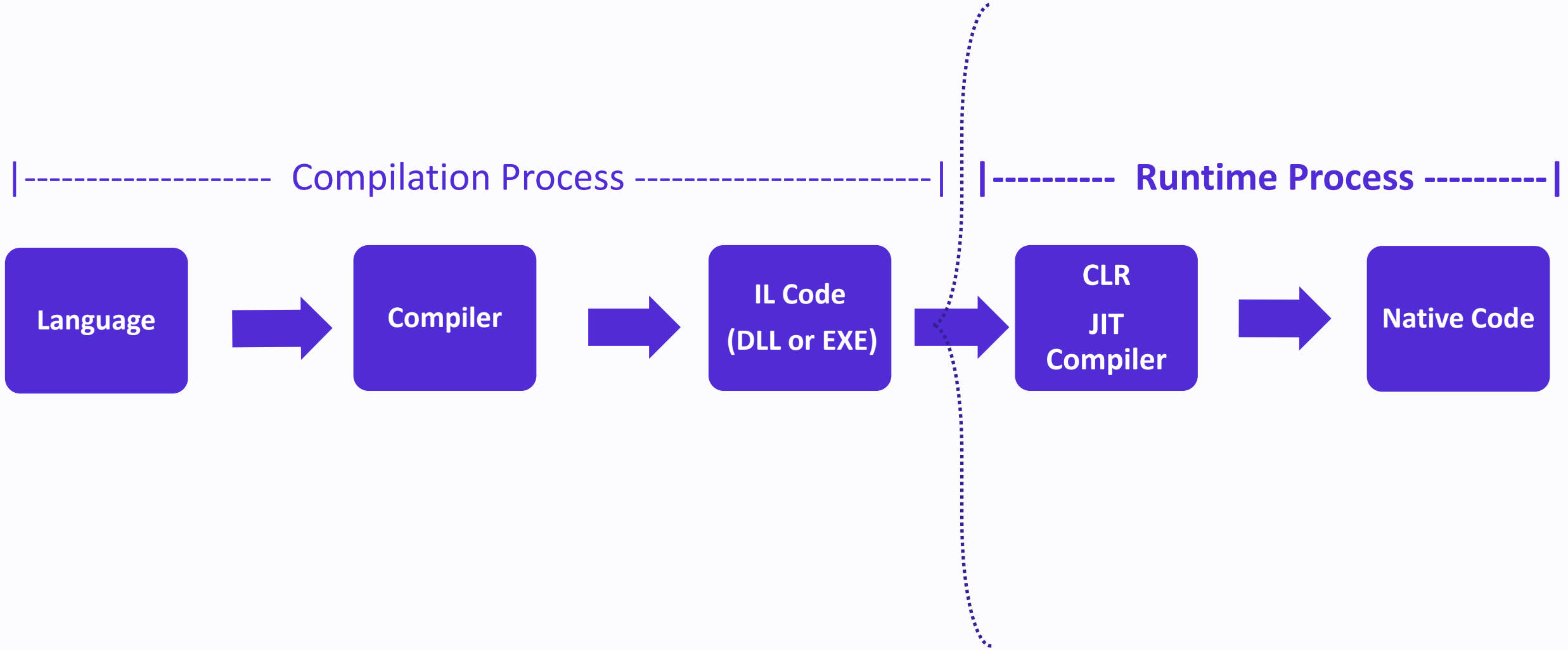
# Prerequisites

- Computer and its basic knowledge.
- Integrated Development Environment or Code Editor
  - Visual Studio (Recommended)
  - Visual Studio Code

# Overview

- Introduction
- .NET Overview?
- Our First C# program
- IDE – Visual Studio quick tour
- C# syntax
- Variables and Data Types
- Type Conversions
- Conditionals
- Loops
- Classes
- Object Oriented Programming
- Value Types vs Reference Types
- Compilation and CLR
- Assemblies and Referencing
- Exceptional Handling

# Compilation and Runtime Execution



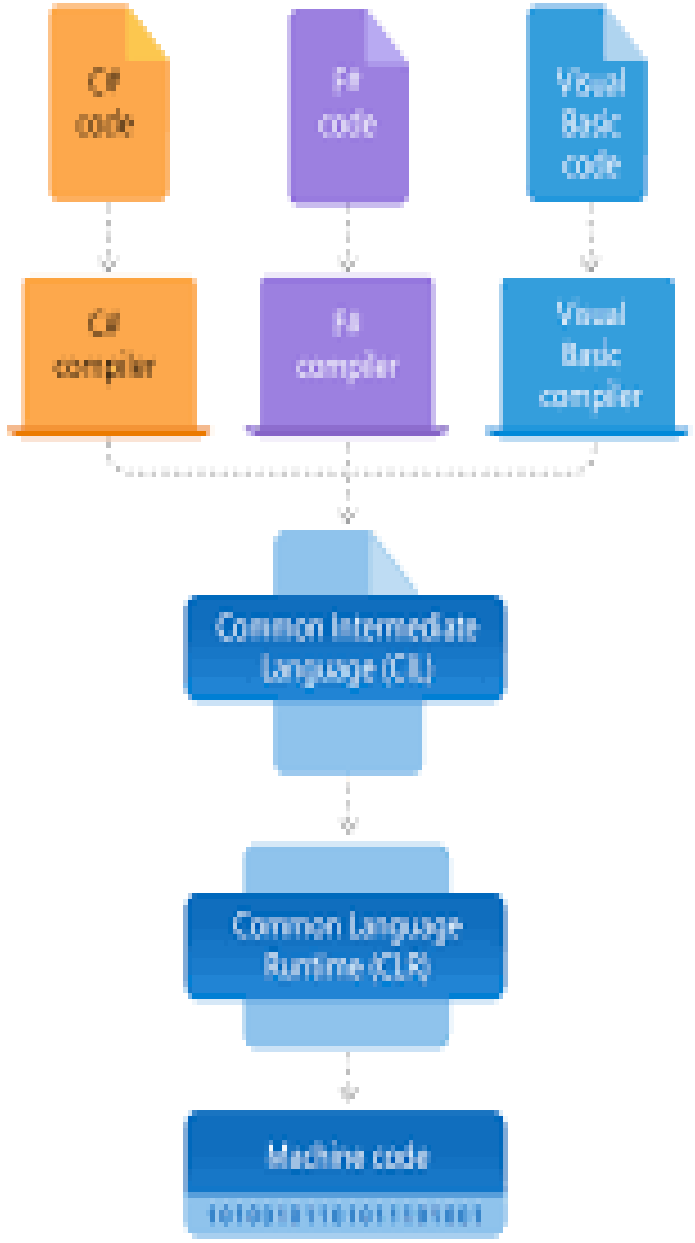
# Architecture

Two major components of .NET ecosystem are

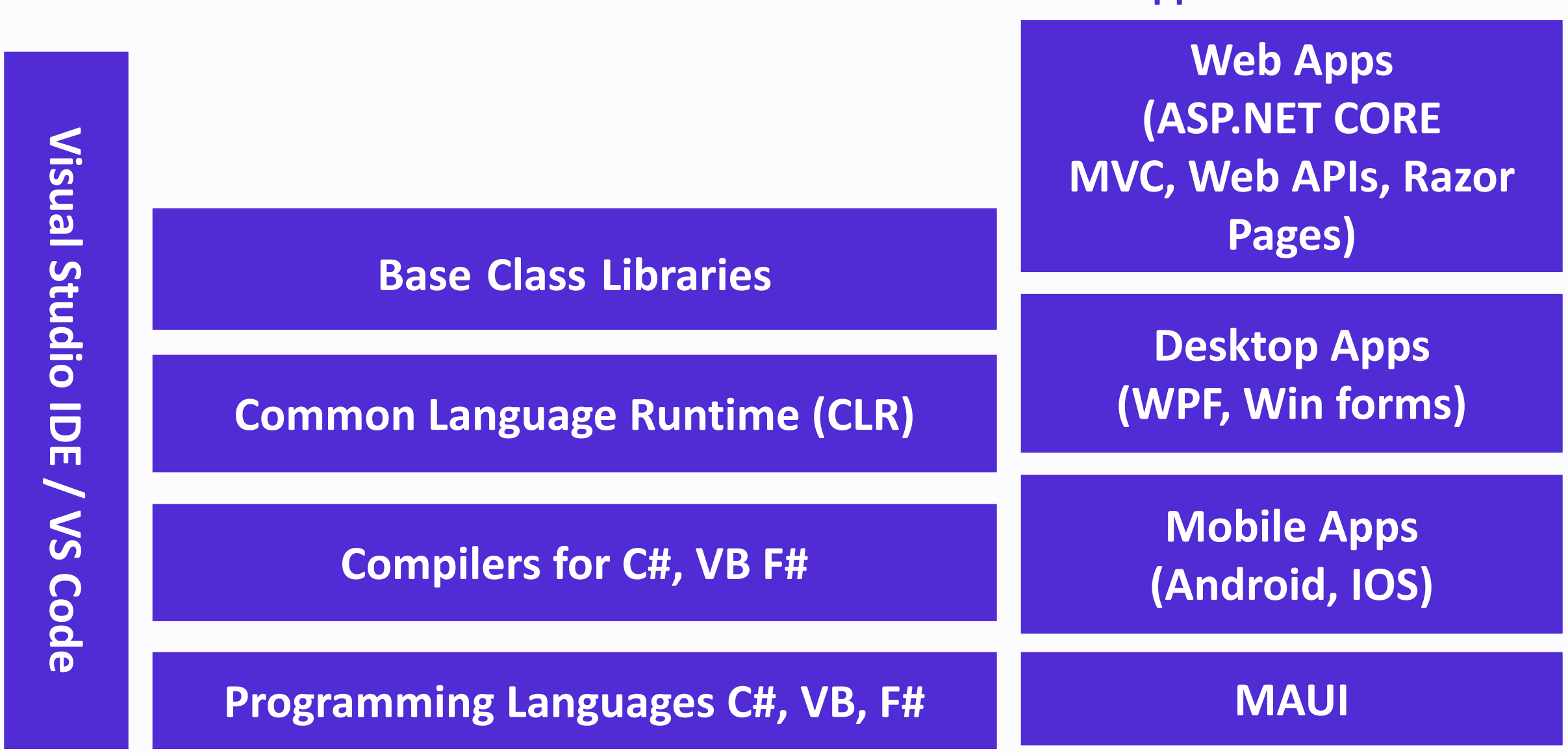
- The **Common Language Runtime (CLR)** is the execution engine that handles running applications. It provides services like thread management, garbage collection, type-safety, exception handling, and more.
- The **Class Library** provides a set of APIs and types for common functionality. It provides types for strings, dates, numbers, etc. The Class Library includes APIs for reading and writing files, connecting to databases, drawing, and more.

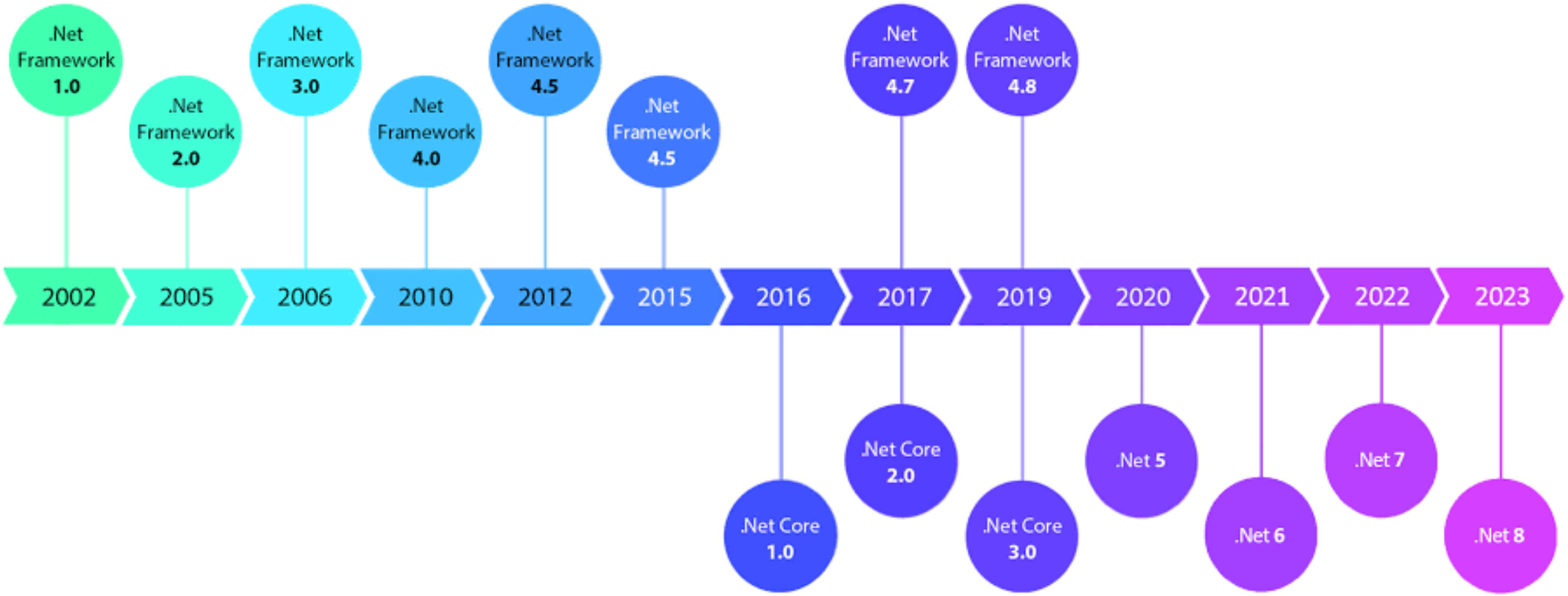
.NET applications are written in the C#, F#, or Visual Basic programming language. Code is compiled into a language-agnostic Common Intermediate Language (CIL). Compiled code is stored in assemblies—files with a .dll or .exe file extension.

When an app runs, the CLR takes the assembly and uses a just-in-time compiler (JIT) to turn it into machine code that can execute on the specific architecture of the computer it is running on.



# .NET Ecosystem and its tools




.Net Framework 1.0
.Net Framework 2.0
.Net Framework 3.0
.Net Framework 4.0
.Net Framework 4.5
.Net Framework 4.5
.Net Framework 4.7
.Net Framework 4.8
2002
2005
2006
2010
2012
2015
2016
2017
2019
2020
2021
2022
2023
.Net Core 1.0
.Net Core 2.0
.Net Core 3.0
.Net 5
.Net 6
.Net 7
.Net 8

# C#

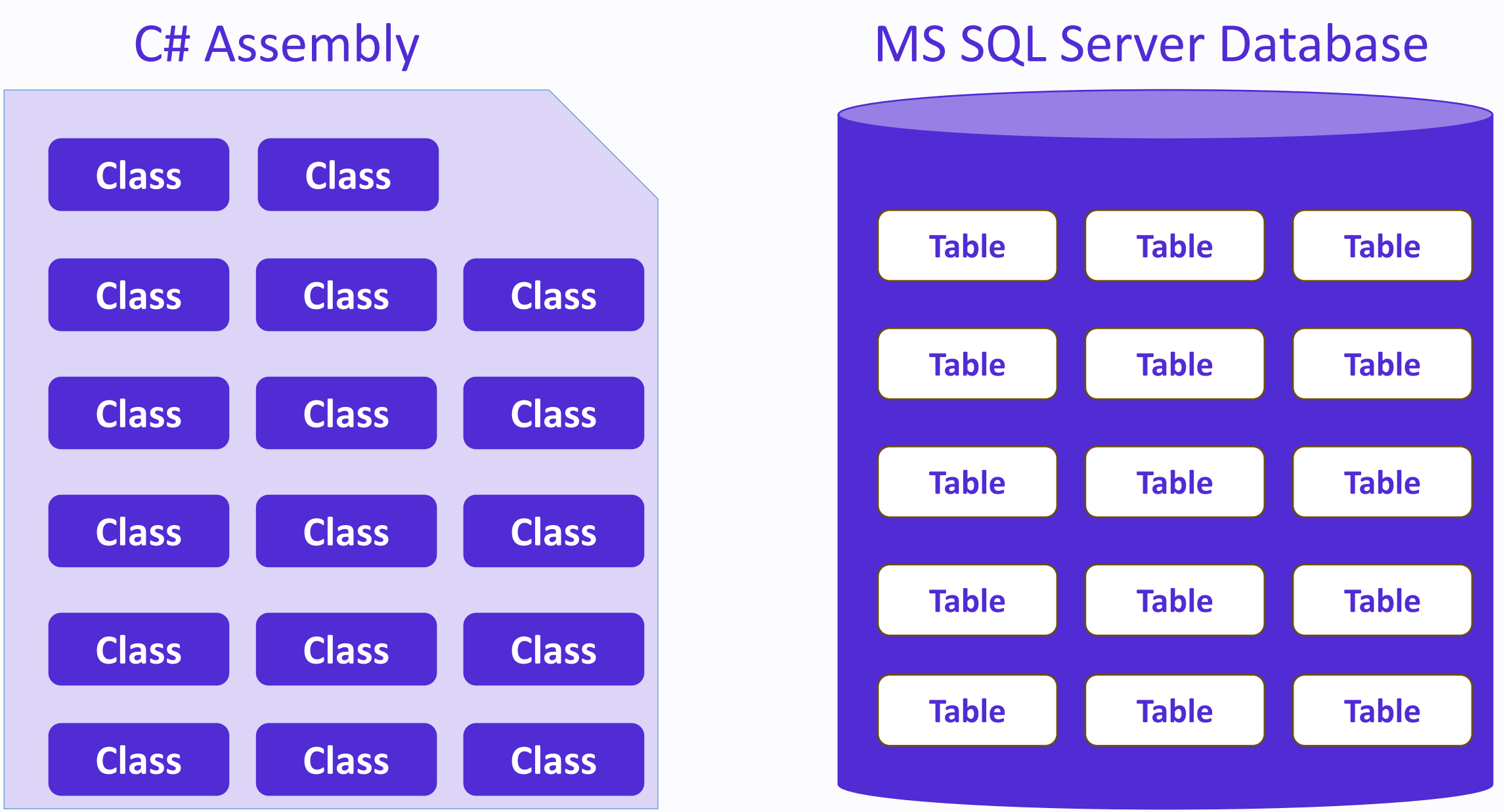
- Open Source
- Cross Platform
- Strongly Typed
- Case Sensitive
- Memory Management
- Object Oriented

- Usage
  - Desktop Applications
  - Web Applications
  - Mobile Applications
  - Cloud Applications
  - Web APIs
  - SSIS Packages
  - Many More…

# Version History

| Target | Version | C# language version default |
|---|---|---|
| .NET | 8.x | C# 12 |
| .NET | 7.x | C# 11 |
| .NET | 6.x | C# 10 |
| .NET | 5.x | C# 9.0 |
| .NET Core | 3.x | C# 8.0 |
| .NET Core | 2.x | C# 7.3 |
| .NET Standard | 2.1 | C# 8.0 |
| .NET Standard | 2 | C# 7.3 |
| .NET Standard | 1.x | C# 7.3 |
| .NET Framework | all | C# 7.3 |

# Our First C# Program


C# Assembly
Class
Class
Class
Class
Class
Class
Class
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Class
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Class
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Class
MS SQL Server Database
Table
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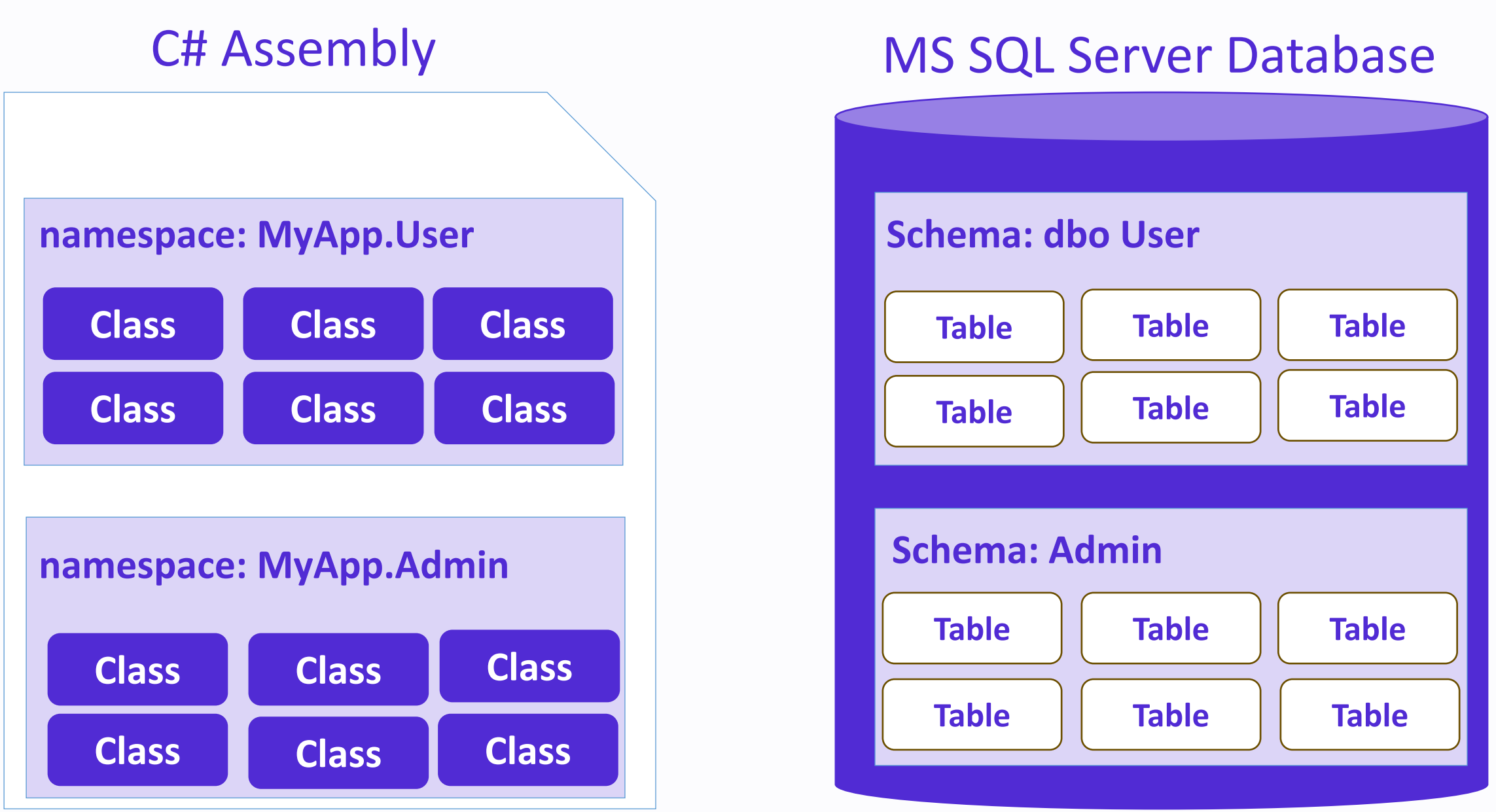
Table

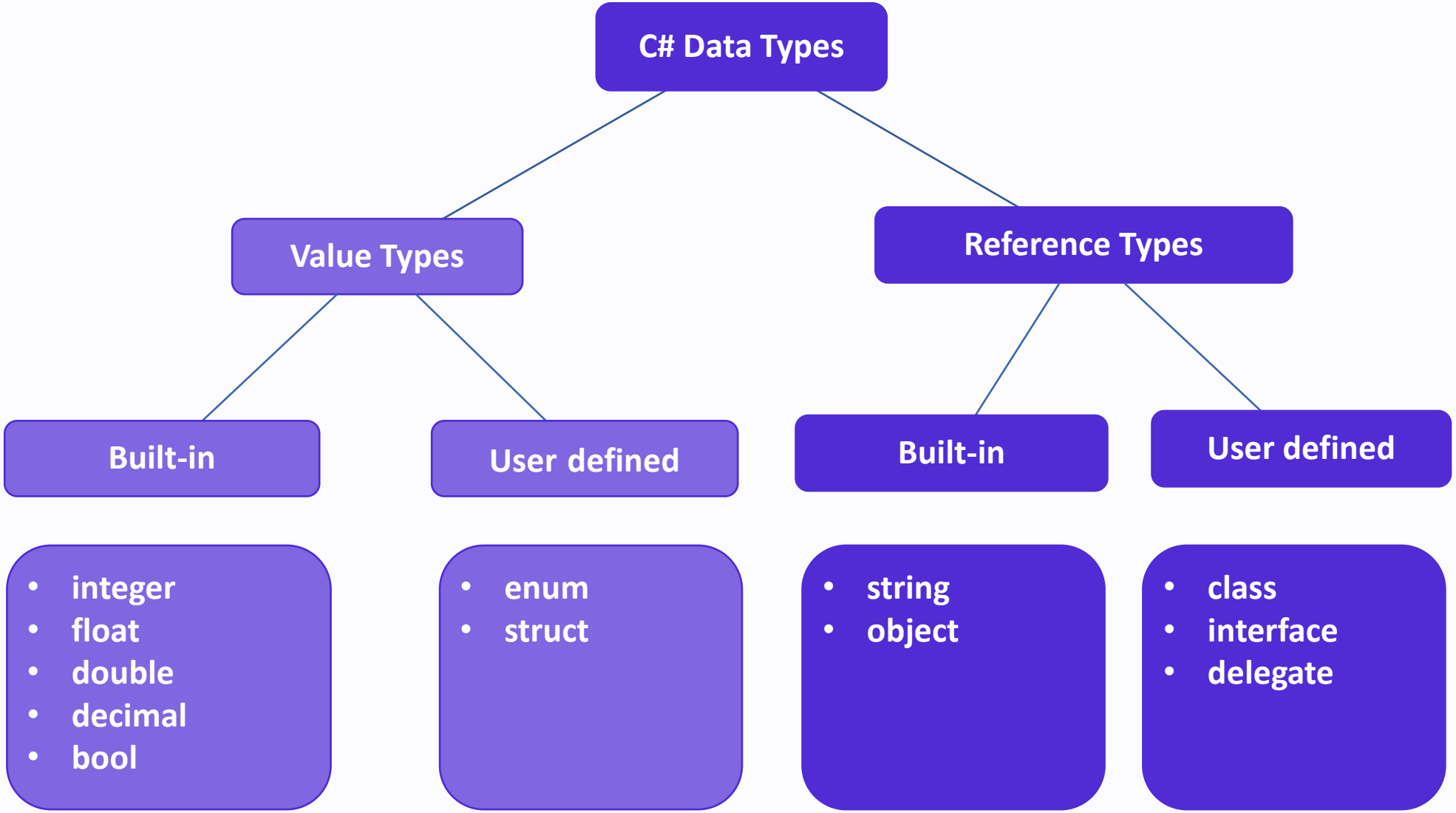

C# Assembly
namespace: MyApp.User
Class
Class
Class
Class
Class
Class
namespace: MyApp.Admin
Class
Class
Class
Class
Class
Class
MS SQL Server Database
Schema: dbo User
Table
Table
Table
Table
Table
Table
Schema: Admin
Table
Table
Table
Table
Table
Table

# Keywords

| | | | | | |
|---|---|---|---|---|---|
| abstract | delegate | if | override | struct | volatile |
| as | do | implicit | params | switch | while |
| base | double | in | private | this | |
| bool | else | int | protected | throw | |
| break | enum | interface | public | true | |
| byte | event | internal | readonly | try | |
| case | explicit | is | ref | typeof | |
| catch | extern | lock | return | uint | |
| char | false | long | sbyte | ulong | |
| checked | finally | namespace | sealed | unchecked | |
| class | fixed | new | short | unsafe | |
| const | float | null | sizeof | ushort | |
| continue | for | object | stackalloc | using | |
| decimal | foreach | operator | static | virtual | |
| default | goto | out | string | void | |

# Contextual Keywords

| | | |
|---|---|---|
| add | group | record |
| and | init | remove |
| alias | into | required |
| ascending | join | scoped |
| args | let | select |
| async | managed | set |
| await | nameof | unmanaged |
| by | nint | value |
| descending | not | var |
| dynamic | notnull | when |
| equals | nuint | where |
| File | on | with |
| from | or | yield |
| get | orderby | |
| global | partial | |


C# Data Types
Value Types
Reference Types
Built-in
User defined
Built-in
User defined
integer
float
double
decimal
bool
enum
struct
string
object
class
interface
delegate

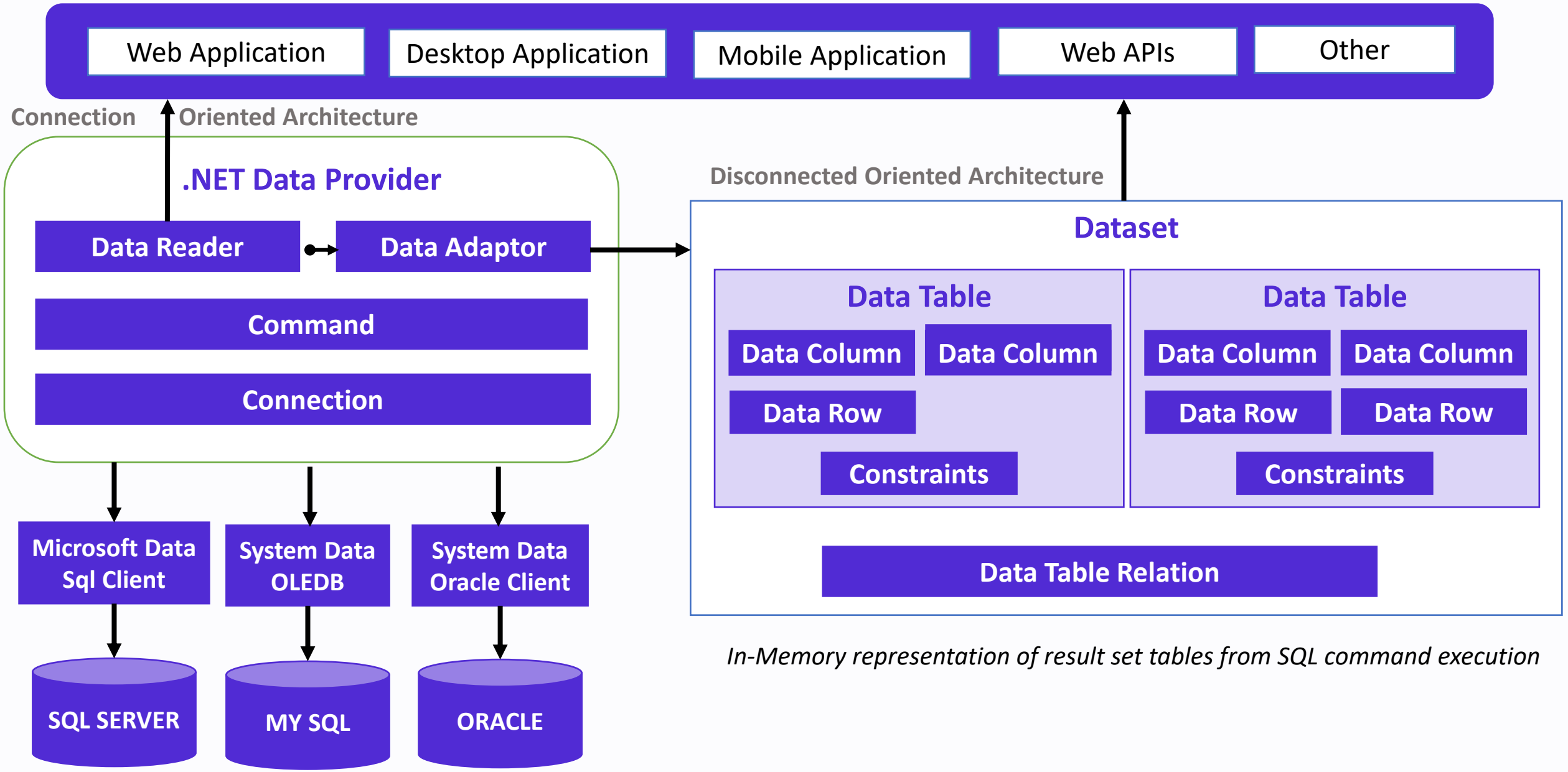
# Data Types

| Data Type | Size | Description |
|---|---|---|
| **Integer** | | |
| sbyte | 8 bits | $-2^7$ to $2^7-1$ |
| int | 32 bits | $-2^{31}$ to $2^{31}-1$ (-2,147,483,648 to 2,147,483,647) |
| short | 16 bits | $-2^{15}$ to $2^{15}-1$ |
| long | 64 bits | $-2^{63}$ to $2^{63}-1$ (-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807) |
| **Real Or Floating Point** | | |
| float | 32 bits | $\pm 1.5 \times 10^{-45}$ to $\pm 3.4 \times 10^{38}$ (7 decimal digits). Suffix: f |
| double | 64 bits | $\pm 5.0 \times 10^{-324}$ to $\pm 1.7 \times 10^{308}$ (15 decimal digits). Suffix: D |
| decimal | 128 bits | $\pm 1.0 \times 10^{-28}$ to $\pm 7.9228 \times 10^{28}$. Suffix: M |
| bool | 1 bit | true or false |
| **Free Text** | | |
| char | 2 bytes | '@' |
| string | 2 bytes per character | "Hello". Size = (2* no of characters in the sequence) bytes. |

# ADO.NET – Data Access API

*“ADO.NET is a data access api in .NET Platform to interact with different data sources such as databases (sql server, oracle, etc.), xml, Microsoft access, and other in a standard, and structured approach.”*

# ADO.NET Architecture




*In-Memory representation of result set tables from SQL command execution*

# MS SQL SERVER Data Access

- Add below DLL as project reference through Manage Nuget Package manager.
  - **Microsoft.Data.SqlClient**
  - **System.Data.SqlClient (Legacy library)**
- SQL Server data provider provides the following classes to interact with database.

| Class | Description |
|---|---|
| **SqlConnection** | Establishes a connection to a datsbase. |
| **SqlCommand** | Represents an individual SQL statement or stored procedure that can be executed against the database connected. |
| **SqlDataReader** | Provides read-only, forward-only access to the data in a database. |
| **SqlDataAdaptor** | Acts as a bridge between the command and connection objects and a dataset |

# Thank You!