

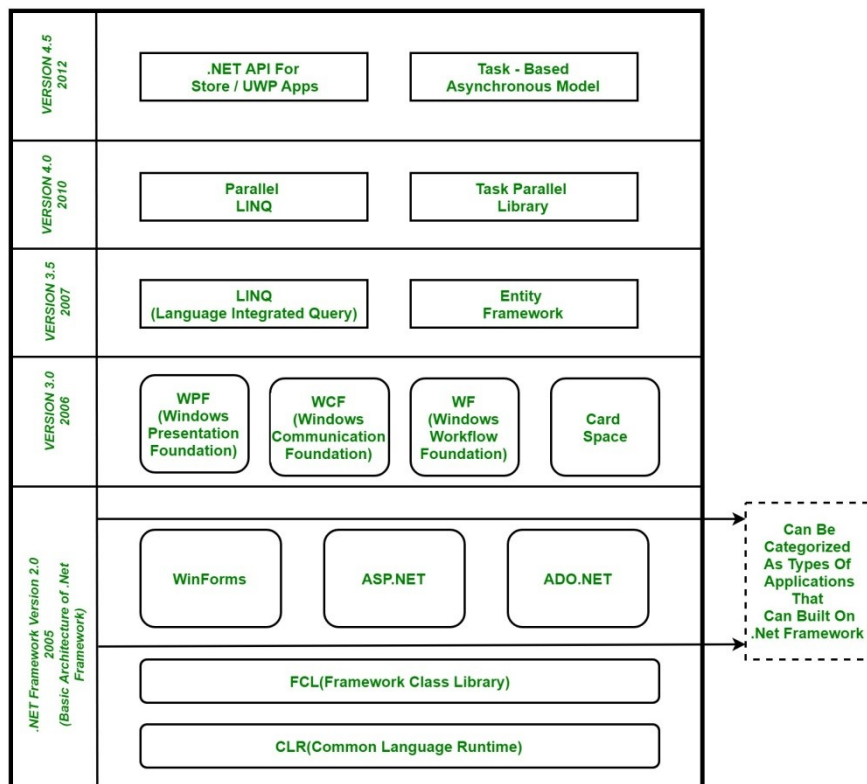
1.1 .NET Framework: Features and Architecture

.NET Framework is a software development platform developed by Microsoft. .net framework is designed and developed by Microsoft and the first beta version released in 2000. .Net framework is used to develop applications for web, Windows, phone. Moreover, it provides a broad range of functionalities and support. This framework contains a large number of class libraries known as Framework Class Library (FCL). The software programs written in .NET are executed in the execution environment, which is called CLR (Common Language Runtime). These are the core and essential parts of the .NET framework. This framework provides various services like memory management, networking, security, memory management, and type-safety. The .Net Framework supports more than 60 programming languages such as C#, F#, VB.NET, J#, VC++, JScript.NET, APL, COBOL, Perl, Oberon, ML, Pascal, Eiffel, Smalltalk, Python, Cobra, ADA, etc.

Features:

- **Language Independence:** Supports multiple programming languages (C#, VB.NET, F#, etc.).
- **Cross-Language Integration:** Code written in different languages can work together.
- **Automatic Memory Management:** Garbage Collector (GC) manages memory allocation and deallocation.
- **Security:** Provides a robust security model.
- **Simplified Deployment:** Easy installation and updates.

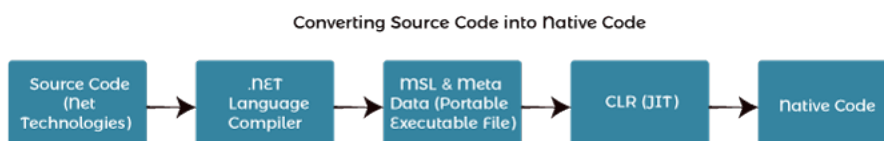
Architecture:



- Built on Common Language Runtime (CLR) and Class Library.
- CLR executes code and provides services like memory management, exception handling, and security.
- Class Library provides reusable code for common tasks.

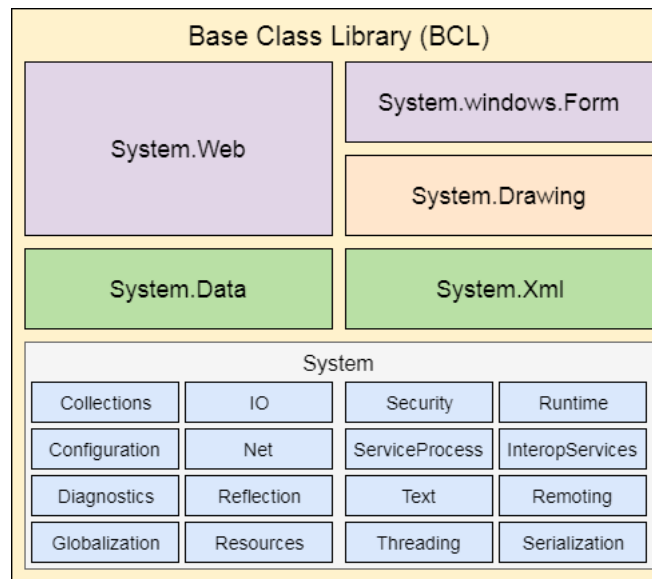
CLR (Common Language Runtime)

It is a program execution engine that loads and executes the program. It converts the program into native code. It acts as an interface between the framework and operating system. It does exception handling, memory management, and garbage collection. Moreover, it provides security, type-safety, interoperability, and portability. A list of CLR components are given below:



FCL (Framework Class Library)

It is a standard library that is a collection of thousands of classes and used to build an application. The BCL (Base Class Library) is the core of the FCL and provides basic functionalities.



WinForms

Windows Forms is a smart client technology for the .NET Framework, a set of managed libraries that simplify common application tasks such as reading and writing to the file system.

ASP.NET

ASP.NET is a web framework designed and developed by Microsoft. It is used to develop websites, web applications, and web services. It provides a fantastic integration of HTML, CSS, and JavaScript. It was first released in January 2002.

ADO.NET

ADO.NET is a module of .Net Framework, which is used to establish a connection between application and data sources. Data sources can be such as SQL Server and XML. ADO .NET consists of classes that can be used to connect, retrieve, insert, and delete data.

WPF (Windows Presentation Foundation)

Windows Presentation Foundation (WPF) is a graphical subsystem by Microsoft for rendering user interfaces in Windows-based applications. WPF, previously known as "Avalon", was initially released as part of .NET Framework 3.0 in 2006. WPF uses DirectX.

WCF (Windows Communication Foundation)

It is a framework for building service-oriented applications. Using WCF, you can send data as asynchronous messages from one service endpoint to another.

WF (Workflow Foundation)

Windows Workflow Foundation (WF) is a Microsoft technology that provides an API, an in-process workflow engine, and a rehostable designer to implement long-running processes as workflows within .NET applications.

LINQ (Language Integrated Query)

It is a query language, introduced in .NET 3.5 framework. It is used to make the query for data sources with C# or Visual Basics programming languages.

Entity Framework

It is an ORM(object relational mapping) based open source framework which is used to work with a database using .NET objects. It eliminates a lot of developers effort to handle the database. It is Microsoft's recommended technology to deal with the database.

Parallel LINQ

Parallel LINQ or PLINQ is a parallel implementation of LINQ to objects. It combines the simplicity and readability of LINQ and provides the power of parallel programming.

It can improve and provide fast speed to execute the LINQ query by using all available computer capabilities.

Apart from the above features and libraries, .NET includes other APIs and Model to improve and enhance the .NET framework.

1.2 .NET Components

Common Language Runtime (CLR):

- The runtime environment that executes .NET programs.
- Provides services like memory management, exception handling, and security.
- Converts Intermediate Language (IL) code into machine code during execution.

Class Library:

- A collection of reusable classes, interfaces, and value types.
- Provides functionality for file I/O, database access, XML manipulation, etc.
- Organized into namespaces for easy access.

1.3 .NET Framework, .NET Core, and .NET Standard

.NET Framework:

- The original .NET platform for building Windows applications.
- Supports desktop, web, and service-oriented applications.

.NET Core:

- A cross-platform, open-source framework for building modern applications.
- Supports Windows, macOS, and Linux.
- Used for cloud-based and high-performance applications.

.NET Standard:

- A formal specification of .NET APIs that are common across all .NET implementations.
- Ensures code compatibility between .NET Framework, .NET Core, and Xamarin.

1.4 Introduction to Visual Studio and Visual Studio Code IDE

Visual Studio:

- A full-featured Integrated Development Environment (IDE) for .NET development.
- Supports debugging, profiling, and IntelliSense (code completion).
- Used for building web, desktop, mobile, and cloud applications.

Visual Studio Code:

- A lightweight, cross-platform code editor.
- Supports multiple programming languages and extensions.
- Ideal for small projects and quick edits.

Setting Up Visual Studio Development Environment:

- Download and install Visual Studio from Microsoft's website.
- Select workloads (e.g., .NET desktop development, web development).
- Configure tools like Git and extensions.

IntelliSense:

- A code-completion tool in Visual Studio.
- Provides suggestions, parameter info, and quick info while typing.

1.5 Project Types in .NET

- **Console Application:** Command-line-based applications.
- **Windows Forms:** Desktop applications with a graphical user interface (GUI).
- **ASP.NET Web Application:** Web applications and services.
- **Class Library:** Reusable code libraries.
- **WPF (Windows Presentation Foundation):** Rich desktop applications with advanced UI.
- **.NET Core Web API:** RESTful services for modern applications.
- **Xamarin:** Cross-platform mobile applications.
- **Unit Test Project:** For testing .NET applications.