SHRI MAHAVIR VIDYAMANDIR TRUST
सा विद्या या विमुक्तये

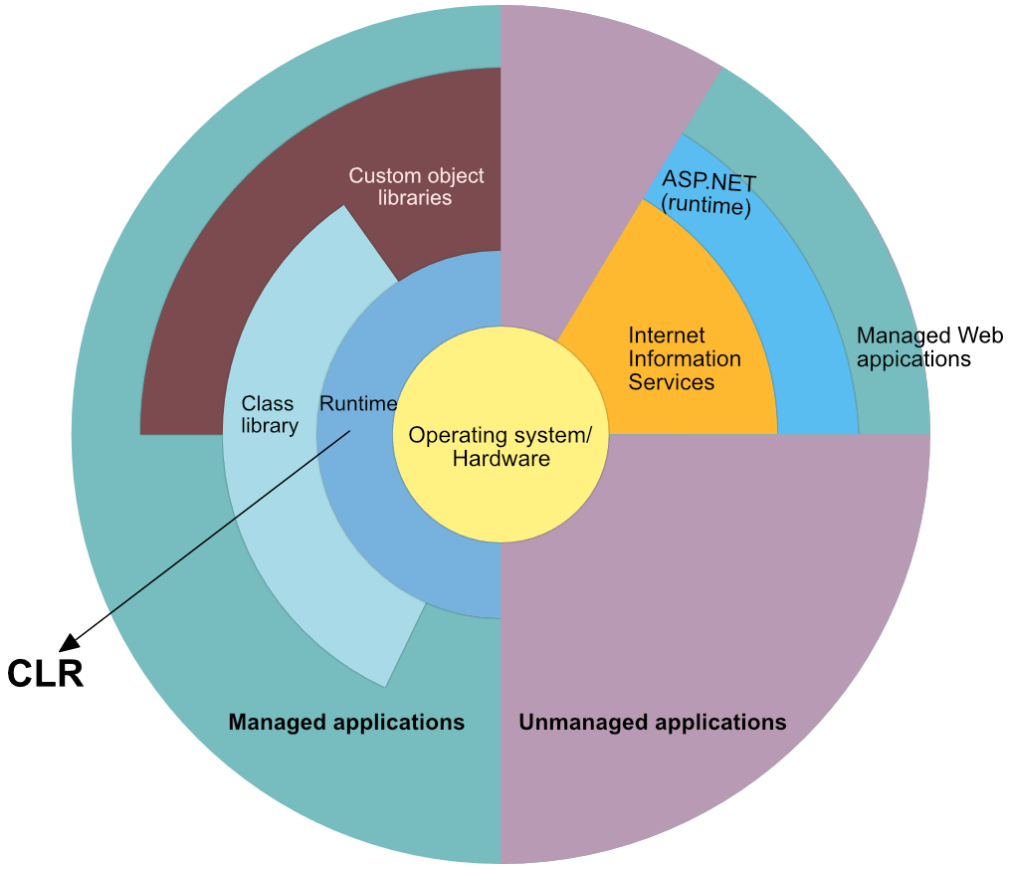
ASP.NET UNIT 1

Unit No 1. Introduction to ASP.NET

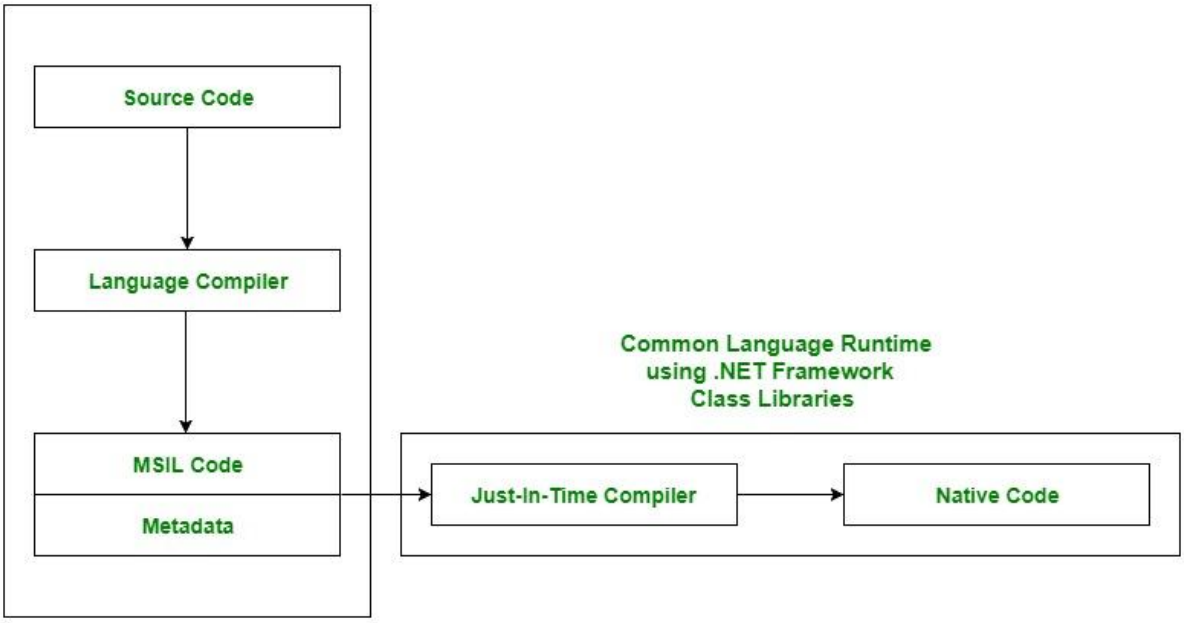
1. Write note on CLR.

CLR is the basic and Virtual Machine component of the **.NET Framework**. It is the **run-time enviornment in the .NET Framework** that runs the codes and helps in making the development process easier by providing the various services. Basically, it is responsible for managing the execution of *.NET programs* regardless of any *.NET* programming language. The code that runs under the Common Language Runtime is termed as the Managed Code. In other words, you can say that CLR provides a managed execution environment for the *.NET* programs by improving the security, including the cross language integration and a rich set of class libraries etc. CLR is present in every .NET framework version. Below table illustrate the CLR version in .NET framework.

Below diagram illustrate how CLR is associated with the operating system/hardware along with the class libraries. Here, the runtime is actually CLR.



- Suppose you have written a program in any .net compliant language and save it in a file which is known as the Source Code.
- Language specific compiler compiles the source code into the ***MSIL(Microsoft Intermediate Language)*** which is also know as the ***CIL(Common Intermediate Language)*** or ***IL(Intermediate Language)*** along with its metadata. *Metadata* includes the all the types, actual implementation of each function of the program. MSIL is machine independent code.
- Now CLR comes into existence. CLR provides the services and runtime environment to the MSIL code. Internally CLR includes the JIT(Just-In-Time) compiler which converts the MSIL code to machine code which further executed by CPU. CLR also uses the .NET Framework class libraries. Metadata provides information about the programming language, environment, version, and class libraries to the CLR by which CLR handles the MSIL code. As CLR is common so it allows an instance of a class that written in a different language to call a method of the class which written in another language.



As the word specify, Common means CLR provides a common runtime or execution environment as there are more than 60 .NET programming languages.

Main components of CLR:

- Common Language Specification (CLS)
- Common Type System (CTS)
- Garbage Collection (GC)
- Just In – Time Compiler (JIT)

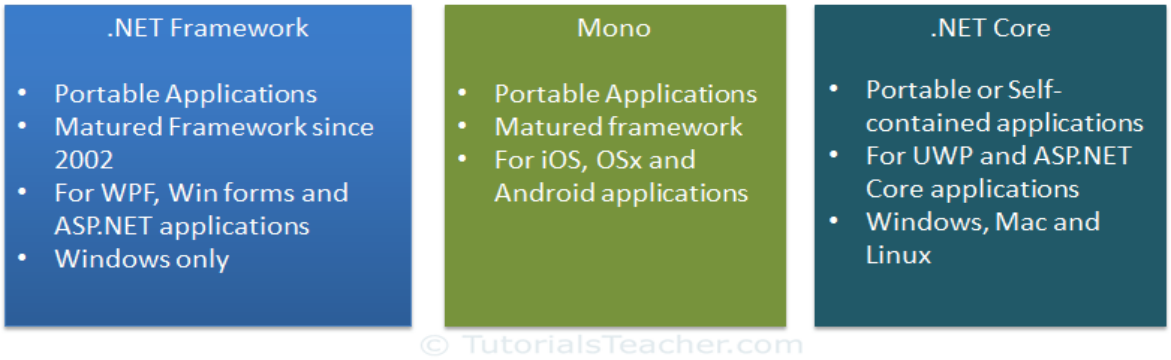
Benefits of CLR:

- It improves the performance by providing a rich interact between programs at run time.
- Enhance portability by removing the need of recompiling a program on any operating system that supports it.
- Security also increases as it analyzes the MSIL instructions whether they are safe or unsafe. Also, the use of delegates in place of function pointers enhance the type safety and security.
- Support automatic memory management with the help of Garbage Collector.
- Provides cross-language integration because CTS inside CLR provides a common standard that activates the different languages to extend and share each other's libraries.
- Provides support to use the components that developed in other .NET programming languages.
- Provide language, platform, and architecture independence.

- It allows easy creation of scalable and multithreaded applications, as the developer has no need to think about the memory management and security issues.

2. Explain Code sharing techniques in details

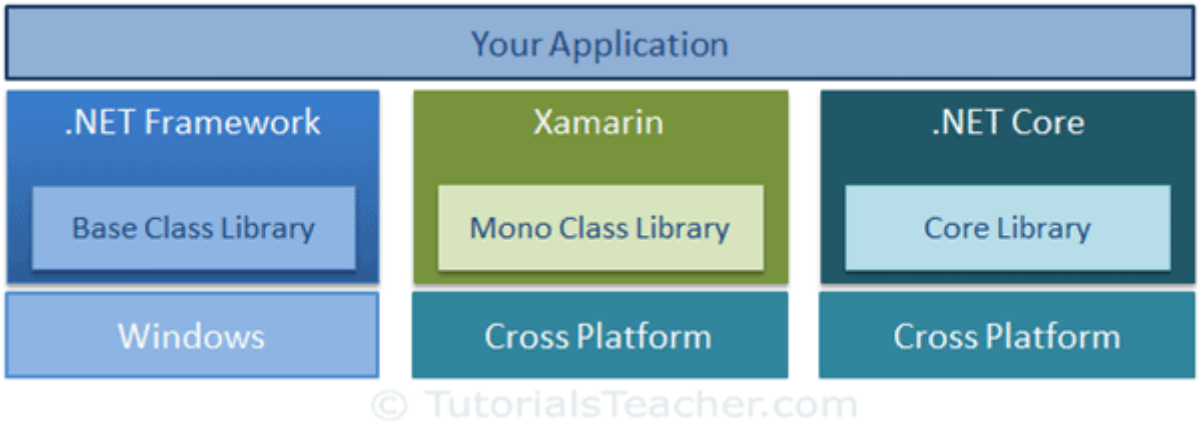
With .NET Core, we can currently develop applications with three different .NET frameworks for different platforms. The traditional or standard .NET Framework is for Windows, Mono framework for iOS, OSx and Android and .NET Core for Windows, Mac and Linux.



NET Frameworks

These frameworks use different framework class libraries. It means code written in one framework cannot be used with other frameworks. For example, a console application developed with .NET Framework cannot run on .NET Core or vice-versa. Thus, code-sharing is not allowed.

It would be nice to write code once and share with other applications with different .NET frameworks.



Code Sharing

To solve this problem of code sharing, we can use the following three approaches:

- **.NET Standard Libraries** – .NET Standard projects can implement code to be shared across multiple platforms, and can access a large number of .NET APIs (depending on the version). .NET Standard 1.0 - 1.6 implement progressively larger sets of APIs, while .NET Standard 2.0 provides the best coverage of the .NET BCL (including the .NET APIs available in Xamarin apps).
- **Shared Projects** – Use the Shared Asset Project type to organize your source code, and use #if compiler directives as required to manage platform-specific requirements.

- **Portable Class Libraries** (deprecated) – Portable Class Libraries (PCLs) can target multiple platforms with a common API surface, and use Interfaces to provide platform-specific functionality. PCLs are deprecated in the latest versions of Visual Studio – use .NET Standard instead.

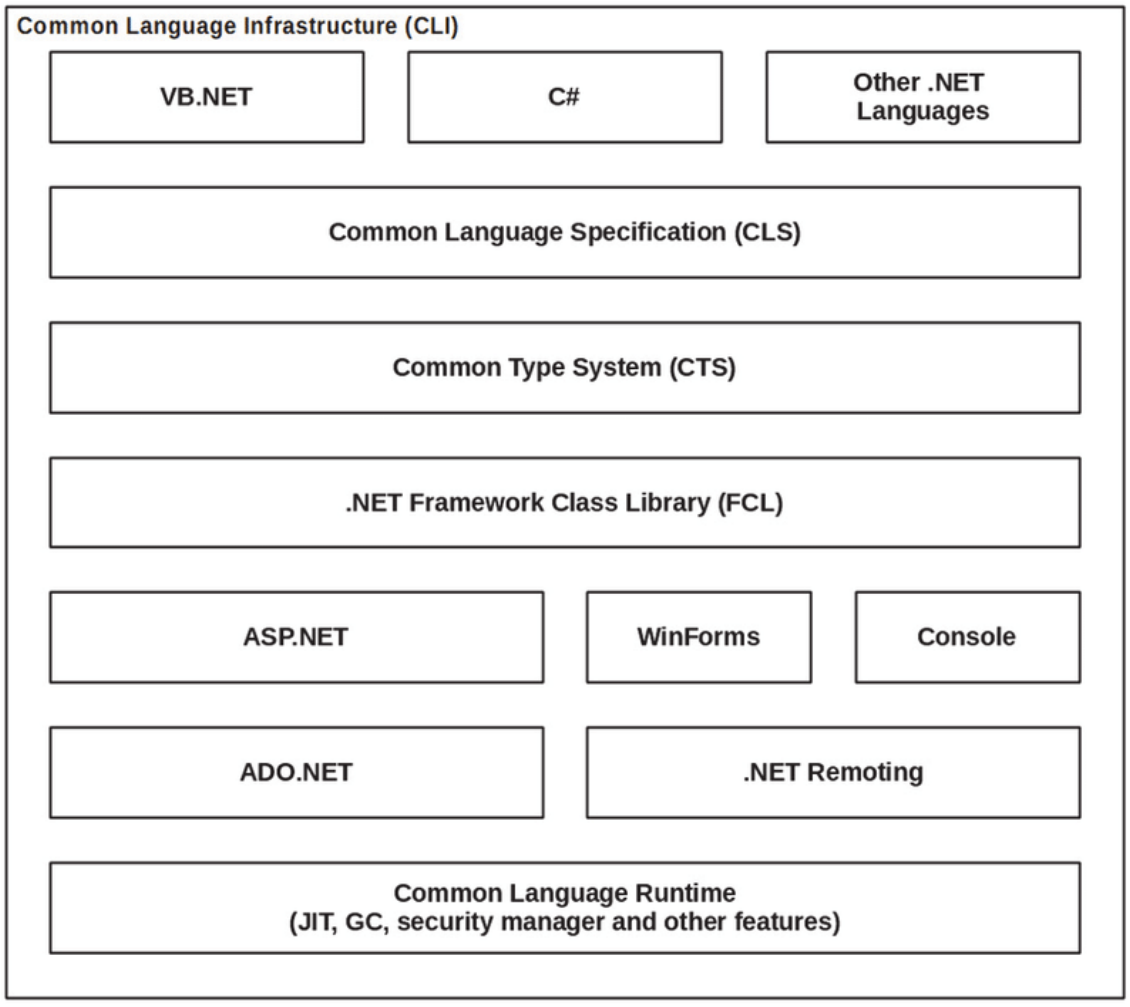
3. Write Note on .NET framework.

A programming infrastructure created by Microsoft for building, deploying, and running applications and services that use .NET technologies, such as desktop applications and Web services

1) It is a platform for application developers.
2) It is tiered, modular, and hierarchal.
3) It is a service or platform for building, deploying and running applications.
4) It consists of 2 main parts: Common language runtime and class libraries.

- The common language runtime is the bottom tier, the least abstracted.
- The .NET Framework is partitioned into modules, each with its own distinct responsibility.

The architectural layout of the .NET Framework is illustrated in following figure:



Here we examine the following key components of the .NET Framework:

1) **Common Language Infrastructure (CLI):** The purpose of the Common Language Infrastructure (CLI) is to provide a language-neutral platform for application development and execution, including functions for Exception handling, Garbage Collection, security, and interoperability.

2) **Common Language Runtime (CLR):** The .NET Framework provides a runtime environment called the Common Language Runtime or CLR (similar to the Java Virtual Machine or JVM in Java), which handles the execution of code and provides useful services for the implementation of the program.

   The CLR is the execution engine for .NET applications and serves as the interface between .NET applications and the operating system. The CLR provides many services such as:

   - Loads and executes code
   - Converts intermediate language to native machine code
   - Manages memory and objects
   - Enforces code and access security
   - Handles exceptions
   - Interfaces between managed code, COM objects, and DLLs
   - Provides type-checking
   - Provides code meta data (Reflection)
   - Provides profiling, debugging, etc.
   - Separates processes and memory

3) **Framework Class Library (FCL):** It is also known as a base class library. The FCL is a collection of over 7000 reusable classes, interfaces, and value types that enable .NET applications to :

   a) read and write files,
   b) access databases,
   c) process XML,
   d) display a graphical user interface,
   e) draw graphics,
   f) use Web services, etc.

   - The .Net Framework class library (FCL) organized in a hierarchical tree structure and it is divided into Namespaces. Namespaces is a logical grouping of types for the purpose of identification. Framework class library (FCL) provides the consistent base types that are used across all .NET enabled languages. The Classes are accessed by namespaces, which reside within Assemblies.

   - Other name of FCL is BCL – Base Class Library

4) **Common Type System (CTS)**
   - The CLS is a common platform that integrates code and components from multiple .NET programming languages.
   - CTS allow programs written in different programming languages to easily share information.

- CLS forms a subset of CTS. This implies that all the rules that apply to CTS also apply to CLS also.
- It defines rules that a programming language must follow to ensure that objects written in different programming languages can interact with each other.
- CTS provide cross language integration.
- The common type system supports two general categories of types:
    a) Value Type
    b) Reference Type

a) **Value Type:** Stores directly data on stack. In built data type. For ex. Dim a as integer.

b) **Reference Type:** Store a reference to the value's memory address, and are allocated on the heap. For ex: dim obj as new oledbconnection.

- The Common Language Runtime (CLR) can load and execute the source code written in any .Net language, only if the type is described in the Common Type System (CTS)

5) Common Language Specification (CLS)

- CLS includes basic language features needed by almost all applications.
- CLS is a subset of the Common Type System.
- It serves as a guide for library writes and compiler writers.
- The CLS is also important to application developers who are writing code that will be used by other developers.

6) Microsoft Intermediate Language:

- When you compile your Visual Basic .NET source code, it is changed to an intermediate language (IL) that the CLR and all other .NET development environments understand.
- All .NET languages compile code to this IL, which is known as Microsoft Intermediate Language, MSIL, or IL.
- MSIL is a common language in the sense that the same programming tasks written with different .NET languages produce the same IL code.
- At the IL level, all .NET code is the same regardless of whether it came from C++ or Visual Basic.
- When a compiler produces Microsoft Intermediate Language (MSIL), it also produces Metadata.
- The Microsoft Intermediate Language (MSIL) and Metadata are contained in a portable executable (PE) file.

7) Garbage Collector (GC)

- Garbage collection is a mechanism that allows the computer to detect when an object can no longer be accessed.
- It automatically free up the memory used by that object.
- One of the functions of CLR is automatic memory management that uses that garbage collection mechanism.
- The CLR's Garbage Collector (GC) manages the allocation and releases of memory for an application.

4. Explain how ASP.NET provides more developer productivity.

One of the goals of ASP.NET is to enable developers to easily and quickly build feature-rich web applications. To accomplish this, ASP.NET applications to identify the common features, patterns, and code that developers build over and over today. Once they identified those features, they componentized those features and included them as built-in functionality of ASP.NET. ASP.NET team has a goal of reducing the number of lines of code required for an application by a whopping 70%. Microsoft has introduced a vast collection of new features that are now available to developers in ASP.NET.

Using these features, you can spend your time building richer, more fully featured applications by adding the new controls and infrastructure services built into the core platform. ASP.NET now includes built-in support for membership (username/password credential storage) and role management services out of the box. The new personalization service provides for quick storage/retrieval of user settings and preferences, enabling rich customization with minimal code. With ASP.NET, Microsoft has introduced a new concept known as master pages that now enable flexible page user interface (UI) inheritance across sites. The new site navigation system enables developers to quickly build link structures consistently across a site. Site counters enable rich logging and instrumentation of client browser access patterns. Themes enable flexible UI skinning of controls and pages. And the new ASP.NET Framework enables rich portal-style layout and end user customization features. Along with all these features, ASP.NET 2.0 also brings with it 45 new server controls that enable powerful declarative support for data access, login security, wizard navigation, image generation, menus, treeviews, portals, and more. The next few sections will provide you with a glimpse of these features.