



Common Language Runtime

.NET

Common Language Runtime (CLR) is a managed execution environment that is part of Microsoft's .NET framework. **CLR** manages the execution of programs written in different supported languages. **CLR** transforms source code into a form of bytecode known as **CIL (Common Intermediate Language)**.

CLR (Common Language Runtime)

<https://docs.microsoft.com/en-us/dotnet/standard/clr>

<https://docs.microsoft.com/en-us/dotnet/framework/get-started/overview>

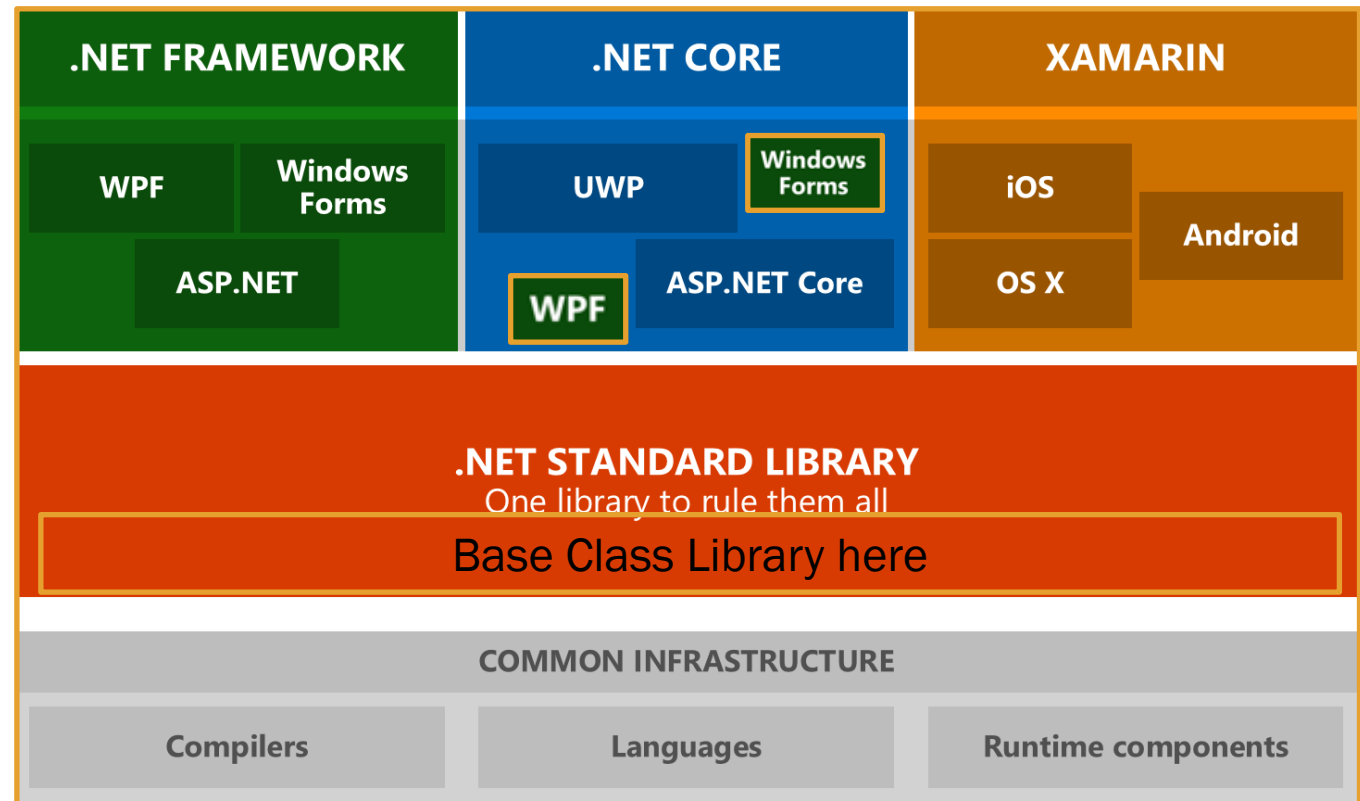
- The .NET Framework consists of the **Common Language Runtime** (CLR) and the **.NET Framework base class library**.
- The **CLR** is the foundation for .NET Framework. It manages and runs the code and provides services like memory management, remoting, type enforcement (through the **CTS**), and security.

Benefits of CLR:		
cross-language integration	cross-language exception handling	enhanced security
versioning and deployment support	a simplified model for component interaction	debugging and profiling services.

.NET Class Libraries

<https://docs.microsoft.com/en-us/dotnet/framework/get-started/overview>

A **class library** is an object-oriented collection of reusable **types** that you can use to develop apps ranging from traditional command-line or graphical user interface (GUI) apps to apps based on the latest innovations provided by ASP.NET, such as XML Web services.

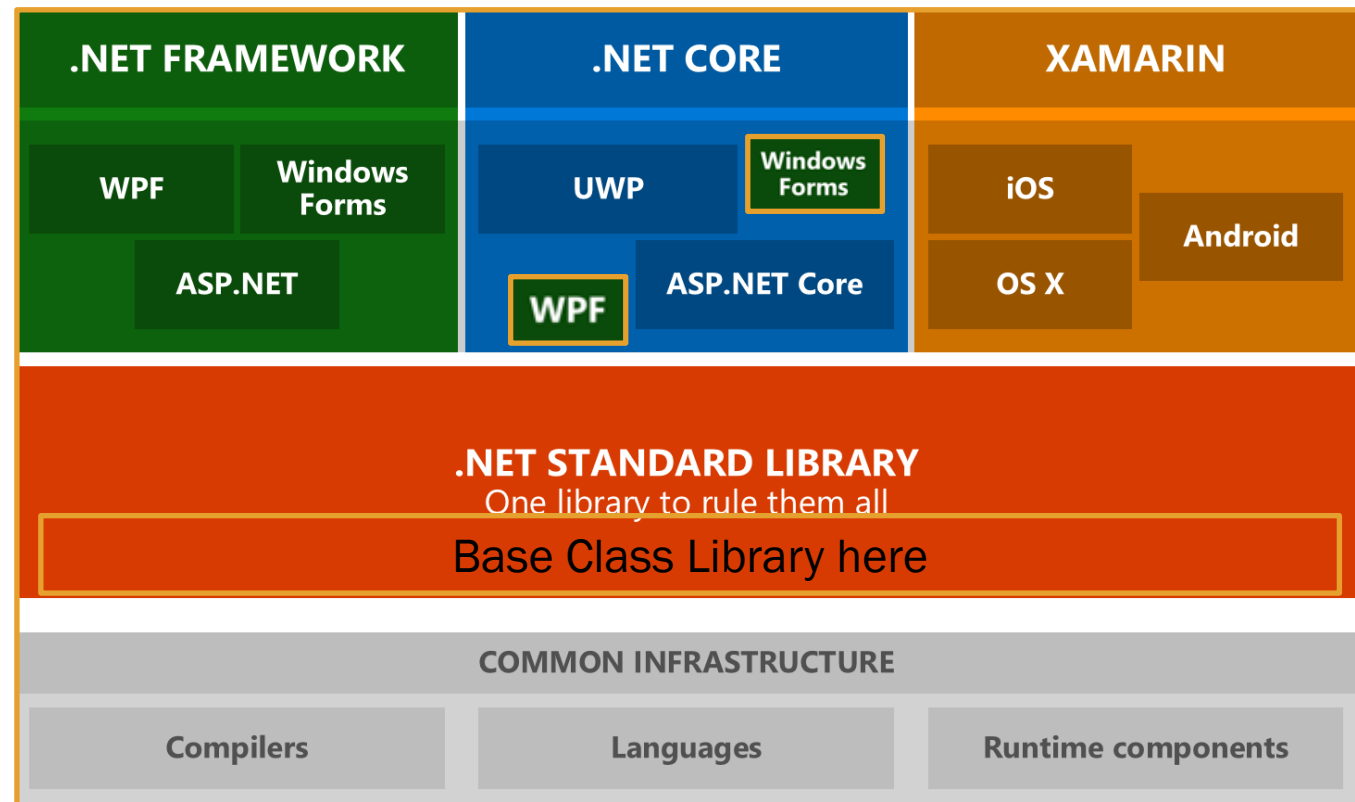


BCL (Base Class Library)

<https://docs.microsoft.com/en-us/dotnet/standard/clr>

BCL stands for **Base Class Library** (AKA, **Class library (CL)**). A .NET Framework library, **BCL** is the foundation for the C# runtime library and one of the **Common Language Infrastructure (CLI)** standard libraries.

BCL provides the **types** that represent built-in CLI data types, basic file access, collections, custom attributes, formatting, security attributes, I/O streams, string manipulation, etc.

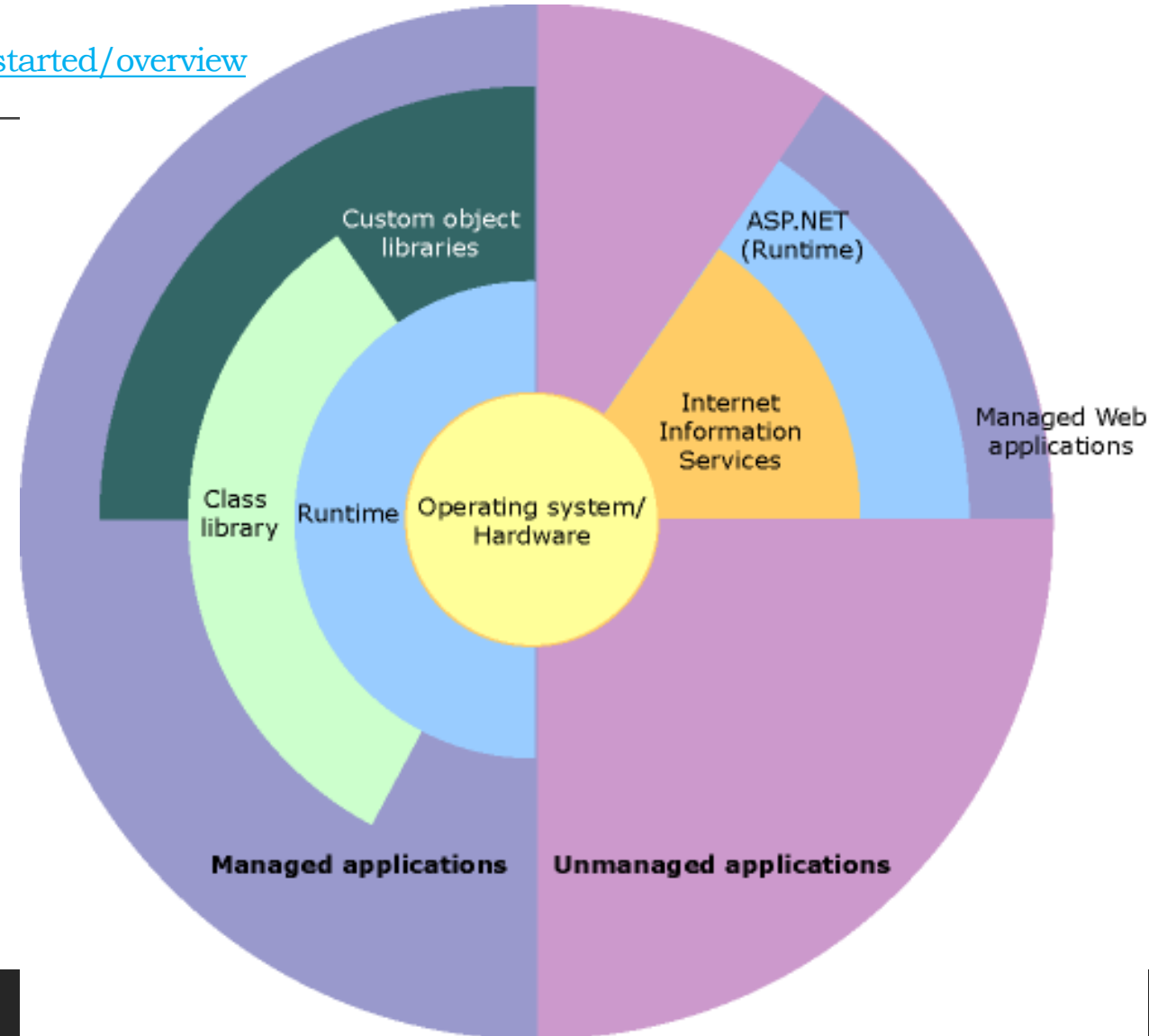


.NET CLR and Class Library Relationship

<https://docs.microsoft.com/en-us/dotnet/framework/get-started/overview>

This illustration shows the relationship of the **Common Language Runtime** and the class library to your apps and to the overall system.

The illustration also shows how managed code operates within a larger architecture.

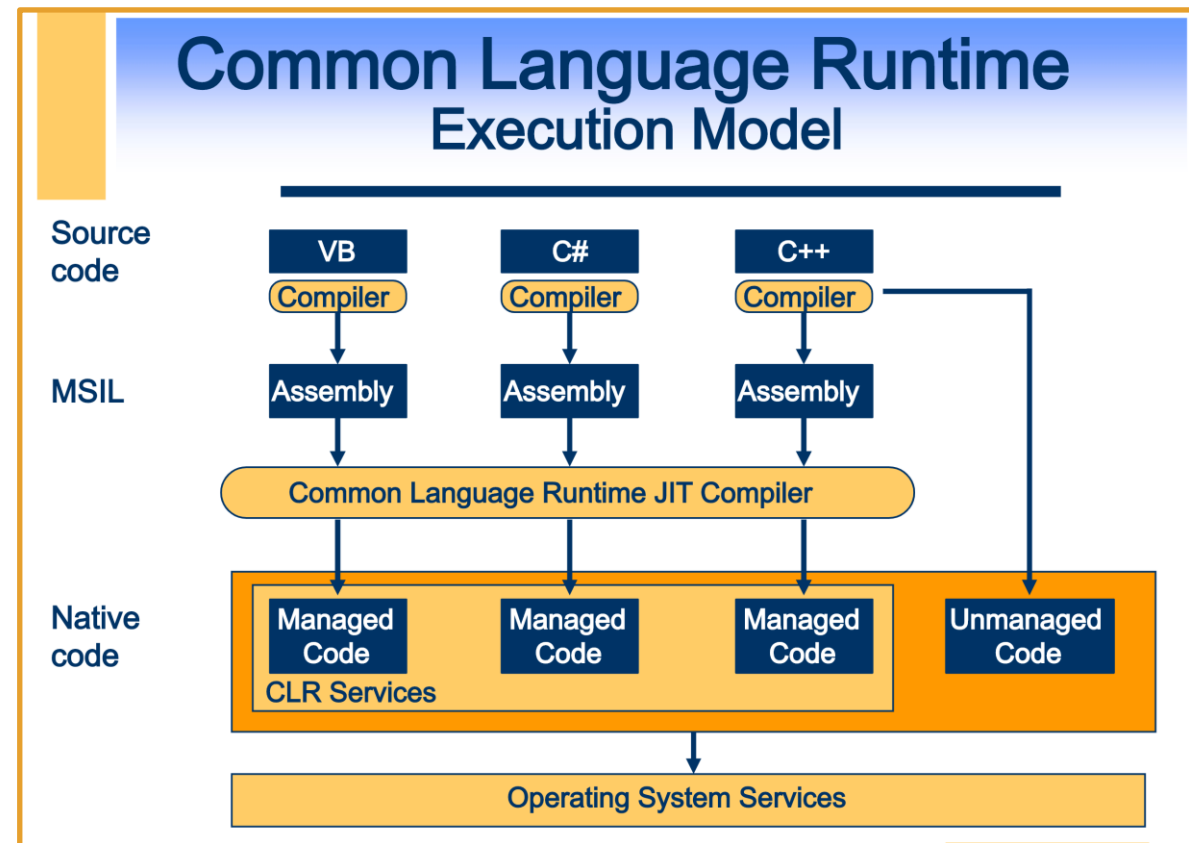


Managed Code

<https://docs.microsoft.com/en-us/dotnet/standard/managed-code>

<https://docs.microsoft.com/en-us/dotnet/standard/managed-execution-process>

- Managed code is managed by the **Common Language Runtime (CLR)** at runtime.
- The **CLR** knows what your code is doing and can *manage* it.
- The **CLR** provides memory management (**GC**), security boundaries, type safety, etc.
- Managed code is written in a high-level language that can be run on top of .NET.
- Code is compiled into **Intermediate Language** code, which the **CLR** compiles and executes.
- The **CLR** manages the **Just-In-Time** compiling of code from **IL** to machine code that can be run on a **CPU**.



Unmanaged Code

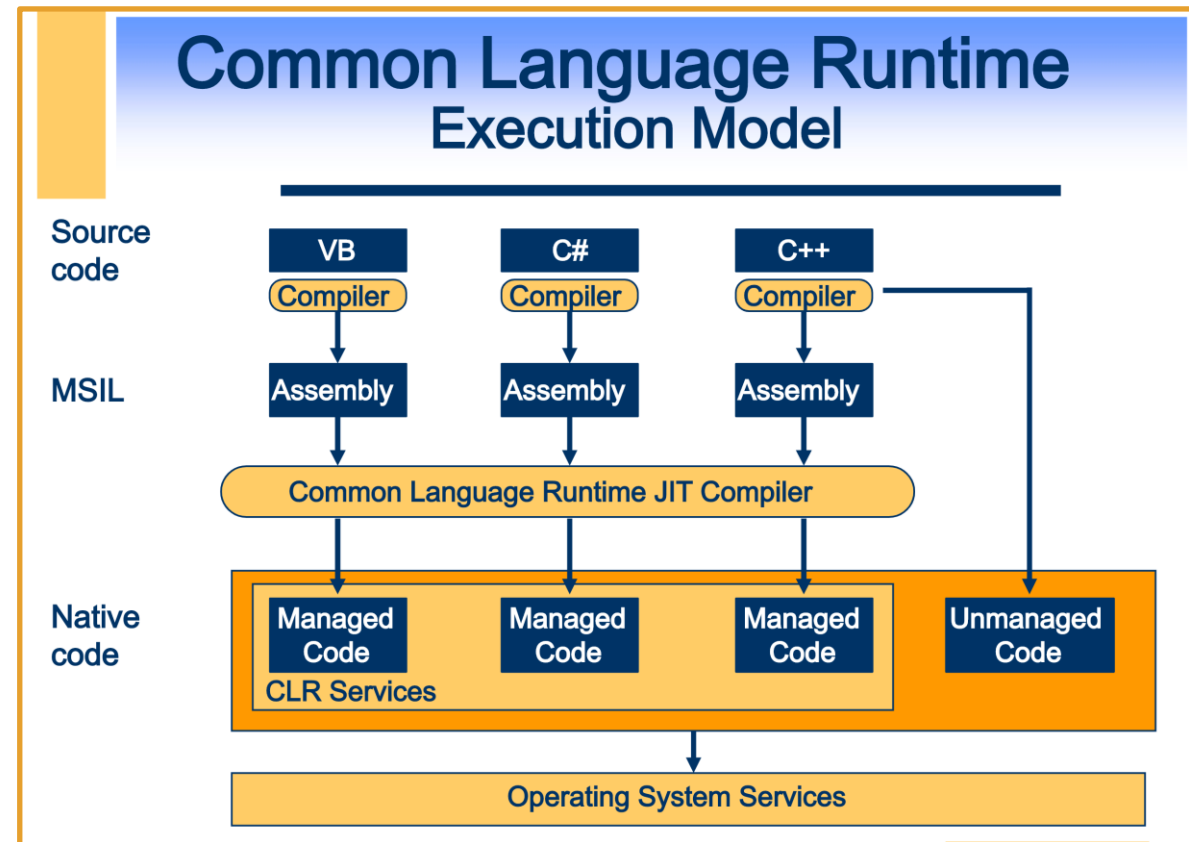
<https://docs.microsoft.com/en-us/dotnet/framework/interop/>

Code that runs outside the **CLR** is called Unmanaged Code.

The .NET Framework promotes interaction with COM components, COM+ services, external type libraries, and many operating system services.

Examples of Unmanaged Code:

- COM components,
- ActiveX interfaces,
- Windows API functions.



IDisposable Interface

<https://docs.microsoft.com/en-us/dotnet/api/system.idisposable?view=net-5.0>

- The **Garbage Collector (GC)** has no knowledge of unmanaged resources (open files and streams).
- ***IDisposable*** provides a method for releasing unmanaged resources.
- To use the ***IDisposable*** interface, call the object's ***IDisposable.Dispose*** implementation when finished using it.

```
// A base class that implements IDisposable.  
// By implementing IDisposable, you are announcing that  
// instances of this type allocate scarce resources.  
public class MyResource: IDisposable  
{  
    // Pointer to an external unmanaged resource
```

```
// Dispose managed resources.  
component.Dispose();
```

using block and IDisposable

<https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/using-statement>

Provides a convenient syntax that ensures the correct use of *IDisposable* objects.

```
using (var font1 = new Font("Arial", 10.0f))  
{  
    byte charset = font1.GdiCharSet;  
}
```

When the lifetime of an *IDisposable* object is limited to a single method, it should be declared and instantiated in a **using** statement. The **using** statement calls **.Dispose()** on the object and causes the object itself to go out of scope as soon as **.Dispose()** is called. Within the **using** block, the object is read-only and cannot be modified or reassigned.

Using Block

<https://docs.microsoft.com/en-us/dotnet/api/system.idisposable?view=net-5.0>

If your language supports a construct such as the **using** statement in C#, you can use it instead of explicitly calling **Idisposable.Dispose()**.

```
public WordCount(string filename)
{
    if (! File.Exists(filename))
        throw new FileNotFoundException("The file does not exist.");

    this.filename = filename;
    string txt = String.Empty;
    using (StreamReader sr = new StreamReader(filename)) {
        txt = sr.ReadToEnd();
    }
    nWords = Regex.Matches(txt, pattern).Count;
}
```

The **using** statement is a syntactic convenience. At compile time, the language compiler converts a using statement to a **try/finally** block.

using block

<https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/using-statement>

The **using** statement ensures that **.Dispose()** is called even if an exception occurs within the **using** block. You can achieve the same result by putting the object inside a **try** block and then calling **.Dispose()** in a finally block.

A **using** block is expanded to a **try/catch** block at compile time. Note the curly braces create a limited scope for the object.

```
{  
    var font1 = new Font("Arial", 10.0f);  
    try  
    {  
        byte charset = font1.GdiCharSet;  
    }  
    finally  
    {  
        if (font1 != null)  
            ((IDisposable)font1).Dispose();  
    }  
}
```

```
using (var font1 = new Font("Arial", 10.0f))  
{  
    byte charset = font1.GdiCharSet;  
}
```